



**IMAGINE railsource database:  
structure and practical application**  
Paul van der Stap

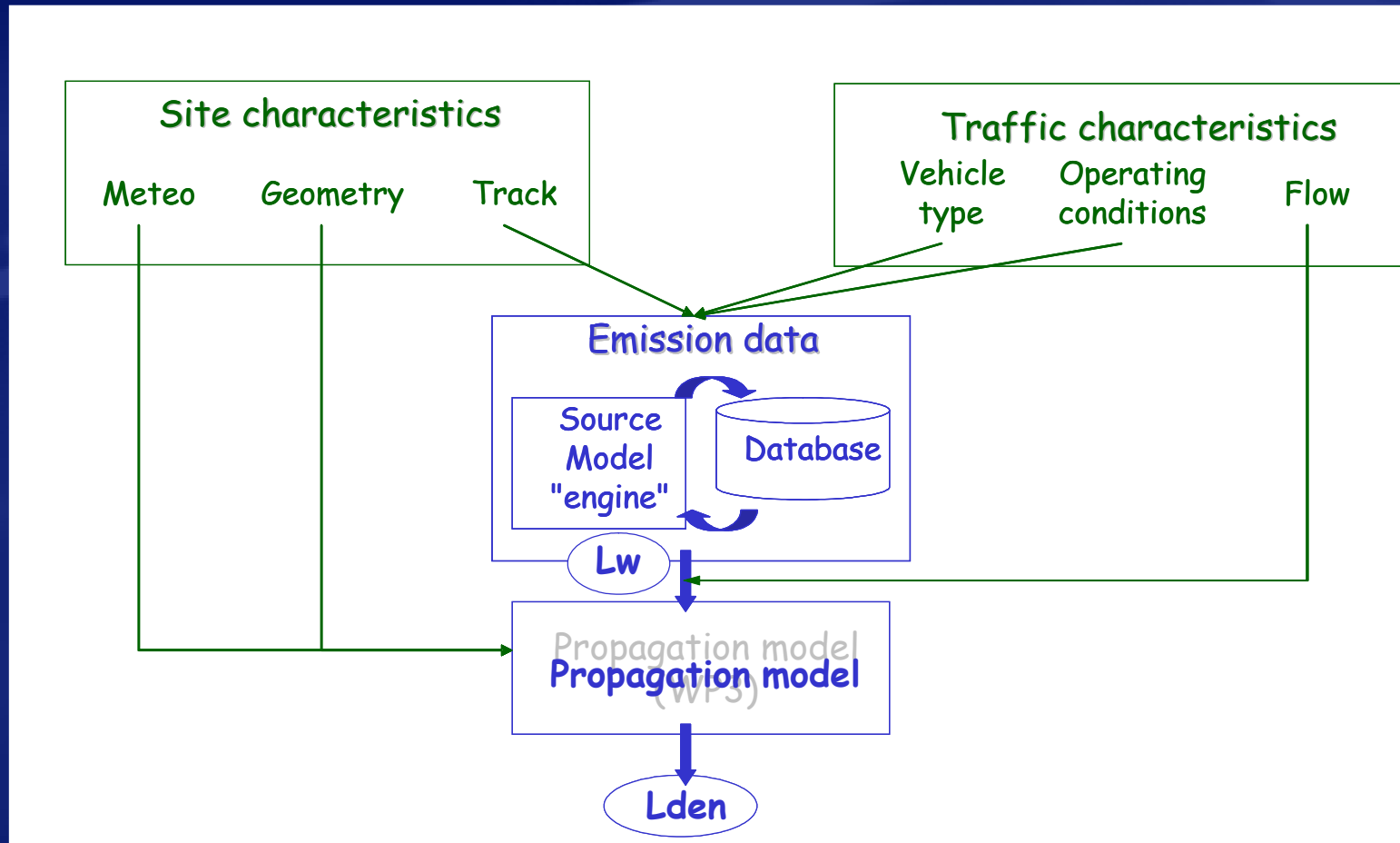
**AEA TECHNOLOGY**  
RAIL BV

The logo for AEA TECHNOLOGY features a stylized, white, curved graphic element that resembles a swoosh or a stylized letter 'D' or 'E', positioned to the right of the text.

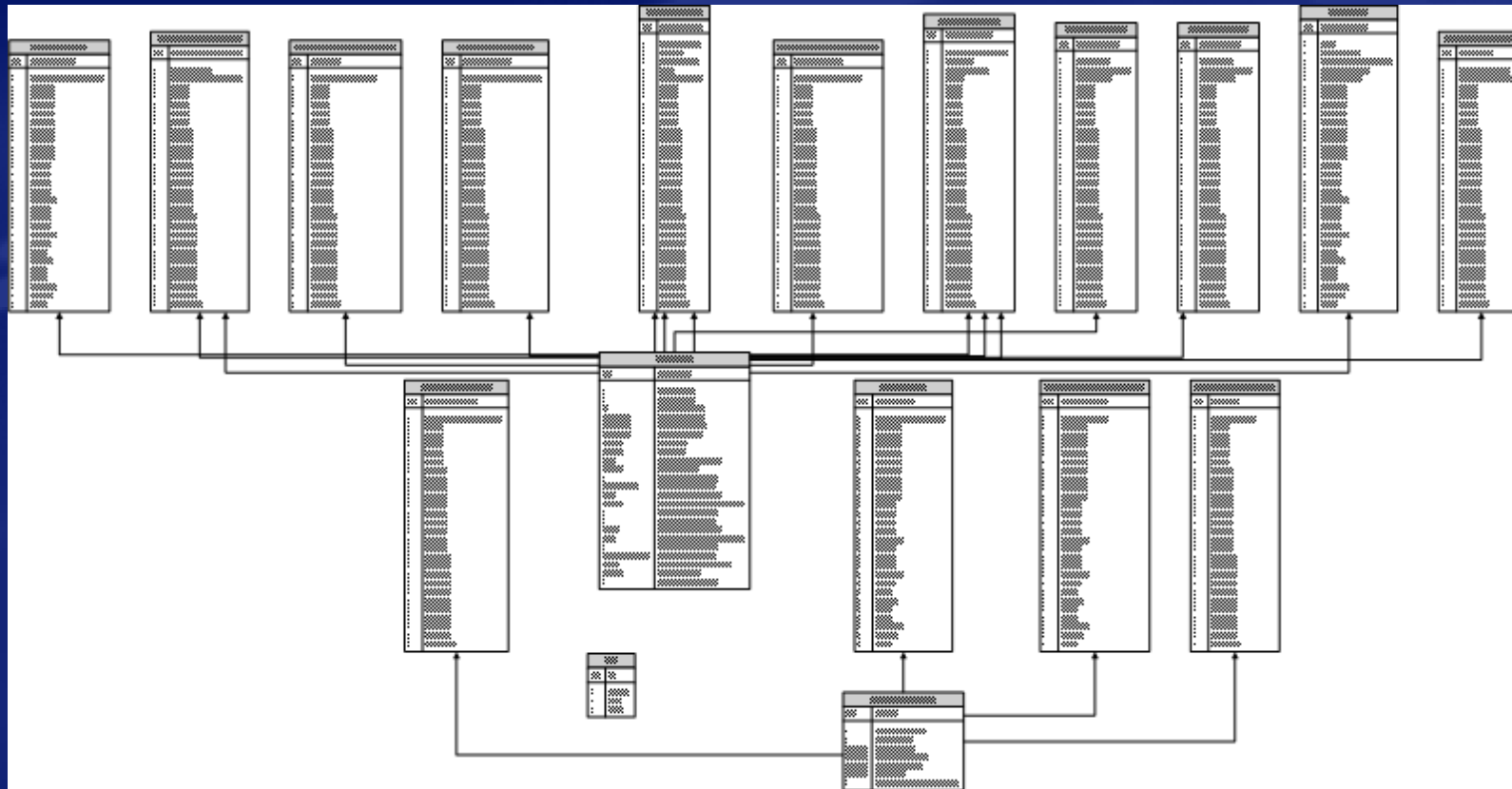
## content

- **IMAGINE railsource database: where does it fit?**
- **database structure and content**
- **database user entry levels**
- **input of new data**
- **IMAGINE railsource database in GIS environment**
- **Conclusions**

# IMAGINE Railsource database: where does it fit?



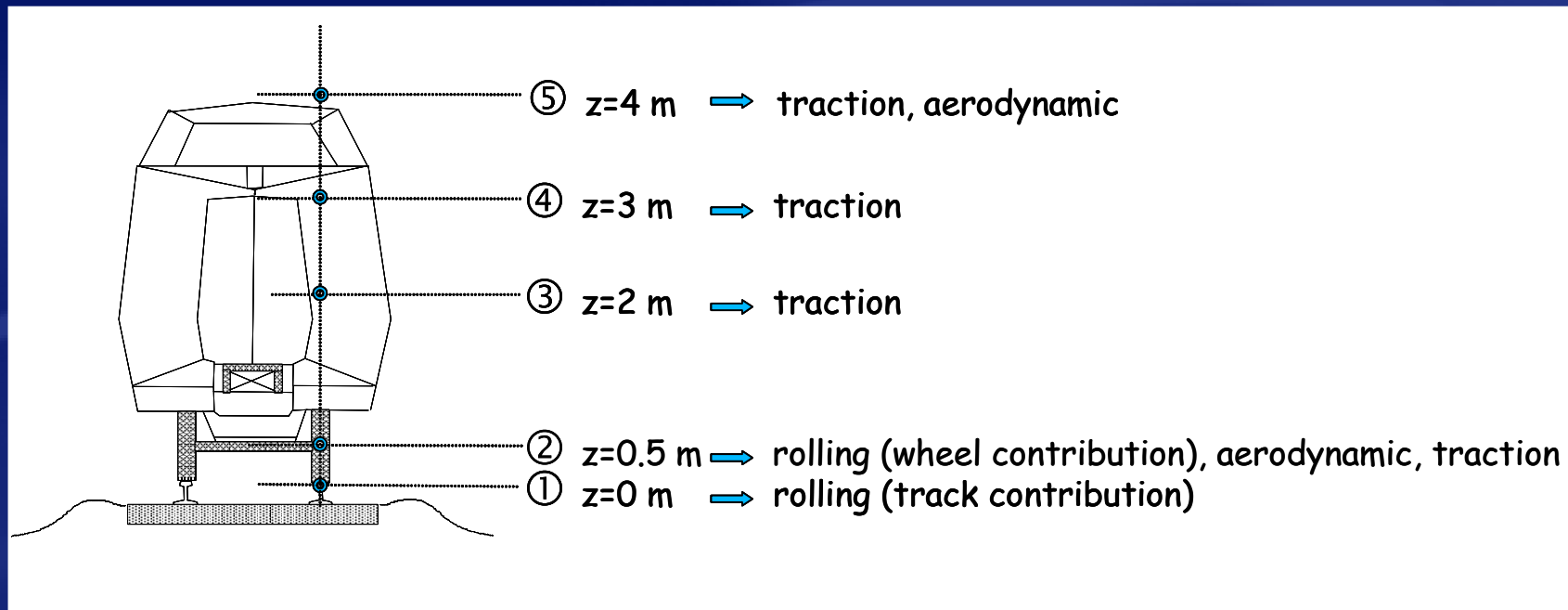
# Database Structure



## Database contents

- **relational database, with all relevant physical parameters to obtain the sound power level  $L_{w,i}$  (in third octave bands) on 5 source heights**
- **track characteristics in 1/3 octave bands, default or user input: rail roughness, decay rates**
- **vehicle characteristics in 1/3 octave bands, default or user input: rolling noise, traction noise, aerodynamic noise for different operation conditions, roughness**
- **vehicle and track descriptors**
- **meta data: origin of data**

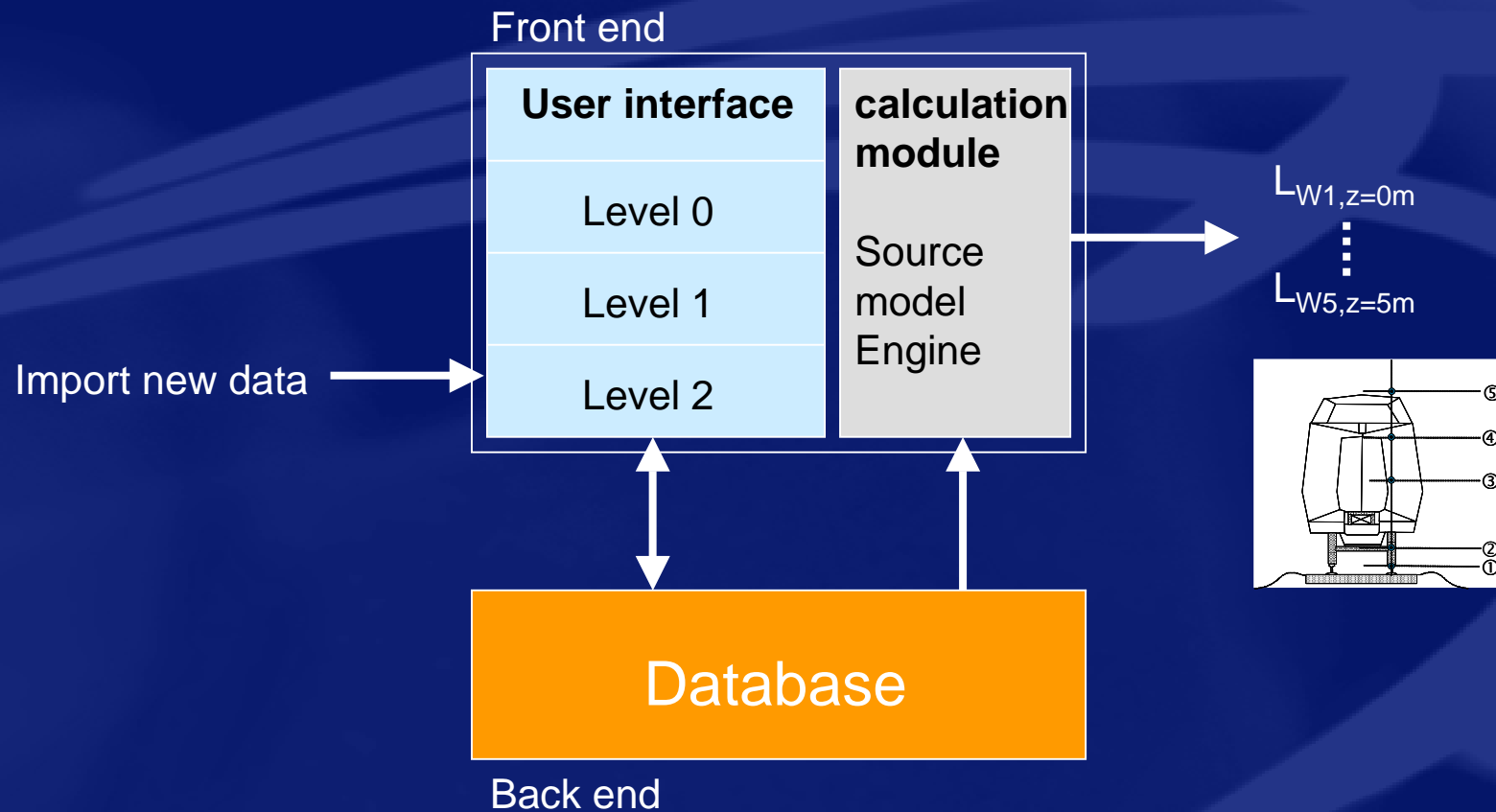
## Output of railsource model: Lw on 5 Source Heights



## Database user entry levels

- **basic (level 0): calculate output with tracktype, vehicle type, speed and operating condition with default values**
- **advanced (level 1): define new vehicles and tracktypes with default values**
- **expert (level 2): input new measurement data for vehicles and tracks**

# Database front end / back end application



## User entry level 0 (basic)

**User\_level\_0 : Formulier**

userinterface Imagine database AEAT Cooltools

Paul van der Stap - version v1\_build05

level 0: default track\_traintype only + calculation Lw

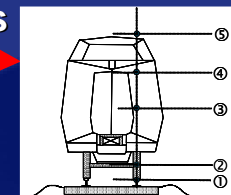
track description: UIC 60 wood	vehicle type: freight wagon
	speed: 80 km/h
	operating condition: constant speed
wheel roughness: smooth	wheel roughness: cast iron braked
Impact noise: none	Contact filter: 10ton
transfer Function: UIC60+wooden sleep	brakenoise: none
bridge noise: none	squeal noise: none
	transfer function: 800-920 mm with whee

**calculate**    add vehicle or track    import new data    Close

choose tracktype, vehicle, speed and operating conditions,

option: show default data for selected track and vehicle

...and calculate Lw on 5 source heights



to user level 1  
(advanced)

to user level 2  
(expert)

## User entry level 1 (advanced)

User\_level\_1 : Formulier

userinterface Imagine database

AEAT Cooltoo

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level 1: add track or train with default data

track description:

copy existing

give new name: UIC 60 wood

rail roughness: smooth

impact noise: none

transfer function: UIC60+wooden

bridge noise: none

vehicle type:

copy existing

give new name: freight wagon

wheel roughness: cast iron braked

Contact Filter: 10ton

Brake noise: none

Squeal noise: none

Transfer function: 800-920 mm with w

save new track delete track save new vehicle delete vehicle

Close

define new tracktype  
and vehicle

....with default data

... and go  
to calculation

## User entry Level 2 / Acquire data in IMAGINE data input sheet

### IMAGINE data input sheet

IMAGINE data input form version 2.8



MEMBER STATE:	Netherlands			
MEMBER STATE CODE:	NL			
NAME OF COMPANY	AEA Technology Rail BV			
SHORTNAME OF COMPANY	AEAT			
POSTAL ADDRESS				
POSTAL CODE				
CITY NAME				
CONTACT PERSONS	NAME	TELEPHONE	FAX	E-MAIL
CONTACT PERSON 1				
CONTACT PERSON 2				
COMPILATION DATE:	1-7-2006			
CAMPAIGN ID	0001			
VERSION	2			
ATTACHMENT	NL_AEAT_0001_IMD_v2.zip			



# IMAGINE data input sheet: track data input

## Track data

IMAGINE data input form version 2.8

### Track descriptor

mbmu5440DNNSU

#### site info

Site identity	Willemsdorp
Country	The Netherlands
Location	Willemsdorp
Track	Dordrecht-Lage Zwaluwe
Kilometre pos.	20,2

#### digits for track descriptor (mandatory)

Track type	
Track base	m
Sleeper type	b
Rail Fastener	m
Track dynamic characteristics	u
Rail type	54
Sleeper spacing	40
Additional measures	D
Roughness condition	N
Rail joints	N
Railpadtype	S
Curvature	U

#### track info (free)

Rail type	UIC code	UIC54
Rail inclination		40
Fastener type	Name/type	Biblock/wire
Last fastener maintenance/tightening	dd/mm/yy	
Pad type	Name/Manufacturer	FC9
Pad thickness	(mm)	5
Pad material	Name	cork rubber
Pad stiffness, static	(kN/mm)	800
Pad age	Placement year	
Sleeper type	Material&Shape	Biblock
Sleeper distance	(mm)	600
Ballast type		Normal

Frequency centreband [Hz]	20	25	31	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000
Rail vertical decay rate [dB/m]					2,85	2,19	1,61	2,28	3,84	5,72	8,65	9,58	10,85	10,42	8,83	8,17	5,53	3,6
Rail lateral decay rate [dB/m]					4,84	6,08	4,92	5,24	5,48	5,83	5,78	4,76	2,23	2,08	1,39	1,62	1,17	1,0
Lr Rail roughness [re 1E-6 m]									12,62	12,18	10,44	7,87	7,99	7,78	5,75	7,48	8,54	7,8
calculate																		
wavelength [cm]	100	80	63	50	40	31,5	25	20	16	12,5	10	8	6,3	5	4	3,15	2,5	
Lr Rail roughness [re 1E-6 m]									12,62	12,18	10,44	7,87	7,99	7,78	5,75	7,55	8,54	7,8

## Settings

Reference train speed vref\* (km/h) 72

Frequency band type	1/3-octave
Frequency range	20-20000 Hz
Weighting	A
Level type	Leq,-10dB

Reference value	2*E-5 Pa
Averaging time	1/8 sec fast
Averaging	Exponential
Wavelength-frequency conversion	Frequency=w/l

# IMAGINE data input sheet: vehicle pass by data input

New page **Pass-by number** 1  
**Vehicle descriptor** P4Imulnn  
 copy data to new sheet

IMAGINE data input form version 2.8

pass-by data		digits for vehicle descriptor (mandatory)		additional vehicle info (free)		remarks
Measurement date (dd-mm-yyyy)	16-apr-2002	train type	P	Length of measured train section [m]		
Time (hh:mm:ss)	11:01	number of axles per vehi	4	Vehicle length L (between buffers) [m]	26,4	
Duration of the measurement [s]		length of vehicle	1	National/international designation	mat64	
single/multiple pass by data	single	vehicle type	m	Vehicle identification number		
multiple: number of pass byz	1	load	u	Type tested in	NL	
Actual train speed [km/h]	128	wheel diameter	1	Wheelset type		
Number of vehicles		brake type	n	Drawing reference number		
Train orientation (free)		Wheel wear	n	Max. speed [km/h]	140	
Direction (free)		<b>Vehicle operating condition (mandatory)</b>		Basic distance [m]	20	
Temperature [Degree C]	13	operating condition	Acceleration	Axle distance [m]	2,5	
Humidity [%]		<b>(mandatory)</b>				
Wind speed [m/s]	2	measurement type	atherzauscor			
Wind direction	NW	Data Quality Indicator	high			

**SPL overall levels**

Frequency centband [Hz]	20	25	31	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	
Lp overall level (1.75 m, 0.0 m) (re 2E-5 Pa)		96,55	97,02	93,14	92,08	92,55	89,67	87,37	86,40	87,27	87,03	91,16	87,11	91,92	91,00	90,37	94,11	96,02	91,17	90,41	90,95	89,54	86,86	84,20	80,55	77,16	72,3	
Lp overall level (7.5 m, 1.2 m) (re 2E-5 Pa)												74,74	73,70	75,73	79,84	79,51	79,70	82,64	85,10	81,52	79,83	80,85	81,42	77,36	74,15	71,66	67,76	63,8
Lp overall level (7.5 m, 3.5 m) (re 2E-5 Pa)																												
Lp overall level (25 m, 3.5 m) (re 2E-5 Pa)																												

**Rolling noise data**

Frequency centband [Hz]	20	25	31	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000			
Lr Wheel roughness (re 1E-6 m)									12,62	12,18	10,44	7,87	7,99	7,79	5,75	7,55	8,50	7,83	0,37	-5,05	-10,25	-13,79	-13,94	-13,81	-12,44	-15,11	-14,8			
Lr, tot Total effective roughness (re 1E-6 m)								18,90	17,00	16,00	15,60	14,40	13,60	12,20	12,60	12,30	12,60	5,00	-2,10	-7,30	-13,90									
Rail vertical vibration level (V1, re 1E-6 m/s²)												66,52	63,72	64,92	66,32	66,41	70,11	74,39	79,11	72,43	64,75	61,85	58,39	55,10	52,01	45,36	43,12	39,4		
Rail lateral vibration level (L1, re 1E-6 m/s²)												64,34	67,46	65,49	69,37	68,30	65,02	65,45	68,42	66,03	64,68	60,81	57,07	47,63	45,63	44,73	44,40	41,3		
Sleeper vertical vibration level (S1, re 1E-6 m/s²)												67,28	61,35	62,95	64,74	61,76	63,56	64,18	62,85	59,03	53,42	46,37	42,24	35,98	26,30	26,47	20,11	26,2		
Lp vehicle contribution (7.5 m, 1.2 m) (re 2E-5 Pa)												72,54	77,76	72,60	76,41	74,89	75,92	78,61	79,20	78,30	78,39	80,31	81,16	77,16	73,87	71,44	67,28	62,9		
Lp track contribution (7.5 m, 1.2 m) (re 2E-5 Pa)												70,73	71,61	72,84	77,21	77,67	77,34	80,46	83,81	78,72	74,33	71,58	69,03	63,86	62,20	58,69	57,91	54,3		
Vehicle axle per meter correction 10*LOG10(N/L) (re 1m <sup>-2</sup> ·s <sup>-1</sup> )												-8,20	-8,20	-8,20	-8,20	-8,20	-8,20	-8,20	-8,20	-8,20	-8,20	-8,20	-8,20	-8,20	-8,20	-8,20	-8,2			
Cf Contact filter (re [-])												0,00	0,00	0,00	0,00	-0,10	-0,30	-0,80	-1,50	-2,50	-4,00	-6,00	-8,50	-11,00	-14,00	-13,50	-14,00	-16,0		
LHush Vehicle transfer function (re 4E2 Pa <sup>2</sup> /m)												65,14	71,56	67,20	72,41	70,49	71,92	73,51	74,30	81,50	83,69	96,21	103,26							
LHtr Track transfer function (re 4E2 Pa <sup>2</sup> /m)												63,33	65,41	67,44	73,21	73,27	73,34	75,36	79,41	81,92	84,63	87,58	91,13							
LHtot Overall transfer function (re 4E2 Pa <sup>2</sup> /m)												67,34	72,50	70,33	75,84	75,11	75,70	77,54	80,70	84,73	90,13	96,85	103,52							
calculat																														
wavelength [cm]	100	80	63	50	40	31,5	25	20	16	12,5	10	8	6,3	5	4	3,15	2,5	2	1,6	1,25	1	0,8	0,63	0,5	0,4	0,315	0,2			
Lr Wheel roughness (re 1E-6 m)												12,62	12,18	10,44	7,87	7,99	7,78	5,75	7,55	8,54	7,83	0,37	-5,05	-10,25	-13,79	-13,94	-13,80	-12,44	-15,11	-14,8

**Aerodynamic noise data**

Frequency centband [Hz]	20	25	31	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	
Lp aera,u0 total																												
Lp aera,u0 0,5m (basic)																												
alpha 0,5m (basic)																												
Lp aera(u,f) 0,5m (basic)																												
Lp aera,u0 4m (pantagraph)																												
alpha 4m (pantagraph)																												
Lp aera(u,f) 4m (pantagraph)																												

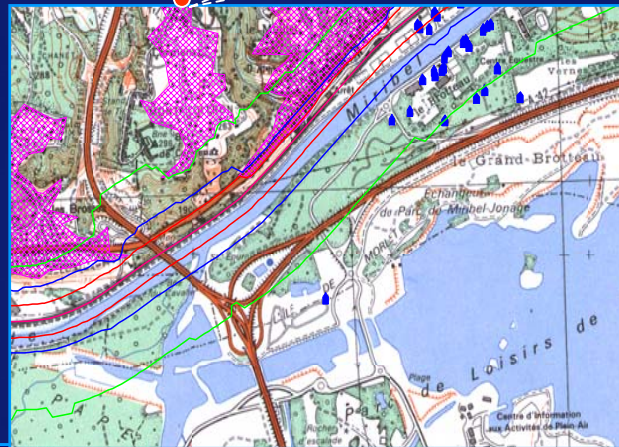
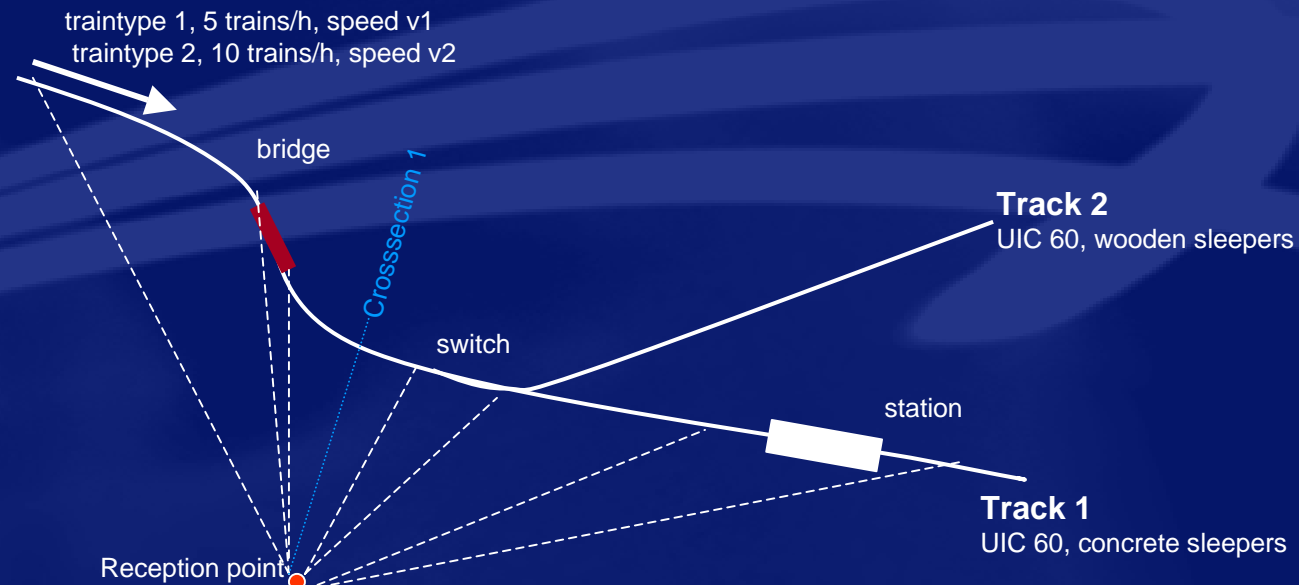
**Other sources**

Frequency centband [Hz]	20	25	31	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	

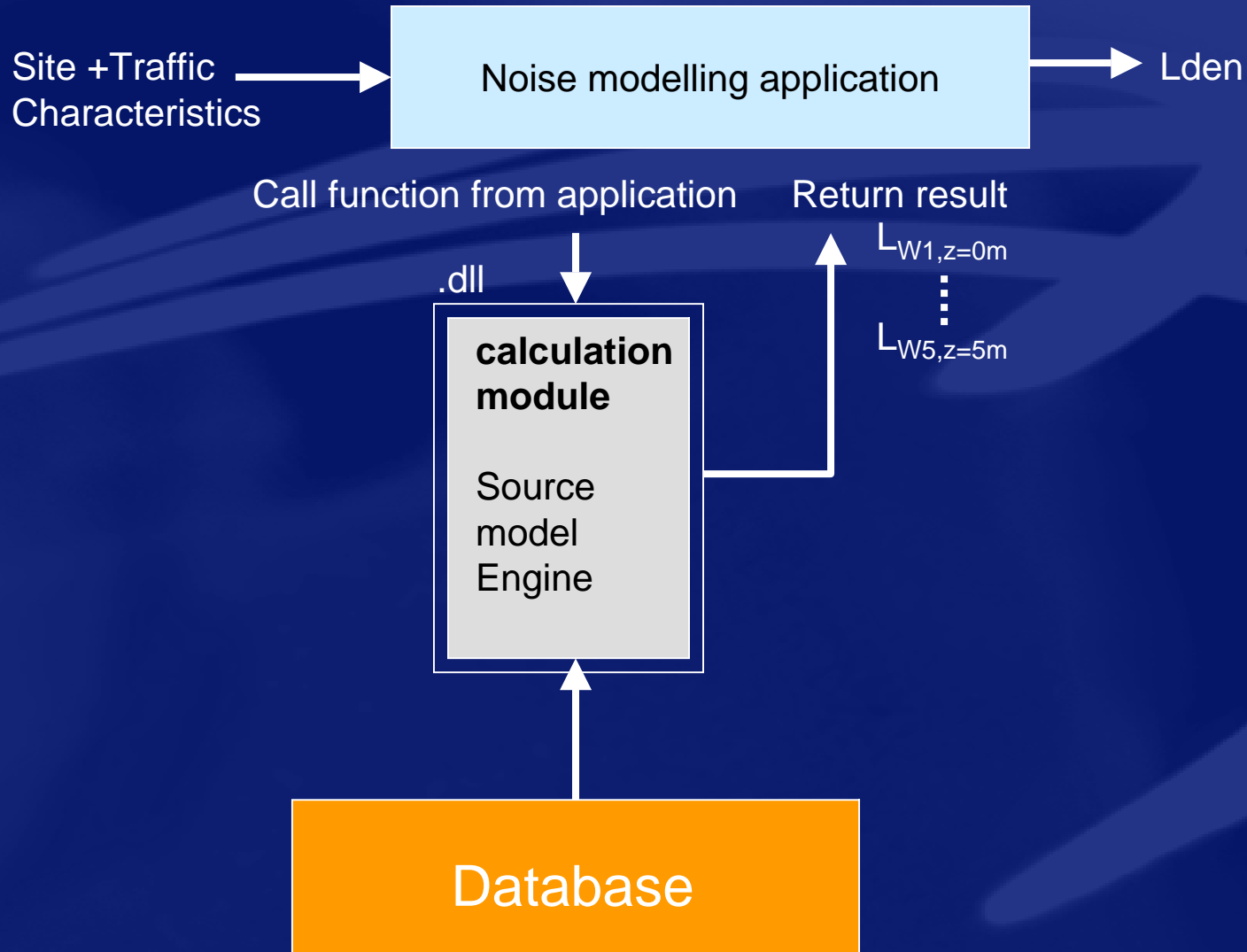
## IMAGINE data input sheet

- **uniform data input format for all Member States**
- **prepared for central European administration**
- **easy to use data input in Excel**

# Application in Noise GIS software



## Application in Noise GIS



## Conclusions

- **state of the art railsource database including all currently known physical railsource parameters**
- **user entry levels from basic to expert**
- **transparent structure**
- **option for input of newly acquired measurement data in uniform data input sheet**
- **applicable in GIS environment**
- **prepared for central European administration**

# Questions & Answers

