


CadnaA®

State-of-the-art
noise prediction software

CadnaA

CadnaA is a world-leading, state-of-the-art software for modeling, calculation and assessment of environmental noise. It can be used efficiently at any scale, starting with a few single receivers in a neighborhood up to noise mapping projects of entire countries. This works for various source types in the fields of road-, railway-, aircraft-, and industrial noise.

CadnaA is a highly usable, yet flexible program which enables a steep learning curve. The approach of having one interface for the whole program, without any modular separation, will allow CadnaA beginners to get started quickly, while the existence of sophisticated project organization techniques and advanced assessment tools will allow handling even complex projects with ease.

With CadnaA, program parts which are required for most projects, such as advanced visualization techniques in 2D and 3D and a wealth of possible import formats, are implemented in all possible CadnaA configurations. This makes CadnaA a valuable tool even in its most basic configuration. Users who want to perform special tasks, such as statistical evaluations for noise mapping projects, can upgrade with separate options if required.

Uses

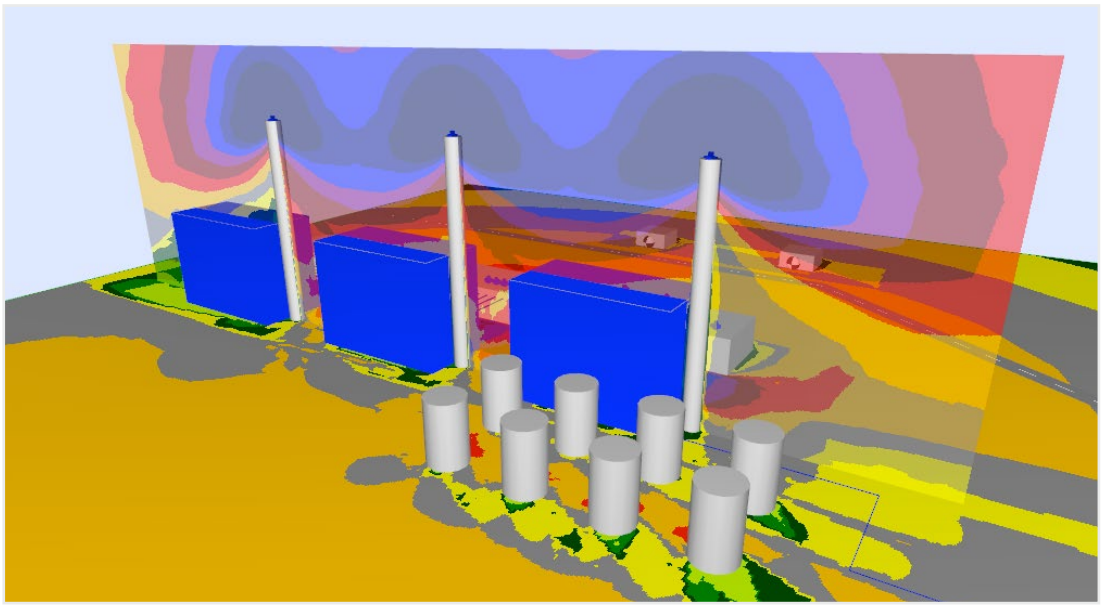
- Modeling and calculation of industrial- traffic- and aircraft noise at different scales
- Noise mapping according to the Environmental Noise Directive (2002/49/EC)
- Statistical evaluations of noise and other data

Key Features

- Highly usable, yet flexible concept
- Calculation according to various national and international standards and guidelines
- Fast calculations even for large projects due to multicore use and 64bit option
- Flexible display and result output options

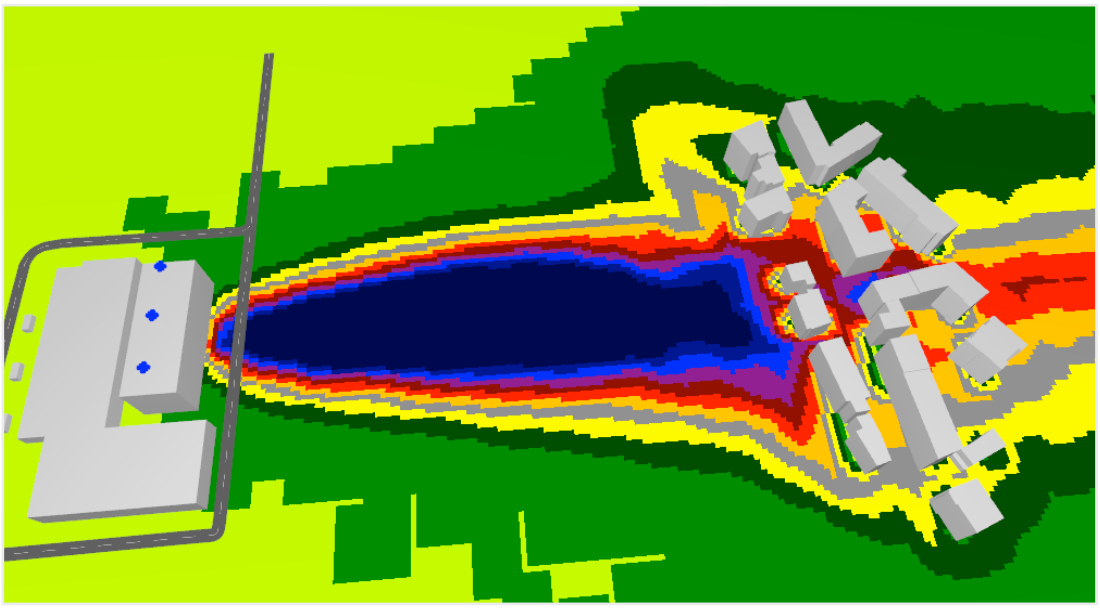
Use Cases

The following pictures show a small selection of possible cases where CadnaA can be and has been used successfully. Of course, many more different cases are possible.

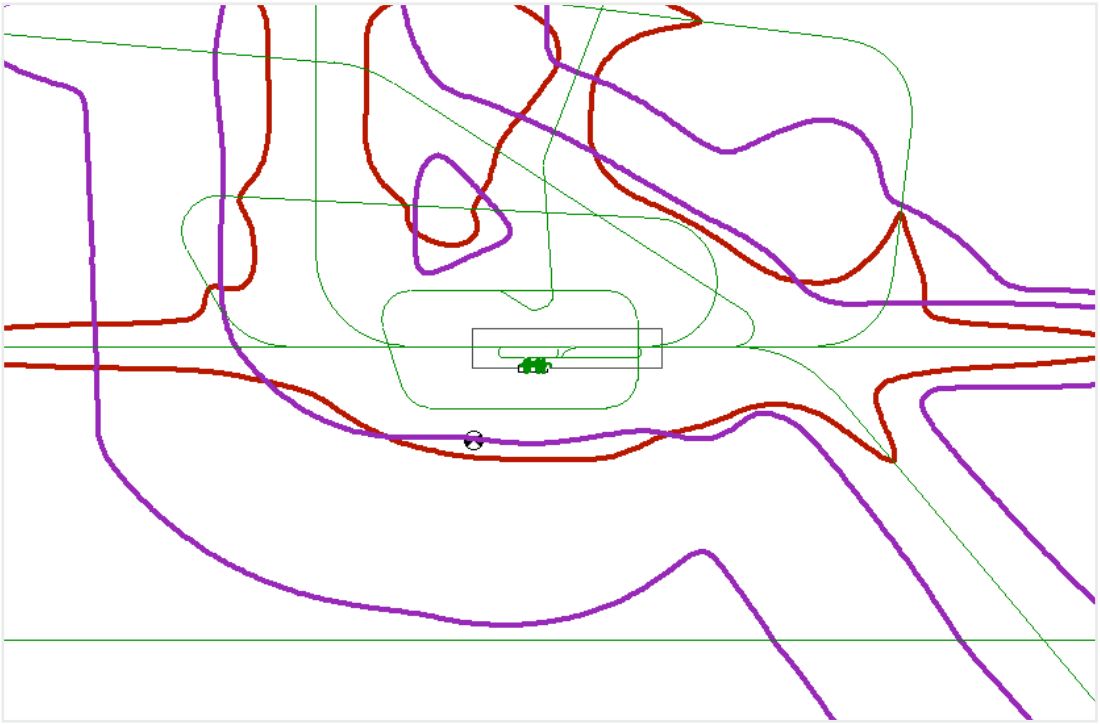


Noise distribution calculated around a power station

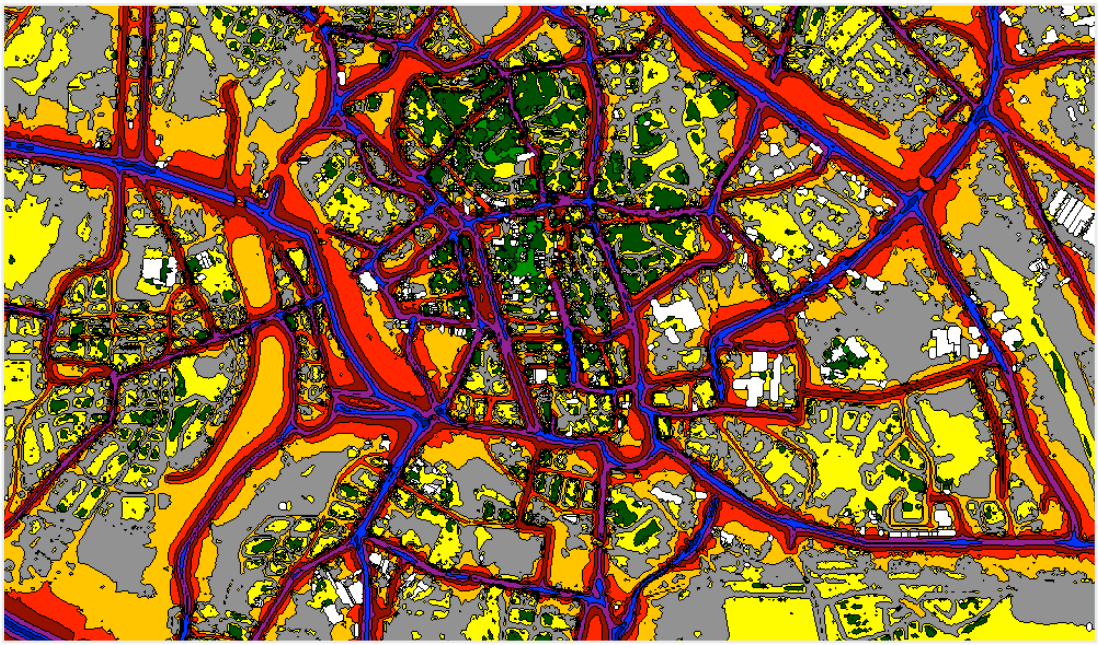
CadnaA 2D view of a railroad and road noise project and 3D View with Building Noise Map results



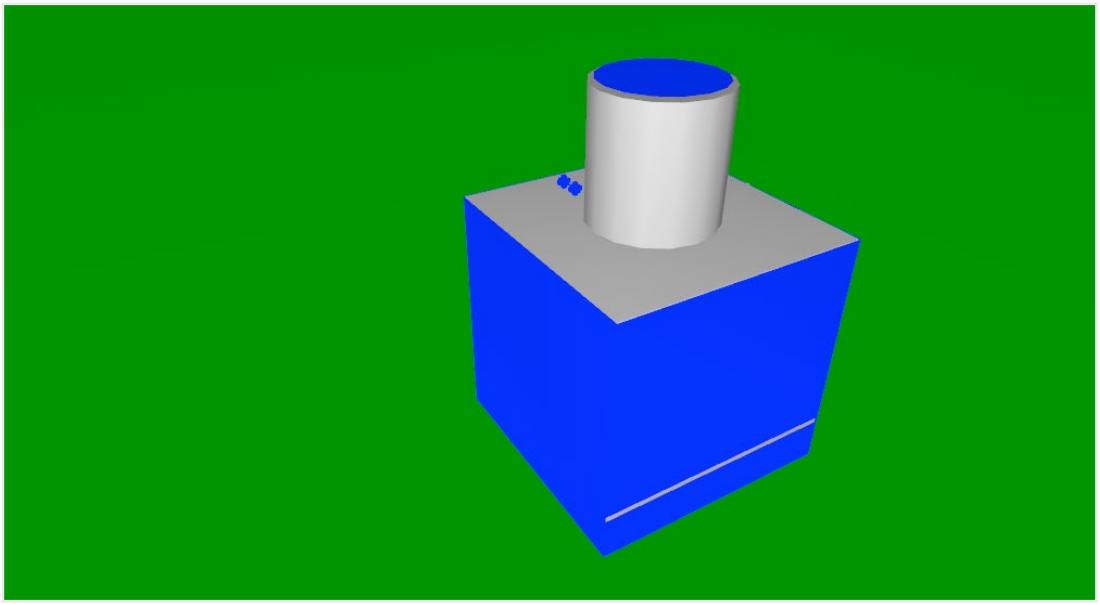
Air pollution calculated close to a dwelling



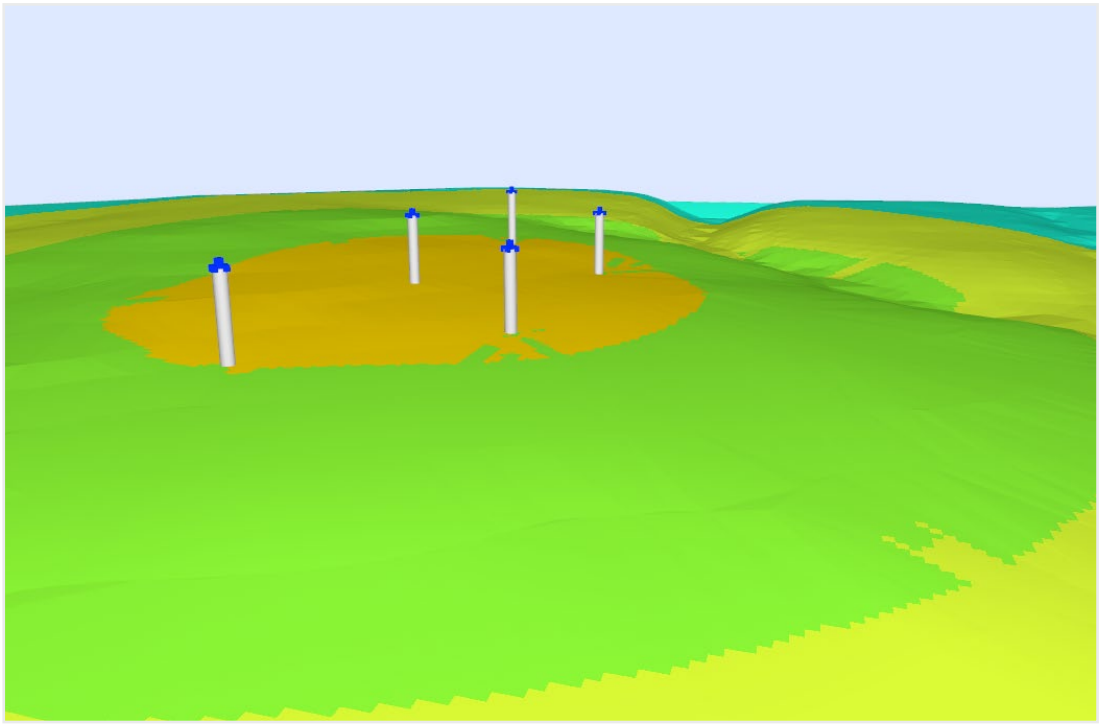
Noise contours around an airport



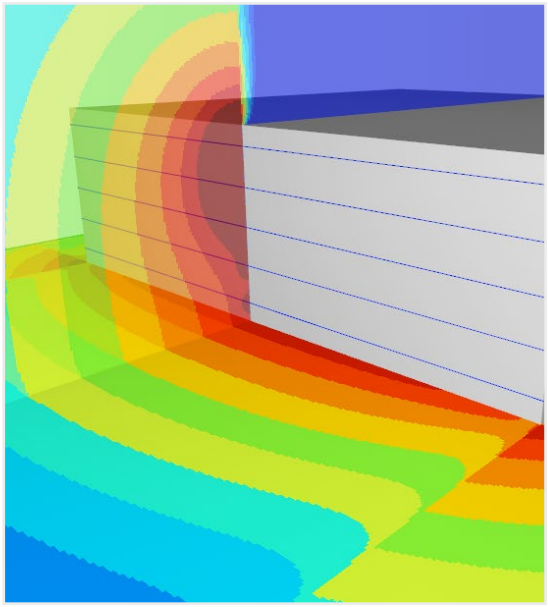
Small part of a large noise map which was calculated with CadnaA



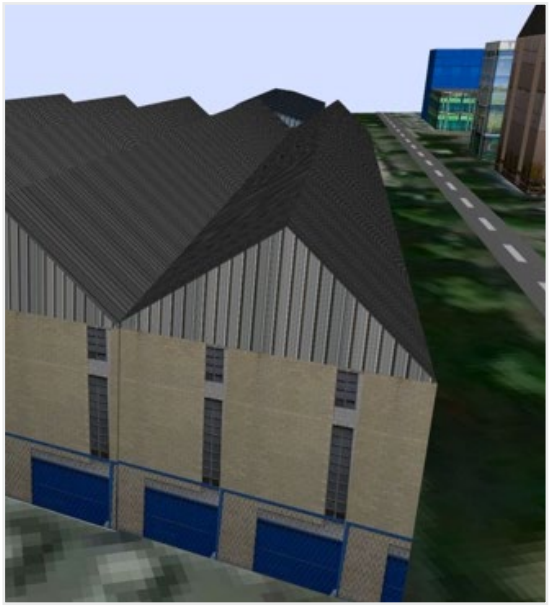
CadnaA model of a cooling tower. All emissions were calculated from technical parameters via CadnaA SET.



Several wind power stations modeled and calculated with CadnaA including meteorological corrections



Noise distribution outside a car park, calculated on a horizontal and a vertical grid



Model of an industry facility and surrounding buildings, including roof edges and high resolution facade pictures.

Software Configurations

CadnaA is available in the general setup Basic, Standard, and Modular. No matter which setup you choose, program parts which are important for all kinds of projects are included even in the most light-weight configurations. The following list shows a selection of always available features.

Selection of always available features

Import Except for bitmaps, which require option BMP, the possible import formats in CadnaA are available for all possible CadnaA configurations

Display You'll always have access to the possible and powerful display options

PCSP Even for the smallest CadnaA packages, it's possible to subdivide projects into several sections, which then can be processed separately

Result Tables It's possible to use, modify and create result tables for all CadnaA configurations

Arithmetics The powerful grid arithmetic feature is available for all CadnaA configurations

General CadnaA Configurations

Standard With CadnaA Standard, you'll have access to all available calculation standards for the noise types Industry, Road and Railway

Basic With CadnaA Basic, you'll have access to one calculation standard for each of the noise types Industry, Road and Railway

Modular With CadnaA Modular, you can choose one calculation standard for one of the noise typed Industry, Road or Railway

Modular Light With CadnaA Modular Light, you can choose one calculation standard for one of the noise types Industry, Road or Railway. The maximum number of sources is limited to 30 roads, railways, area source, line sources, and to 50 point sources

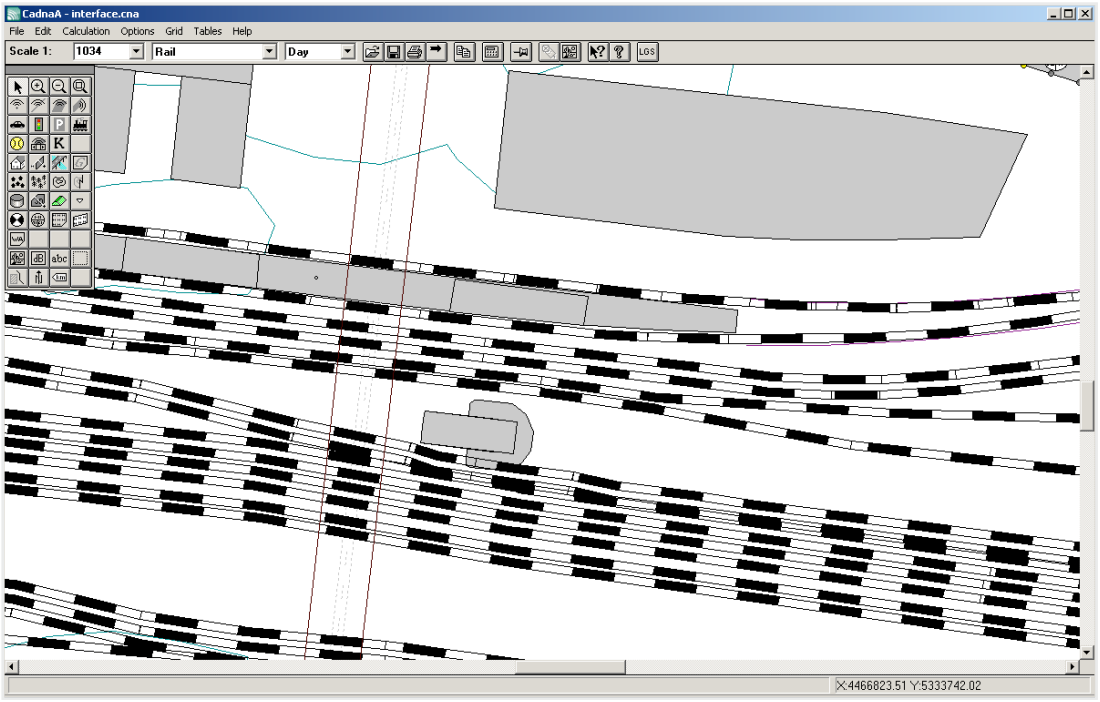
CadnaA Options

X	A feature-pack especially for noise mapping. It contains the features Object-Scan, Population Density, Monetary Evaluation, Map of Conflicts, Close Polygons Automatically, Delete Height Points
L	Calculate with an unlimited number of screening objects
XL	Combination of options X and L
64 bit	Use CadnaA (incl. all further extensions) with 64bit address length. Handle large projects with one single file. 64GB of RAM can be addressed; a 64bit operating system is required.
BMP	Import various bitmap formats. Option BMP includes direct access to Google Earth (Import / Export)
BPL	Optimize area-based sound power levels depending on limiting values at receivers
SET	Create sound power spectra based on technical parameters. Combine different modules to create complex facilities.
APL	Calculate air pollution for more than 50 pollutants for industrial and road sources
FLG	Calculate noise propagation from aircrafts
Radartracks	Use radar tracks (Fanomos, Stanly, Topsonic) for aircraft noise calculations. Group assignment is done via ICAO code.
MITHRA	Assure compatibility of calculation results with the French program MITHRA.
CALC	Install CadnaA on up to 5 computers, which can participate in calculations.
CALC XL	As option CALC, but including 64bit capabilities

Usability / Interface

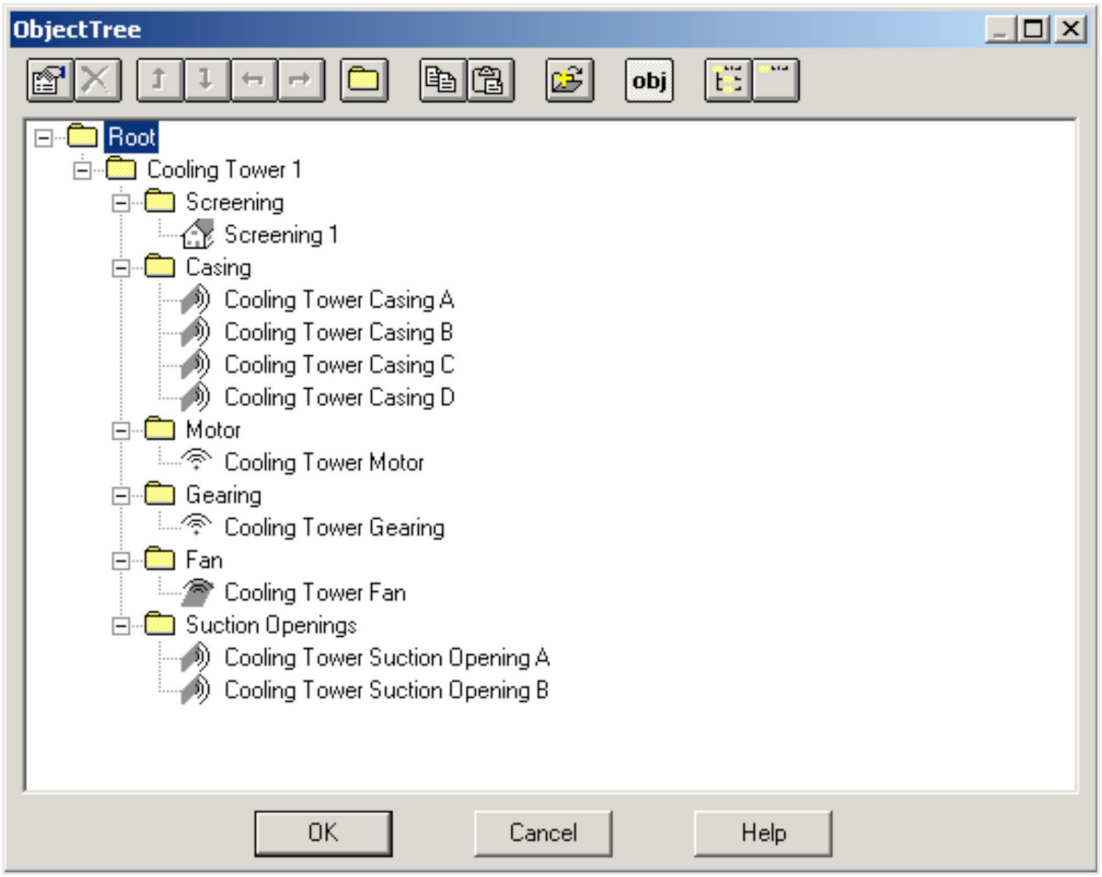
In addition to the features which are available in all CadnaA setups, there are options, which can be purchased along with CadnaA. These options generally aim at specialized features, which can be very valuable depending on the type of project. The following options are possible:

One interface for the whole software
One of the big CadnaA advantages is its advanced usability. No matter of what type your project is, no matter which options you might have purchased, CadnaA is always based on the same intuitively usable interface which doesn't require separate complicated modules. Due to this, CadnaA has a very steep learning curve, and even if you haven't used the program for a while, you'll be able to solve your noise related problems fast with it.



Powerful Project Organization

CadnaA has a sophisticated concept for organizing larger projects. All objects can be structured hierarchically in an ObjectTree or organized in groups. Based on this organizational scheme, it's easy to create several variants in one file. If you for example want to compare sound sources with different properties, or completely different geometries, this is a fast and reliable way to do so.



Object Access

It is significant to have access to all objects in CadnaA at any time. In CadnaA, this is not only possible in the 2D construction view, but also directly from the OpenGL based 3D view, from object tables and from the ObjectTree. So no matter which of the several possible ways of handling objects turns out to be your favorite one, access to objects is always ensured.

Library Concept

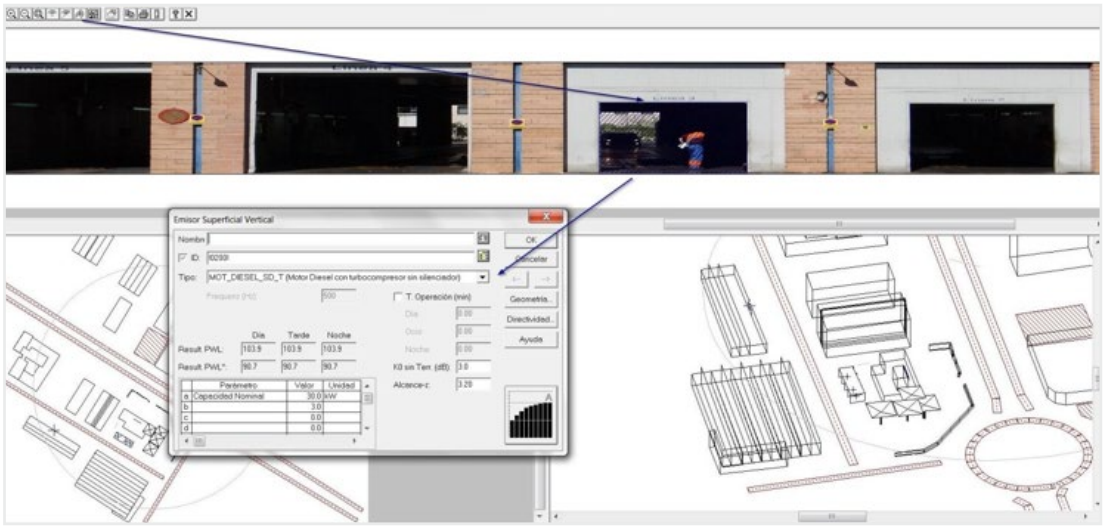
Elements which are no model of physical objects – e.g. sound power spectra or directivities - are stored in libraries. In CadnaA, libraries can exist locally for a project and globally for all projects. There are predefined libraries in CadnaA, which can easily be expanded by own measurements and definitions, and due to a conveniently usable library manager, it's easy to even exchange libraries with colleagues.

3D View

CadnaA features a powerful, OpenGL based 3D view, which serves several purposes: use it to quickly check your model, or for changing objects due to the direct access to them which you also have in 3D mode, or use it for presenting results to customers.

Facade Editing

The Edit Facades command allows precisely to draw and calibrate emission sources which are located at the facade of buildings. By using the comfortable interface of the facade texture feature, you will have full control of the shape, position and type of the emission located at the facade. Additionally, every picture associated to any facade is represented within the 3D View in order to ensure project overview and high quality presentations at all times.



Same Concepts as in CadnaR

CadnaA shares many of its concepts with CadnaR, the software for indoor noise calculation. Consequently the user of one of the two software products will be able to easily learn the other one.

Flexibility

Several features and capabilities make CadnaA one of the most flexible noise calculation programs on the market. And this is not at the cost of usability!

Object-Scan

The Object-Scan allows for statistical evaluations in your project. It can be used for analyses of exposed inhabitants according to EC regulations, but due to its flexible concept, all kinds of formulas for statistical evaluations can be used.

Attribute Access

All objects in CadnaA have a set of attributes, which describe the objects entirely. Access to all attributes is ensured at any time. One of the access possibilities is the function Modify Attributes, which also gives global access to attributes easily.

Grid Arithmetics

In case you have calculated several grids in CadnaA, they can easily be compared. With Grid Arithmetics, a large selection of mathematical operations can be performed on the grid, which effectively allows grid additions or comparisons without much effort.

Dynmap

With the Dynamic Noisemap (Dynmap) it is possible to update calculated noise maps based on measurements. This is an extremely valuable tool when monitoring stations are available in a city. The update in CadnaA is very fast, as no new noise distribution calculations need to be executed.

Geodetic Transformations

Objects in CadnaA can be transformed in a variety of modes, including geodetic transformations. So if your project for example is in UTM coordinates, but you want to use data which has been modeled based on e.g. Gauß-Krüger-Coordinates, transformation is easy. If desired, this can be done directly during import.

Import options

CadnaA offers a huge variety of import formats. The most important import formats might be DXF, SHP and bitmaps from Google Earth; the whole list of possible formats for import can be seen further down in this document.

Calculation

CadnaA is one of the most powerful noise calculation programs on the market. Here are a few of the reasons which make CadnaA such a superior calculation tool:

Multicore Calculation

CadnaA supports multicore calculations to obtain results in very short times.

64 bit support

With 64bit support in CadnaA Option 64, you can use all available RAM. Especially for large projects this is an enormous advantage compared to old-fashioned programs which still don't support more than 32bit address length.

Segmented Processing

CadnaA allows an easy subdivision of your projects into several tiles with the PCSP technology. With this technology, several computers in a network can participate in the calculation of a project

Two calculation methods

CadnaA is the only noise calculation programs, where you can choose between the two most important noise calculation methods: *ray tracing* and *angle scanning.*

Sophisticated Acceleration Techniques

In CadnaA it's possible to speed up the fast calculations even more by applying intelligent acceleration techniques. These techniques are optional and include interpolations, maximum search radii and the possibility to allow a maximum calculation error

Statistical Evaluations

Especially when calculation acceleration has been used, statistical evaluation regarding exactness are important. CadnaA has an easy to use tool which executes them according to DIN 45687 (QSI).

Uncertainty Calculations

CadnaA has a large selection of evaluation parameters. Among those are the possibility of calculating standard deviations, which is required by many guidelines like TA Lärm.

Wall Optimizations

When a certain limiting level is given, CadnaA can automatically optimize given walls in order to minimize the required wall area in a way where the limiting levels are still not exceeded.

Pass-by levels

CadnaA can not only calculate Leqs, but also show the time-based sound pressure levels based on passing sound sources like cars or trains. The results can be visualized in a graph, auralized and shown for a whole calculated grid.

Many calculation standards

CadnaA can perform calculations according to various national and international standards. The following page shows the list of supported calculation standards:

Supported Calculation Standards for Industrial Noise

ISO 9613	International, EC-Interim
CONCAWE	International
VDI 2714	Germany
VDI 2720	Germany
DIN 18005	Germany
ÖAL Richtlinie Nr. 28	Austria
BS 5228	United Kingdom
General Prediction Method	Scandinavia
Ljud från vindkraftver	Sweden
Harmonoise	International

Supported Calculation Standards for Road Noise

NMPB-Routes-9	France, EC-Interim
RLS-90, VBUS	Germany
DIN 18005	Germany
RVS 04.02.1	Austria
STL 86	Switzerland
SonRoad	Switzerland
CRTN	United Kingdom
TemaNord 1996:525	Scandinavia
Czech Method	Czech Republic

Supported Calculation Standards for Railway Noise

RMR, SRM II	Netherlands, EC-Interim
Schall03, Schall Transrapid, VBUSch	Germany
Schall03 new, draft	Germany
DIN 18005	Germany
ONR 305011	Austria
Semibel	Switzerland
NMPB-Fer	France
CRN	United Kingdom
TemaNord 1996:524	Scandinavia
FTA/FRA	USA

Supported Calculation Standards for Aircraft Noise

ECAC Doc. 29, 2nd edition 1997	International, EC-Interim
DIN 45684	Germany
AzB	Germany
AzB-MIL	Germany
LAI-Landeplatzleitlinie	Germany
AzB 2008	Germany

Supported Calculation Standards for Air Pollution

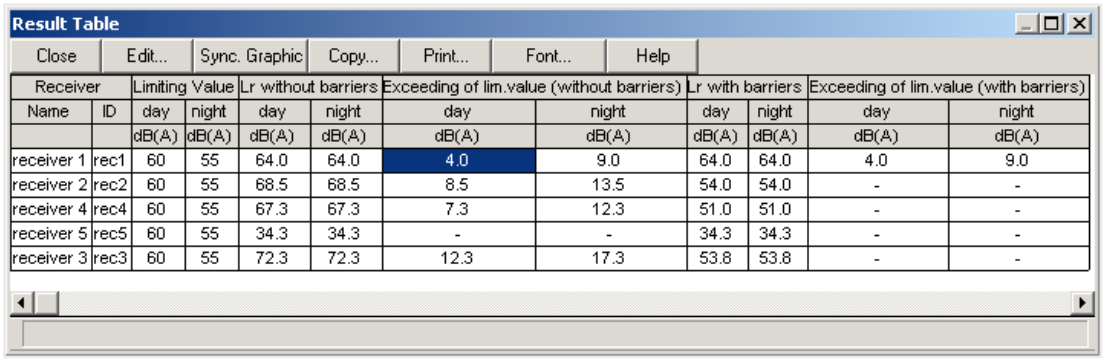
AUSTAL 2000	Germany

Result Display / Export

In CadnaA, all result display and output possibilities are easily to handle and provide results in a convenient and reliable way

Result Tables

Calculation results can be displayed in a configurable result table. Display all desired result properties including variant comparisons in highly adaptable tables.



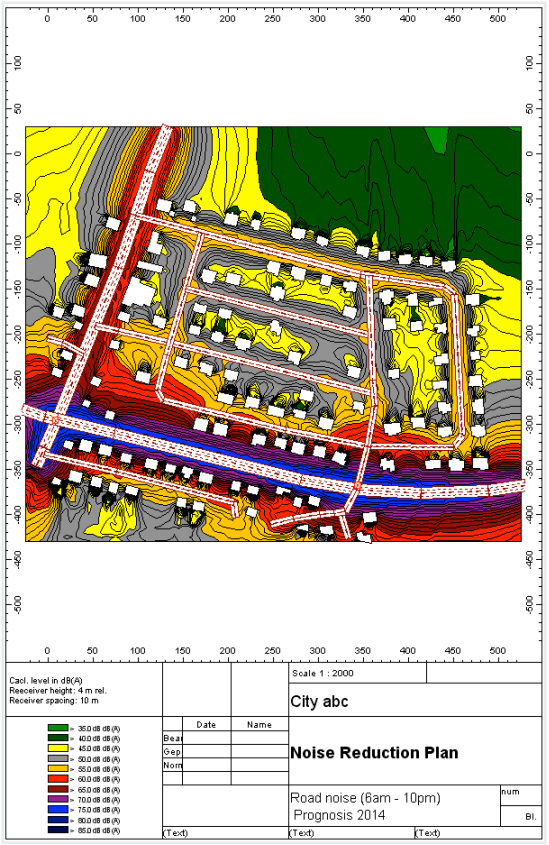
Result Table

Close | Edit... | Sync. Graphic | Copy... | Print... | Font... | Help

Receiver		Limiting Value		Lr without barriers		Exceeding of lim.value (without barriers)		Lr with barriers		Exceeding of lim.value (with barriers)	
Name	ID	day	night	day	night	day	night	day	night	day	night
		dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
receiver 1	rec1	60	55	64.0	64.0	4.0	9.0	64.0	64.0	4.0	9.0
receiver 2	rec2	60	55	68.5	68.5	8.5	13.5	54.0	54.0	-	-
receiver 4	rec4	60	55	67.3	67.3	7.3	12.3	51.0	51.0	-	-
receiver 5	rec5	60	55	34.3	34.3	-	-	34.3	34.3	-	-
receiver 3	rec3	60	55	72.3	72.3	12.3	17.3	53.8	53.8	-	-

Plot Designer

The Plot Designer is a unique way of presenting calculation results to the public. You can choose predefined designs to quickly obtain a plot or design own layouts from the scratch.



Protocol

All calculations to single receivers can be traced. This means that a formatted protocol is written, which displays all attenuation terms from sources to receivers for direct and reflected rays, always depending on the chosen calculation standard. This makes it easy to see exactly where a calculated result comes from.

Point Source, ISO 9613, Name: "source1", ID: "source1"																		
Nr.	X	Y	Z	Refl.	Freq.	LxT	LxN	K0	Dc	Adiv	Aatm	Agr	Afol	Ahous	Abar	Cmet	RL	LrT	LrN
	(m)	(m)	(m)		(Hz)	dB(A)	dB(A)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	dB(A)	dB(A)
1	62.34	172.33	4.00	0	32	42.6	42.6	0.0	0.0	50.5	0.0	-3.0	0.0	0.0	0.0	0.0	-0.0	-4.9	-4.9
2	62.34	172.33	4.00	0	63	63.8	63.8	0.0	0.0	50.5	0.0	-3.0	0.0	0.0	0.0	0.0	-0.0	16.3	16.3
3	62.34	172.33	4.00	0	125	80.9	80.9	0.0	0.0	50.5	0.0	4.6	0.0	0.0	0.0	0.0	-0.0	25.8	25.8
4	62.34	172.33	4.00	0	250	102.4	102.4	0.0	0.0	50.5	0.1	3.5	0.0	0.0	0.0	0.0	-0.0	48.3	48.3
5	62.34	172.33	4.00	0	500	105.8	105.8	0.0	0.0	50.5	0.2	0.0	0.0	0.0	0.0	0.0	-0.0	55.1	55.1
6	62.34	172.33	4.00	0	1000	96.0	96.0	0.0	0.0	50.5	0.4	0.0	0.0	0.0	0.0	0.0	-0.0	45.1	45.1
7	62.34	172.33	4.00	0	2000	80.2	80.2	0.0	0.0	50.5	0.9	0.0	0.0	0.0	0.0	0.0	-0.0	28.8	28.8
8	62.34	172.33	4.00	0	4000	76.0	76.0	0.0	0.0	50.5	3.1	0.0	0.0	0.0	0.0	0.0	-0.0	22.4	22.4
9	62.34	172.33	4.00	0	8000	67.9	67.9	0.0	0.0	50.5	11.1	0.0	0.0	0.0	0.0	0.0	-0.0	6.3	6.3
10	62.34	172.33	4.00	1	250	102.4	102.4	0.0	0.0	54.1	0.2	3.8	0.0	0.0	0.0	0.0	6.0	38.3	38.3
11	62.34	172.33	4.00	1	500	105.8	105.8	0.0	0.0	54.1	0.3	0.0	0.0	0.0	0.0	0.0	6.0	45.4	45.4
12	62.34	172.33	4.00	1	1000	96.0	96.0	0.0	0.0	54.1	0.5	0.0	0.0	0.0	0.0	0.0	6.0	35.3	35.3
13	62.34	172.33	4.00	1	2000	80.2	80.2	0.0	0.0	54.1	1.4	0.0	0.0	0.0	0.0	0.0	6.0	18.7	18.7
14	62.34	172.33	4.00	1	4000	76.0	76.0	0.0	0.0	54.1	4.7	0.0	0.0	0.0	0.0	0.0	6.0	11.2	11.2
15	62.34	172.33	4.00	1	8000	67.9	67.9	0.0	0.0	54.1	16.8	0.0	0.0	0.0	0.0	0.0	6.0	-9.0	-9.0

Export Formats

Not only calculated results, but also the geometries can be exported. The whole list of export formats can be seen further down in this document.culation standard. This makes it easy to see exactly where a calculated result comes from.

Technical Specifications

File Types for Import

Atlas GIS	former GIS-software by ESRI (until 2001)
ArcView	Shape-file from ArcView/ArcInfo-GIS-software (by ESRI)
ASCII grid	ASCII-format for grid point data
ASCII Objects	ASCII-format for open or closed polygon-lines
AutoCad-DXF	AutoCad export format for object geometry (by Autodesk Inc.)
Building Height points	ASCII-format for building height points
CityGML	format for exchange and storage of virtual 3D city models
EDBS	format used by the German ordnance surveys
GML	format used by the UK Ordnance Survey
GYpSiNOISE	data interchange format CadnaA-GIS
LimA	format used by LimA software
MapInfo	format used by MapInfo (by MapInfo Corp.)
MITHRA	format used by MITHRA software
NTF	UK National Transfer Format
QSI	data interchange format according to DIN 45687 and ÖAL 36
Sicad	GIS-software by AED-SICAD AG
SLIP	format used by SLIP road noise software
SOSI	format used by SOSI software (® Ordnance Survey Norway)
SoundPLAN	format used by SoundPLAN software
Stratis	program system for road design & civil eng. (by RIB Software AG)
T-Mobil	format used by Deutsche Telekom MobilNet GmbH
Winput-DGM	ASCII-format by the Bavarian Ordnance Survey, Munich

File Types for Export

ArcView Grid	used by ArcView/ArcInfo-GIS-software (by ESRI)
ArcView Shape	used by ArcView/ArcInfo-GIS-software (by ESRI)
AutoCad DXF	AutoCad format for object geometry (by Autodesk Inc.)
Building Height points	ASCII-format for building height points
Google Earth	Keyhole Markup Language (KML)
GYpSiNOISE	data interchange format CadnaA-GIS
IMMIS Luft	format used by IMMIS software
LimA	format used by LimA softwar
QSI	data interchange format according to DIN 45687 and ÖAL 36
RTF	document file format
Text files	
X-file	

Object Types in CadnaA

Point Source
Line Source
Area Source
Vertical Area Source
Road
Traffic Light
Parking Lot
Railway
Tennis
Optimizable Source
Power-Plant-Source
Building
Barrier (incl. floating barrier, cantilevered barrier)
Bridge
Ground Absorption
Built-Up Area
Foliage
Contour Line
Line of Fault
Cylinder
3D Reflector
Embankment
Height Point
Receiver
Building-Evaluation
Calculation Area
Vertical Grid
Area of Designated Land Use
Bitmap
Level Box
Text Box
Section
Auxiliary Polygon
Symbol
Station
Airport
Air Route

Specifications for Modeling and Calculating

Maximum number of sources per project:

Unlimited, except when using CadnaA Modular Light, where it's limited to 50 point sources and/or 30 of other source types

Maximum number of obstacles:

16 million

General Calculation Methods:

Two general calculation methods are possible in CadnaA, either ray tracing or angle scanning

Calculation with spacious sources:

Area- and line sources, including roads, railways, parking lots, are subdivided into several point sources for propagation calculation in CadnaA. This way, several rays are calculated from larger sources to receivers. In the case of existing obstacles, a so-called projection method ensures that rays are calculated in between objects for realistic results, when possible.

Specifications for Terrain and Obstacles

Contour Lines together with implicitly created triangulation lines, contour lines can have diffracting influence on noise propagation. Other objects can automatically be lifted to an appropriate height above the resulting terrain, in case their height set to relative

Height Points Used to create triangulation lines, which have diffracting influence on noise propagation. Other objects can automatically be lifted to an appropriate height above the resulting terrain, in case their height set to relative

Lines of Fault can be modeled with vertices to change the terrain height locally

Barriers can be modeled on top of terrain, if desired. The height parameters define the upper edge, which can be absolute or relative. Barriers can act diffracting and reflecting (with different octave band based absorption coefficients being possible on both sides).

Floating Barriers Like barriers, but the height of a lower barrier edge can implicitly be defined by entering a z-extension. Noise can propagate below the barrier.

Cantilevered Barriers Like barriers, but with a cantilever. The cantilever dimension is entered in horizontal and vertical direction.

3D Reflector an obstacle that can be defined as arbitrarily positioned plane. It can act diffracting and reflecting.

Embankment Element that can be positioned on top of existing terrain. It's completely absorbing.

Building Defined with vertices; can be entered in absolute height or relative to the terrain. Buildings can act diffracting and reflecting. They can also have a transparency value, allowing for parts of the noise propagating through buildings for special modeling situations. Furthermore, a number of residents can be assigned to any building.

Roof Edges this function allows to calculate noise propagation shielded by buildings within the frame of calculation standards and also to create visual realistic appearance of buildings.

Cylinder Defined by its center point and radius; the height can be relative or absolute. Cylinders in CadnaA can have reflecting and diffracting properties.

Specifications for Modeling and Calculating Industrial Noise

Source Types	point, line, horizontal and vertical area sources
Emission	Sound Power Level, alternatively length-related PwL for line sources, area-related PwL for area sources and moving point sources for line- and area sources. PwL is either A-weighted level with indication of main frequency band or octave band sound power levels 31.5 Hz – 8000 Hz. Furthermore, CadnaA can automatically calculate the PwL based on technical parameters such as the pressure and flow rate of fans.
Height	z-coordinates in meters (absolute, relative to ground height or relative to the height of a roof)
2D Geometry	Points x and y or in polar coordinates (absolute or relative to the last point)
Operation Time	Can be defined in minutes for day, evening, night. The duration of these time periods and a level correction can be defined in the configuration menu.
Directivity	For point-, line- and area sources. Each directivity is referenced in the source input window and then positioned with a vector. Directivity index in 15°-steps from 0° to 180° for all octave bands 31.5 Hz to 8000 Hz. If values are missing these are interpolated automatically. Furthermore, predefined standardized directivities can be chosen.
Emmission at facade	Point, line and area sources can be modeled precisely in vertical section view through the “edit facades” interface.

Specifications for Modeling and Calculating Road Noise

Source Type

Road

Emission

The emission can either be specified directly depending on the chosen standard, or, alternatively, be calculated based on the following parameters (also depending on chosen standard):

- **daily counts** (e.g. MDTD: mean daily traffic density Vehicles / 24h)
- **hourly count data** (Vehicles/1h).
- **percentage of heavy vehicles** (e.g. heavy vehicles, light trucks, noise reduced trucks)
- **speed**
- **type of road surface**
- **traffic flow**
- **road gradient correction**

Road Gradient

The road gradient can be calculated based on the terrain model and processed further as road attribute upon calculation.

Height

coordinates in meter absolute or relative to ground height. If heights are unknown for some polygon points these can be interpolated automatically using the heights of neighbouring points.

Further Attributes

Further attributes are available for road noise:

- **road width at each point** (variable road width possible)
- **lateral slope at each point** (variable lateral slope possible)
- **speed limit** for day / evening / night and for cars / trucks separately

Self-screening

the propagation from segmented road source is calculated as if the road surface was a reflecting plate. Diffraction at the plate edges is considered. This feature enables to model bridges, viaducts and other kind of raised roads. The additional width can be specified for left and / or right side of the road. On both sides the height of parapets can be entered.

Pass-By Levels

A level – time history for a defined vehicle and speed can be calculated and displayed graphically. Alternatively, a video with a moving grid can be calculated.

Auralisation

Pass-bys can be auralized; the sound will be reproduced including the Doppler Effect (for road sources).

Specifications for Modeling and Calculating Railway Noise

Source Type

Railway

Emission

The emission can either be specified directly depending on the chosen standard, or, alternatively, be calculated based on the following parameters (also depending on chosen standard):

- **type of train:** predefined lists of trains types (depending on selected railroad standard)
- **train classes:** The type and number of trains (for intervals day, evening, night) can be entered into the library and is referenced by a class name. When the timetable change just the editing of the lists in the library are necessary. All railroad sections concerned by this change will be updated automatically.
- **percentage with disc brakes**
- **number of trains** (day, evening, night)
- **speed**, maximum speed
- **train length**, number of axes
- **corrections:** bridge, railway crossing, radius of curves

Height

coordinates in meter absolute or relative to ground height. If heights are unknown for some polygon points these can be interpolated automatically using the heights of neighbouring points.

Pass-By Levels

Each receiver point can be selected to calculate the level – time history for a defined vehicle and speed. Presentation as time history of the level at the receiver. Alternatively, a video with a moving grid can be calculated.

Specifications for Modeling and Calculating Aircraft Noise

Source Type	Air Routes
Emission	The emission is described based on aircraft groups. For each aircraft group a reference spectrum at a reference distance and a directivity index is specified. In addition, for each aircraft group the flight path profiles for take-offs and landings are given. The aircraft groups are distributed by default.
Percentage	For each air route the percentage of flights can be specified for time intervals day / evening / night. With 100%-percentage the flight traffic data is considered as being specified within the calculation. With other percentages of flights different kinds of scenarios can be accounted for (e.g. with shorter reference time intervals) without the need to enter the number of flights again.
Traffic-Count Calculator	With the Traffic-Count Calculator the present numbers of aircraft on air routes with traffic specified for the time periods day / evening can be redistributed for the time intervals day / evening / night according to EC-directive without additional calculation or paperwork.
Noise Contours	Calculation of noise contours of constant equivalent sound pressure level. Aircraft noise zones are calculated according to AzB (with balancing of irregularities and optional protocol)
Max. Level Statistics	maximum level distributions can be calculated at predefined receiver points. By specifying a different percentage of flights on each air route the maximum level distribution can be calculated for a different time interval (e.g. one day instead of 6 months).
Arousal Reactions	additional arousal reactions during the sleep at night induced by aircraft noise events can be calculated with CadnaA
Number of Exceedings	Calculate the number of exceeding above a threshold value. In this case, the grid shows not levels, but the number of exceedings of the stated level.

Specifications for General Calculation Results

Calculation at single receivers

Single receivers can be placed on any position in the project. Here, calculations for up to 4 evaluation parameters and 16 variants at the same time can be done. Calculations can be tracked the following ways:

- **Partial Levels** show exactly, how much the different sources contribute to the overall receiver level
- **Rays** from all sources to receivers can be visualized; this includes reflected rays. Each ray informs about the amount of contribution to the overall level.
- **The protocol function** shows all attenuation terms for each calculated ray standard-depending.
- **Configurable labels** show results directly in the project view.

Calculation at horizontal grids

By defining a receiver spacing and height, a grid can be calculated over larger areas. These areas can be restricted with closed polygons. Calculations can be calculated for up to 4 evaluation parameters at the same time.

Calculation at vertical grids

Vertical grids can be defined anywhere in the project by entering the appropriate polygon. As for the horizontal grid, the receiver distance can be set up before calculating.

Calculation at building evaluations

A distribution of receivers around buildings can be generated with CadnaA. These building evaluations can be used for whole building noise maps, representing results along facades. Building noise map receivers can be shown as rectangles, octagons or spheres in the 3D View.

Service and Support

With CadnaA, you don't only buy a great software product, but you can also gain access to very good support. It's highly recommended to have a maintenance contract, which enables access to our hotline, web seminars and software updated. The following topics show the broad range of service and support we give our customers.

Selection of Service and Support Possibilities

Hotline

Our team of CadnaA experts supports customers with maintenance contract with all kinds of technical questions regarding modeling and calculating with CadnaA. (German, English and Spanish supported)

Web Seminars

With a maintenance contract, you'll have access to our web seminars. They take place several times per year, each time for different time zones, and cover specific CadnaA topics.

Seminars

We offer seminars for CadnaA beginners as well as for advanced users up to expert seminars regarding specific topics such as industrial-, traffic- or aircraft noise. Seminars take place all over the world - if required, even in your office.

Web Tutorials

We have several hours of CadnaA related videos on our website, which especially aim at CadnaA beginners. A great way to start learning and using our software.

Updates

With a maintenance contract, you'll have access to our latest beta versions and release versions.

More Information

For more information about CadnaA and about our software for indoor noise calculations (CadnaR) you can visit www.datakustik.com or call +49 8192 933 08 0. Furthermore, we attend most major conferences on acoustics and noise, where you can meet us in person.