

Test of SoundPLAN

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To ensure the validity of SoundPLAN results the implementation of standards and guidelines is verified by running test cases. For each SoundPLAN version and update, models of these cases are calculated, and the results are evaluated.

Some of these cases are genuine test cases, published by authorities or recognized organizations. For these test cases we know the true results, most of them obtained by using reference software, otherwise manual work by skilled people. Other cases have less official status, but still capable of proving SoundPLAN's reproducibility from version to version and from update to update.

The testing is shared between the producer of SoundPLAN – SoundPLAN GmbH – and SoundPLAN Nord ApS. The testing performed by SoundPLAN GmbH goes way back in SoundPLAN history; the testing done by SoundPLAN Nord ApS started in 2009 with the release of Version 7.0 and has continuously been amended since then. This Net info states status at a time where SoundPLAN 9.1 is current version.

SoundPLAN GmbH (genuine test cases)

- NORD2000, road emission and propagation according to Environmental Project 1022/2005 including later revision RL 18-18 published by Danish Environmental Protection Agency. Reference software: Reference matlab code for NORD2000.
- NORD2000, rail emission according to Environmental Project No. 1391 2011 including later revision RL 14-18 published by Danish Environmental Protection Agency. Reference software: Reference matlab code for NORD2000.
- CNOSSOS EU:2015 according to ISO/TR 17534-4:2020. Reference software: none-commercial test software, true values evaluated by members of working group (WG56). Declaration of conformity can be downloaded [here](#).
- NORD2000, LAFmax levels of the official Nord2000 rail test cases, Andreas Gustafson, VTI, Version 2024-08-07.

SoundPLAN Nord ApS (genuine test cases):

- General Prediction Method (GPM 1982) according to Report 32 from Danish Acoustical Laboratory. True results found by work performed by the developers of GPM 1982.
- General Prediction Method (GPM 1982) according to Orientering nr. 37 from Miljøstyrelsens Referencelaboratorium for Støjmålinger. Reference software: ILYD.
- Road Traffic Noise, Nordic Prediction Method (RTN 1996) according to AV 1059/97 from DELTA Acoustics and Vibration. Reference software: NBSTØJ version 4.1 [DK].

Concerning test of:

- Railway Traffic Noise, Nordic Prediction Method (NMT96). No genuine test cases are available. Test cases for NORD2000, RTN96 and GPM 1982 were financed by Danish authorities and since NMT96 was never approved in Denmark and since other countries obviously were not interested in preparing such cases, there are no means to check the implementation against true values.
- GPM 2019. Until now no test cases to check the implementation of the new math for double screening in GPM have been published.

'Unofficial' tests:

Besides the genuine tests, SoundPLAN Nord ApS runs several cases for which we don't know the true results because these cases have never been calculated by third party using reliable reference software. These tests mainly serve the purpose of proving the reproducibility of SoundPLAN results.

These 'unofficial' cases include:

- ‘Sammenlignende støjmålinger’ ¹⁾ (# 14, 15, 17, 19, 20, 21, 22, 23, 24, 25, 26, 27 and 28)
- Calculation of noise from wind turbines according to BEK nr 1284 of 15/12/2011 and BEK nr 135 of 07/02/2019 (Danish guidelines).
- Calculation of rail noise according to NMT96.
- Calculation of both road and rail noise according to CNOSSOS EU.
- Calculation according to GPM 2019 in a medium size ‘real’ industry noise project.

All models tested by SoundPLAN Nord ApS – genuine as well as ‘unofficial’ – are merged into a single SoundPLAN project and the results from a batch run are extracted and saved in a spreadsheet. We have gathered this extract from SoundPLAN Version 8.2, 9.0 and 9.1 in a single spreadsheet. This spreadsheet – named ‘Monitor’ – is available for all and can be **downloaded from our website > page ‘Support’**, whereas the project itself with all models is shared only with Certificeringsordningen (see footnote ¹⁾), since some models origin from customer projects which we do not have the rights to publish.

Our tests of Version 8.2 are done with the 32 bit version, whereas we use 64 bit version of Version 9.0 and 9.1. Comparisons between version 32 bit and 64 bit show that the deviations are less than 0,0001 dB.

Notes to the spreadsheet.

Calculations obtained with not-published SoundPLAN versions (‘beta-versions’) are greyed out.

There are 6 sheets, ‘dB(A) 8.2’, ‘dB(A) 9.0’, ‘dB(A) 9.1’, ‘Octave 8.2’, ‘Octave 9.0’ and ‘Octave 9.’ (plus some hidden sheets). The three sheets named ‘Octave x.y’ contains results per octave from test example 5.2 in Orientering 37 from Miljøstyrelsens Referencelaboratorium for Støjmålinger; all other results are total A-weighted values.

Top rows on ‘dB(A) - sheets’ state a name of the test case plus true values. Column A indicates if the update returns identical results with the former update (✓), or if you should pay attention to one or more results (OBS); in this case the relevant cells come with a note (red triangle in upper right corner). Holding your cursor on the cell will make a note pop up, e. g. explanations for deviations. Column B identifies the update, format yyyymmdd.

All calculations from update 20190626 on (Version 8.2) includes the latest revision of NORD2000 (according to Sagsnr.: 118-22465 from FORCE Technology).

On the ‘Octave - sheets’ deviations within the allowed tolerance are written on green background colour. Prior to update 20191217 our results are obtained with GPM 1982, which gives deviations within the tolerance in all receivers and at all octaves. After this update we switched to GPM 2019 (mandatory to use in Denmark), which includes new math for double screening. True values with GPM 2019 for this test case haven’t been published yet. Results affected by the new math for double screening in GPM 2019 deviate from the original true values with GPM 1982. These results are framed and marked with white fill. On the sheet it looks like this (upper with GPM 1982, lower with GPM 2019):

SoundPLAN ver 8.2 17-12-2019 w/ GPM 1982									
63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	Deviation	
16,45	24,11	14,05	22,12	15,17	14,05	13,11	-2,40	0,00	0,00
16,72	23,47	15,06	22,05	15,49	13,75	4,55	-18,31	0,01	0,00
16,10	24,11	14,40	18,48	15,52	13,13	1,36	-18,90	0,00	0,00
17,41	28,96	19,37	20,08	22,62	15,34	12,96	-9,22	0,00	0,01
41,35	31,76	27,86	28,77	15,79	18,84	25,26	11,28	0,01	0,01
41,11	33,13	27,91	28,81	15,64	15,17	28,01	10,44	0,00	0,01
38,72	36,50	24,64	25,12	25,75	26,52	26,51	9,57	0,00	0,00
38,58	28,68	24,60	24,02	25,51	30,31	28,01	8,07	0,00	0,01
38,28	28,17	24,48	24,79	25,22	27,61	7,74		0,00	0,00
38,10	29,10	25,67	26,12	31,38	32,40	27,14	6,44	0,00	0,00
38,10	29,17	27,43	28,16	31,38	31,36	26,76	4,46	0,01	0,00
37,79	28,58	24,12	25,78	32,09	34,01	28,14	4,09	0,00	0,00
38,08	31,82	28,10	29,57	32,72	31,63	25,82	3,15	0,00	0,00
38,08	32,29	28,57	29,18	32,88	31,36	24,84	2,33	0,00	0,00
38,28	32,11	28,09	29,53	32,88	31,36	25,84	2,33	0,00	0,00
38,10	32,29	28,58	29,18	32,88	31,36	26,84	2,33	0,00	0,00
38,01	32,47	28,38	29,85	33,01	31,94	26,17	3,67	0,00	0,00
38,28	32,48	28,58	30,02	33,20	31,80	26,84	4,41	0,00	0,00
38,04	31,96	28,78	29,18	31,30	30,80	24,88	4,34	0,00	0,00
37,72	29,74	24,98	26,25	28,72	27,07	20,01	-1,44	0,00	0,00
37,05	29,54	24,81	26,21	28,40	26,40	18,95	-2,33	0,00	0,01
37,10	29,61	24,87	26,49	28,29	26,08	18,46	-2,34	0,00	0,00
37,38	29,91	25,11	26,87	28,51	26,73	19,04	-2,10	0,00	0,00

SoundPLAN ver 8.2 17-12-2019 w/ GPM 2019									
63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	Deviation	
16,45	24,11	14,05	22,12	15,17	14,05	13,11	-2,40	0,00	0,00
16,72	23,47	15,06	22,05	15,49	13,75	4,55	-18,31	0,00	0,00
16,10	24,11	14,40	18,48	15,52	13,13	1,36	-18,90	-1,92	-0,05
17,41	28,96	19,37	20,08	22,62	15,34	12,96	-9,22	-2,05	-1,77
41,35	31,76	27,86	28,77	15,79	18,84	25,26	11,28	-1,74	-0,68
41,11	33,13	27,91	28,81	15,64	15,17	28,01	10,44	0,00	0,00
38,72	36,50	24,64	25,12	25,75	26,52	26,51	9,57	0,00	0,00
38,58	28,68	24,60	24,02	25,51	30,31	28,01	8,07	0,00	0,00
38,28	28,17	24,48	24,79	25,22	27,61	7,74		0,00	0,00
38,10	29,10	25,67	26,12	31,38	32,40	27,14	6,44	-1,17	-1,74
38,10	29,17	27,43	28,16	31,38	31,36	26,76	4,46	-1,51	-1,11
37,79	28,58	24,12	25,78	32,09	34,01	28,14	4,09	-1,40	-0,88
38,08	31,82	28,10	29,57	32,72	31,63	25,82	3,15	-1,31	-0,15
38,08	32,29	28,57	29,18	32,88	31,36	24,84	2,33	-0,48	0,00
38,28	32,11	28,09	29,53	32,88	31,36	25,84	2,33	0,00	0,00
38,10	32,29	28,58	29,18	32,88	31,36	26,84	2,33	0,00	0,00
38,01	32,47	28,38	29,85	33,01	31,94	26,17	3,67	0,00	0,00
38,28	32,48	28,58	30,02	33,20	31,80	26,84	4,41	0,00	0,00
38,04	31,96	28,78	29,18	31,30	30,80	24,88	4,34	0,00	0,00
37,72	29,74	24,98	26,25	28,72	27,07	20,01	-1,44	0,00	0,00
37,05	29,54	24,81	26,21	28,40	26,40	18,95	-2,33	0,00	0,00
37,10	29,61	24,87	26,49	28,29	26,08	18,46	-2,34	0,00	0,00
37,38	29,91	25,11	26,87	28,51	26,73	19,04	-2,10	0,00	0,00

footnote

- 1) *To obtain a certificate to perform ‘Miljømåling – ekstern støj’ in Denmark, you must fulfill a series of criteria, one of which is to join ‘Sammenlignende målinger’ (Round Robin test). These tasks can be a measurement or a calculation of environmental noise; to pass the test you must reach a result that is not too far away from the average of all participant’s results. The administration of this certification scheme is hosted by FORCE Technology (former DELTA and before that Danish Acoustical Laboratory). The administration has received the SoundPLAN project that hosts all the above-mentioned tests. Further information about the scheme you can contact us on support@soundplan.dk*