An innovative damper for traffic noise

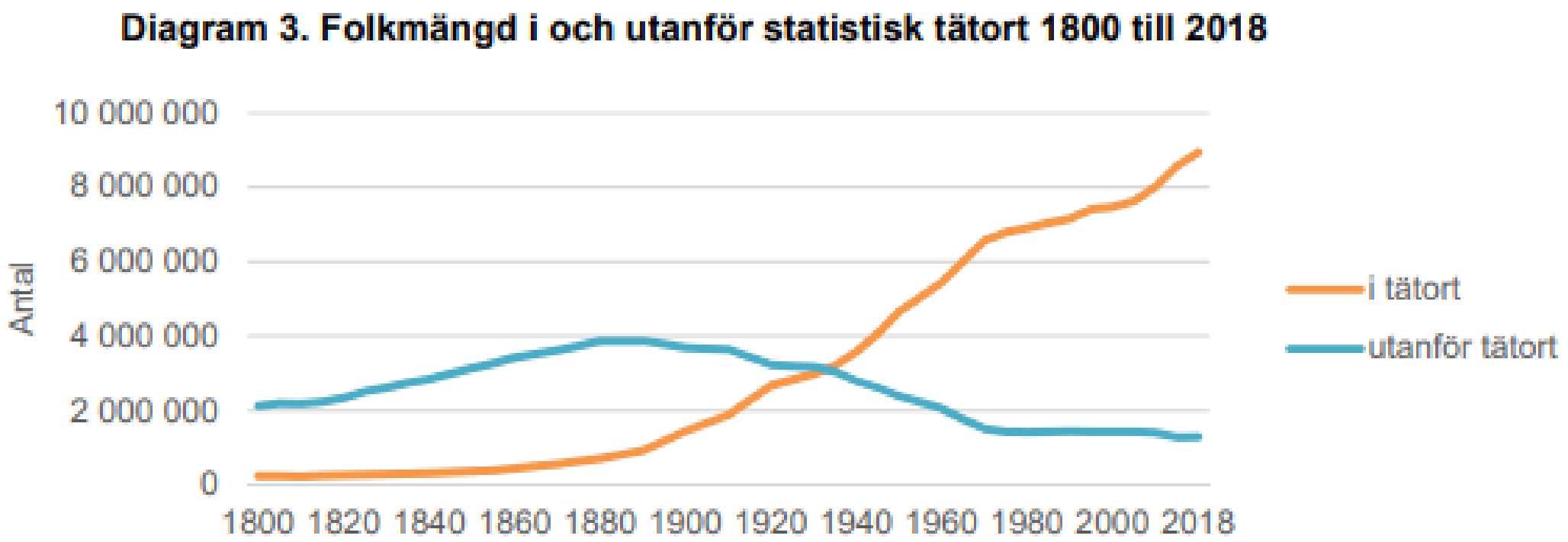
VINNOVA
Sveriges innovationsmyndighet

INFRA SWEDEN 2030

WAVEBREAKER

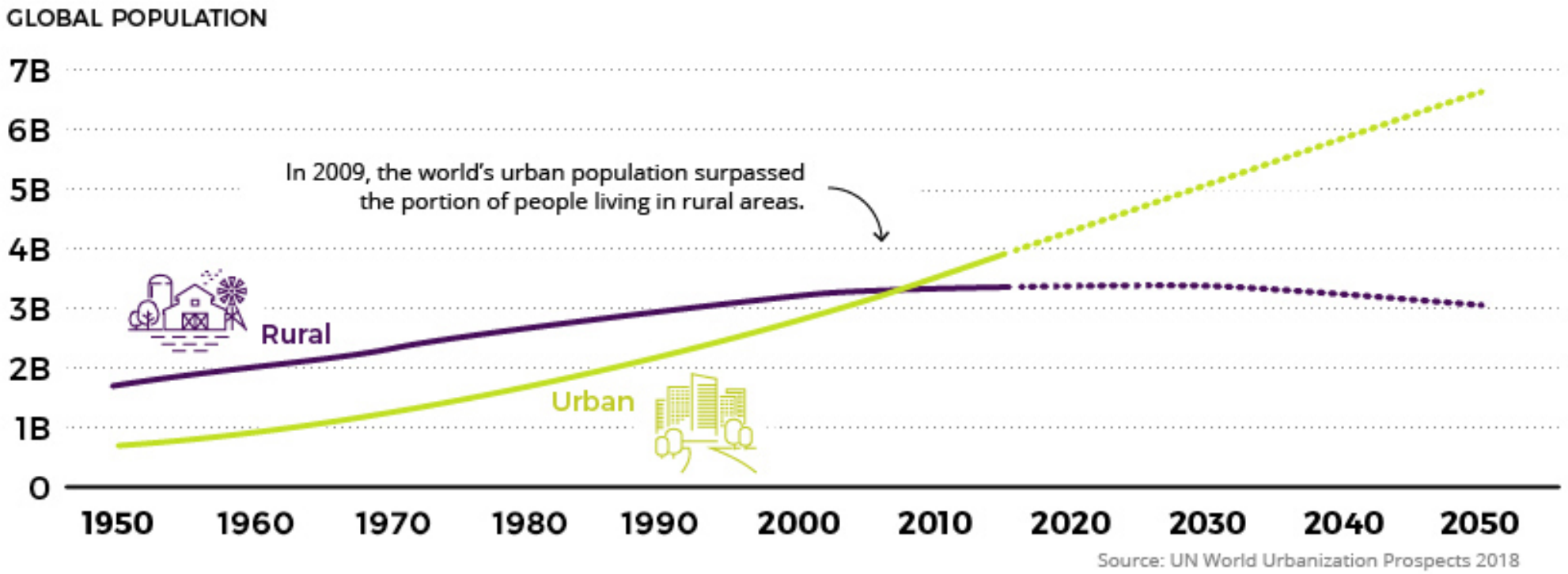
*- INNOVATING **SILENCE***

Urbanization in Sweden



Source: SCB, Statistiska meddelanden MI 38 SM 1901

Urbanization globally



European Environmental Agency 2020

- 20% in EU live in harmful noise.
- 12 000 people/year die prematurely.
- Problems are projected to increase.

Based on noise maps with limits Lden ≥ 55 dB and at Lnight ≥ 50 dB.
Roads >3 millions vehicles, railway >30 000 passages, airport >50 000 movements, urban areas >100 000 inhabitants.
>30% of reports missing.

SOLUTION

”**Added device**” on top of the noise screens.

Noise reduction **3-5 dB**

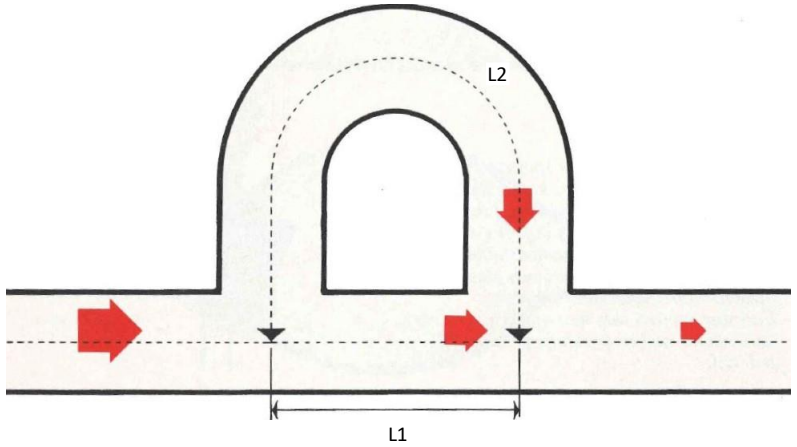
Costs < 25-50%

compared with alternative solutions.

INTERFERENCE SOUND DAMPING

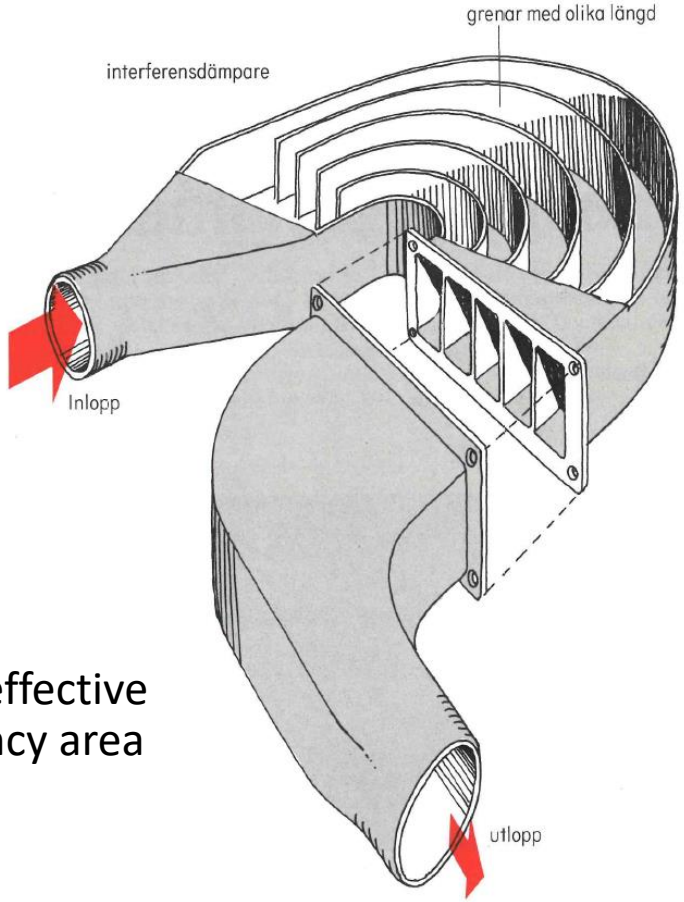
Principle well-known since year 1866.

$$f = n \times \frac{c}{2(L_2 - L_1)}$$



Tonal sounds / narrow frequency spectrum

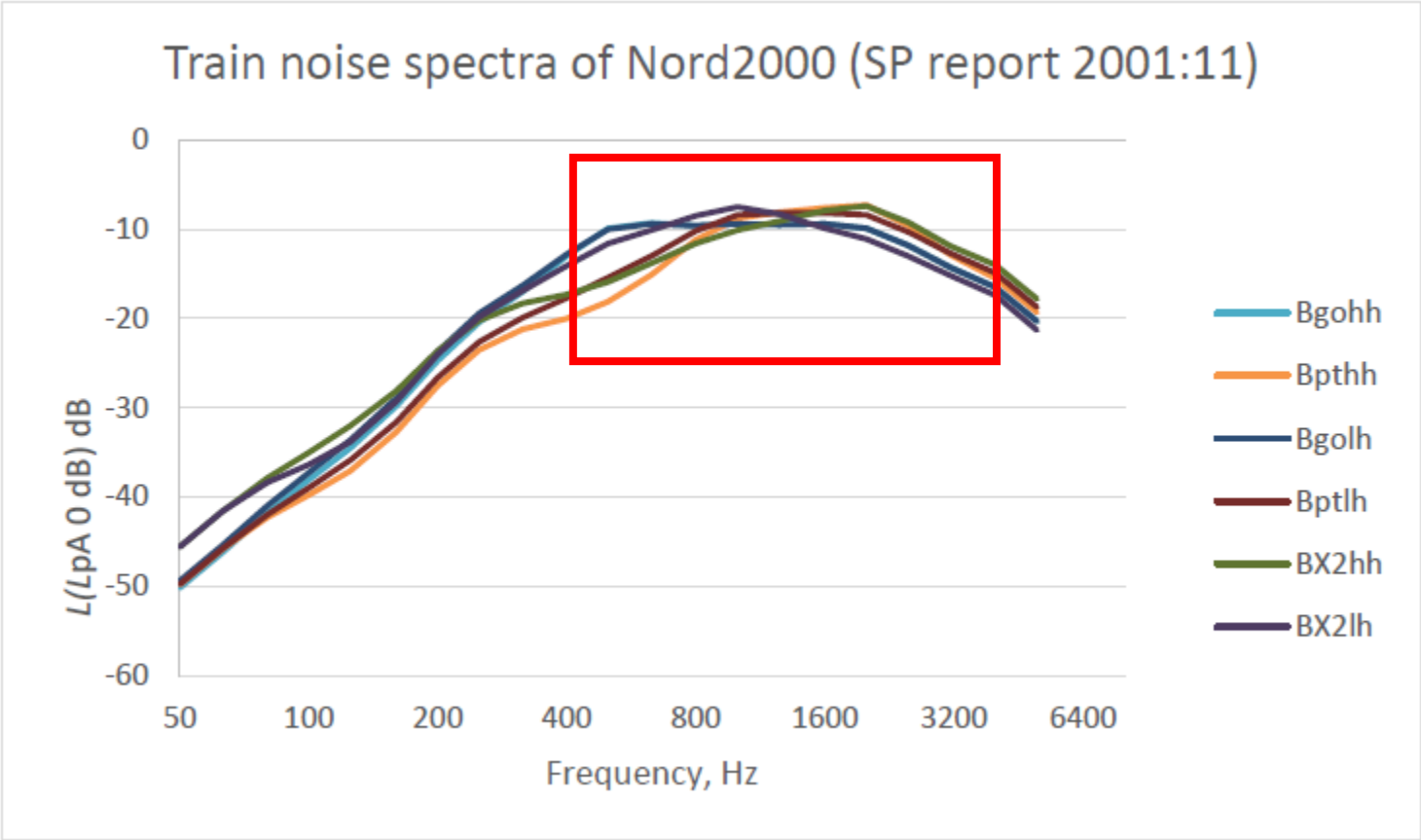
The time-delayed sound = ”anti-sound”



Broadening the effective damping frequency area

The examples from Bullerbekämpning. Principer och tillämpning, S. Ingemansson, H. Elvhammar, Arbetarskyddsfonden, 1977.

FOCUS ON 400–4000 HZ = INSERTION LOSS OF 3–5 DBA?



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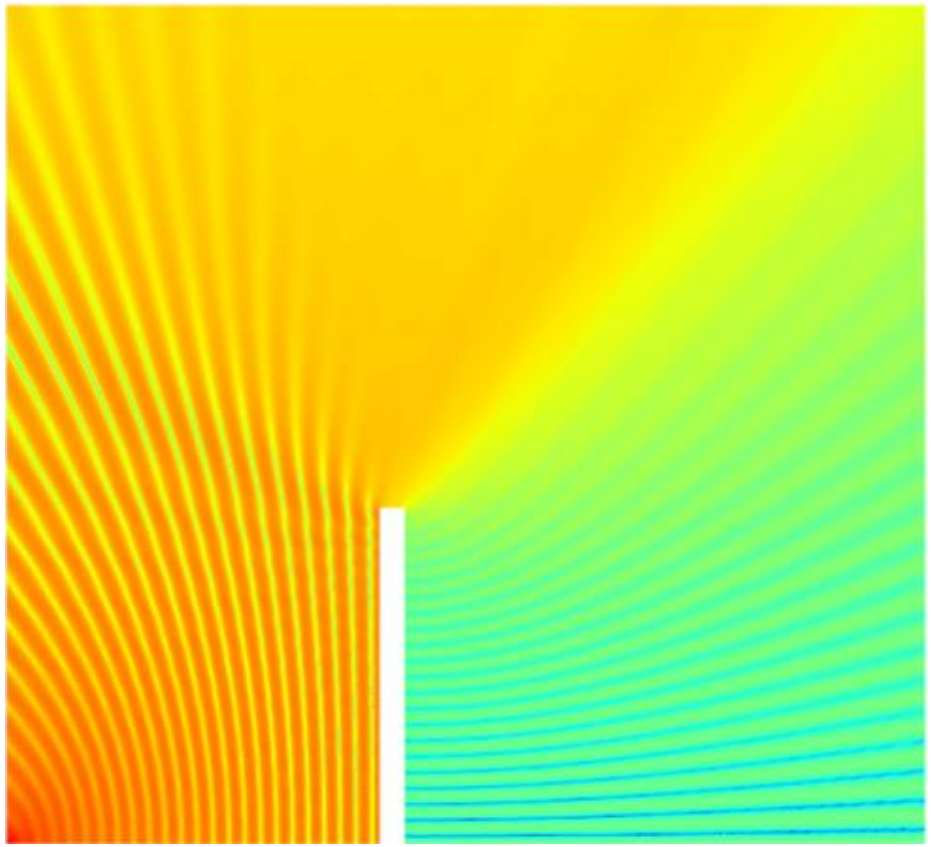
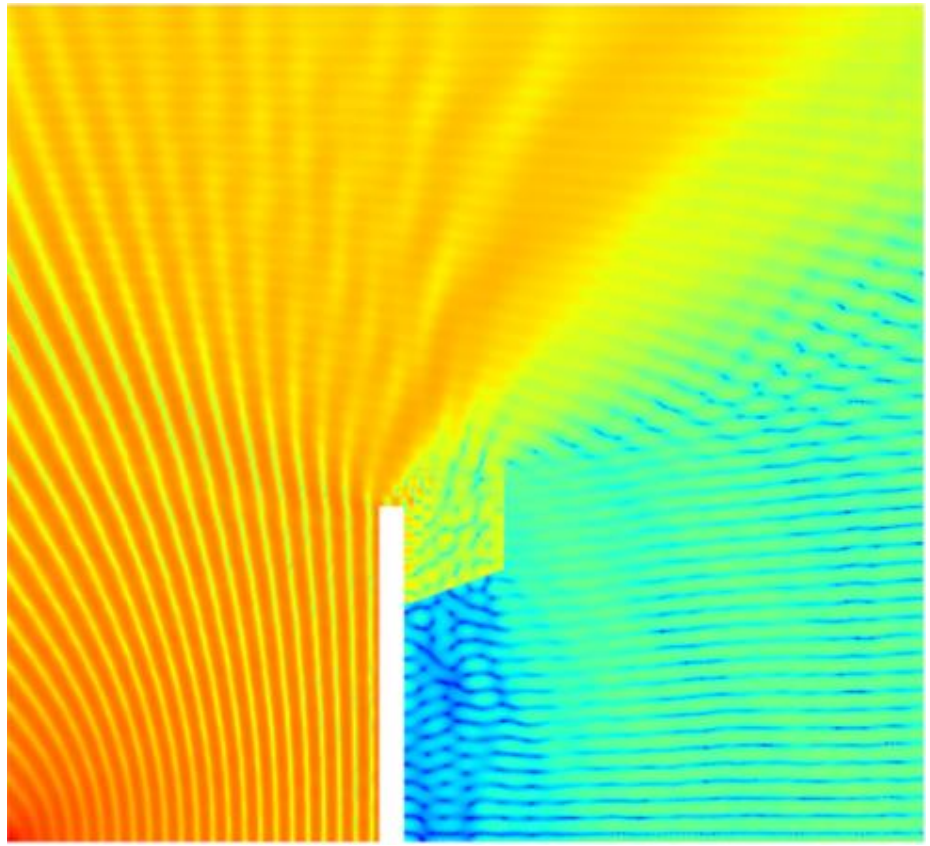
SIMULATIONS – INTERFERENCE FIELD AT 2000 HZ

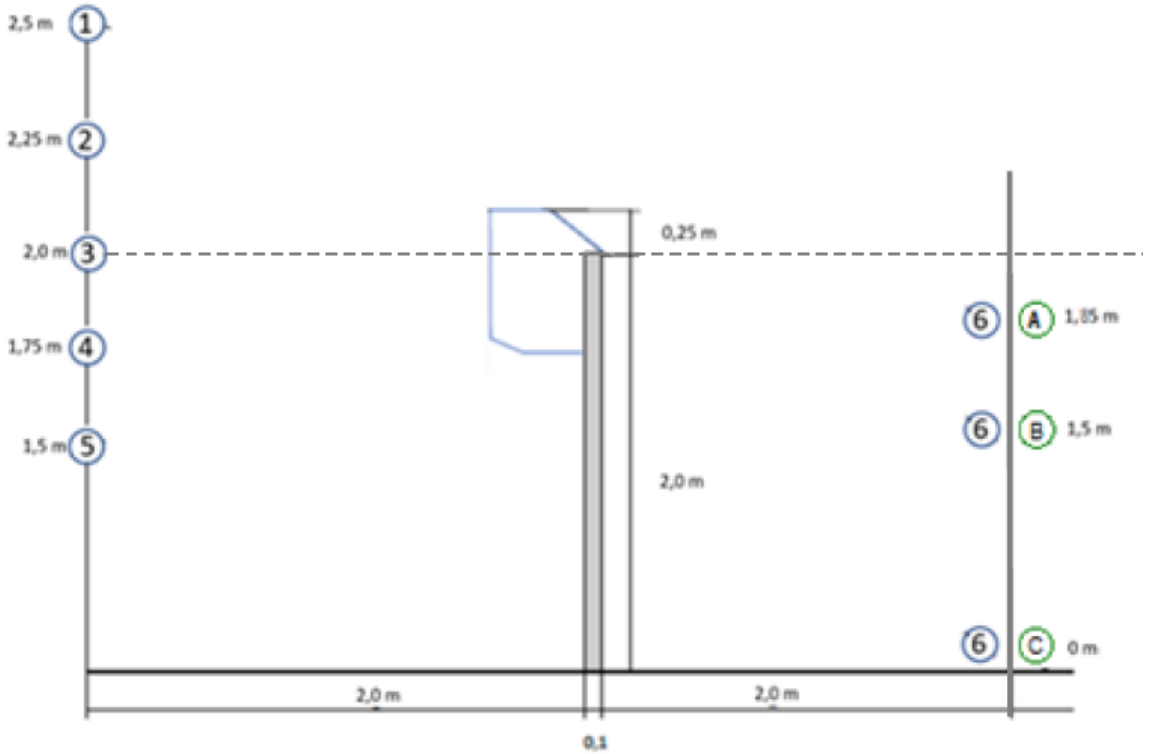


Without interference sound damper

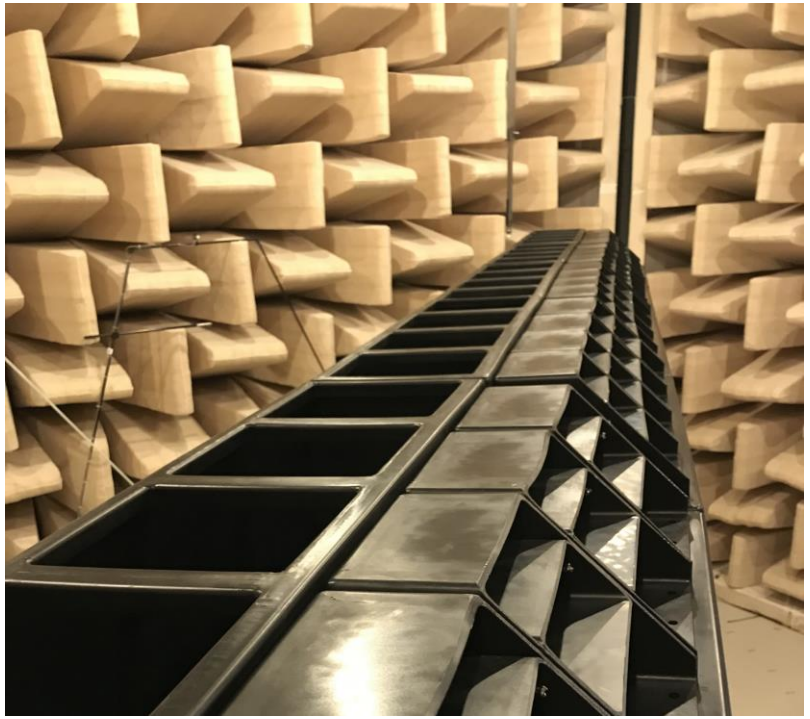


With interference sound damper

RISE LABORATORY COMPARISON TESTS OF A PROTOTYPE

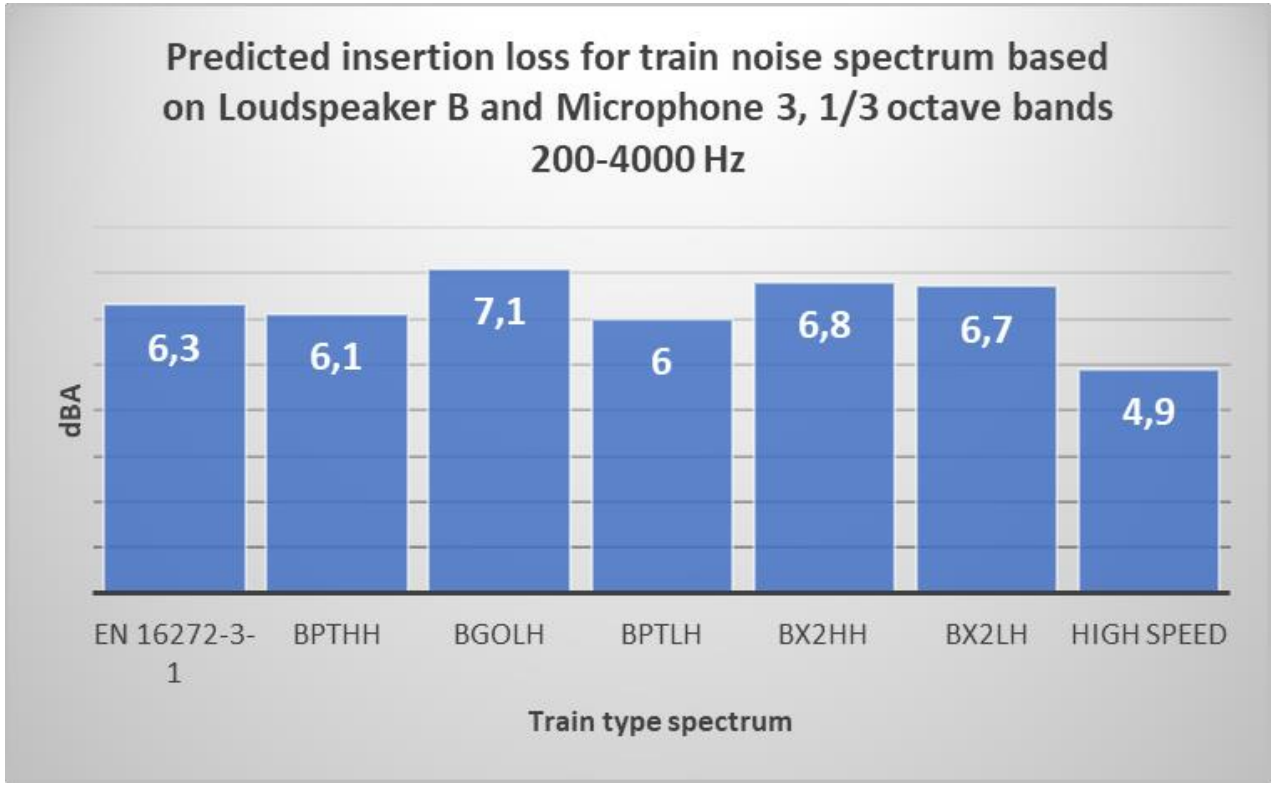


Measurement method corresponding to EN 16727-4:2016
(microphone position kept on same height, insulation material on floor)



Test wall built diagonal in test room.
Double wall total width 10 cm.

PREDICTED SOUND LEVEL DIFFERENCE FOR DIFFERENT TRAIN NOISE SPECTRA



EN 16272-3-1: Normalised A-weighted railway noise
Bpthh: Passenger train w/ RC-locomotive, 160 km/h
Bgolh: Freight train w/ RC-locomotive, 4a-80 km/h
Bptlh: Passenger train w/ RC-locomotive, 120 km/h
BX2hh: X2000, 200 km/h
BX2lh: X2000, 80 km/h
High speed: Normalised high speed train noise spectrum (derived) of SP Report 2015:42

TEST TRACK KONSTGJUTAREVÄGEN, JOHANNESHOV

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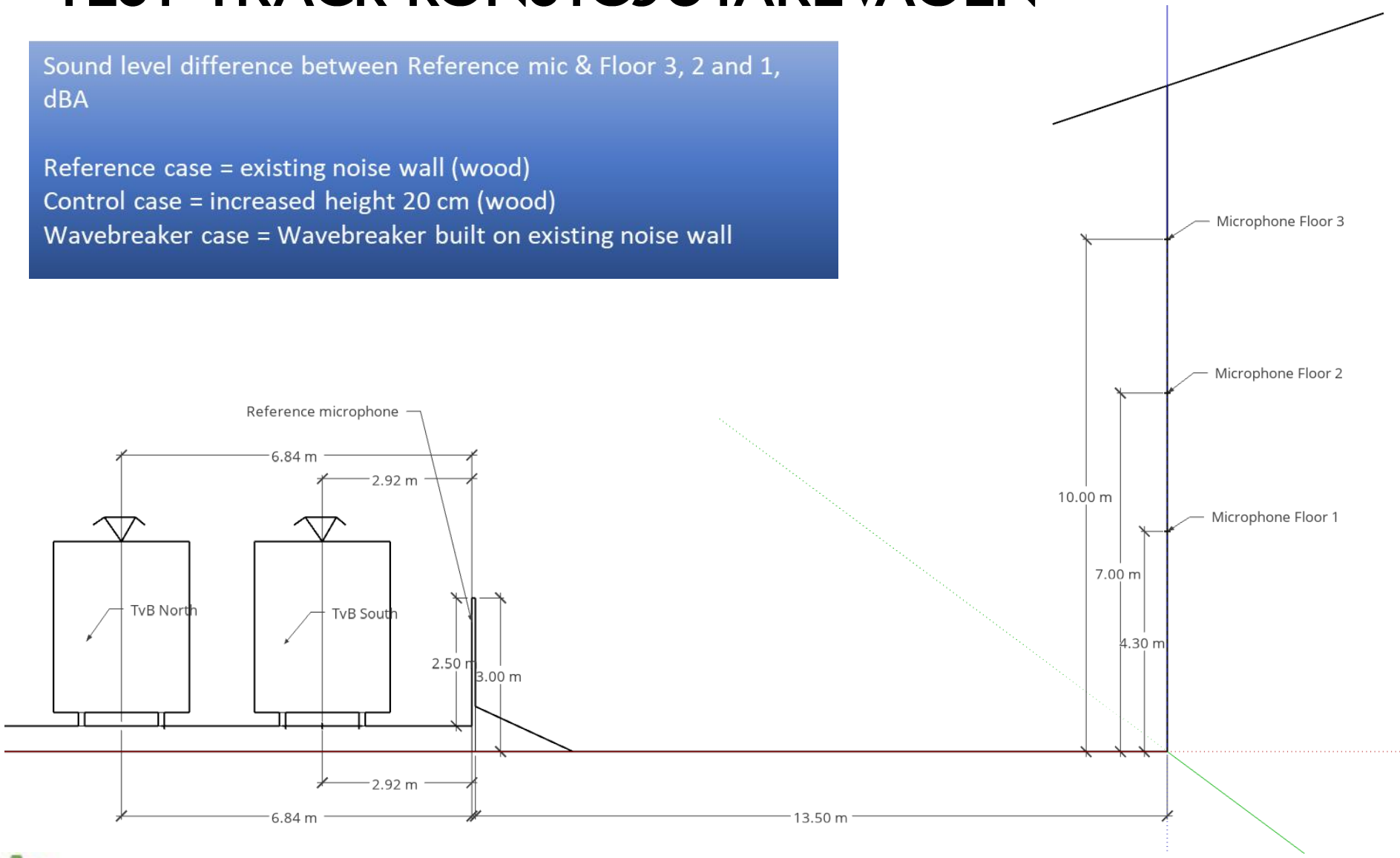
TEST TRACK KONSTGJUTAREVÄGEN

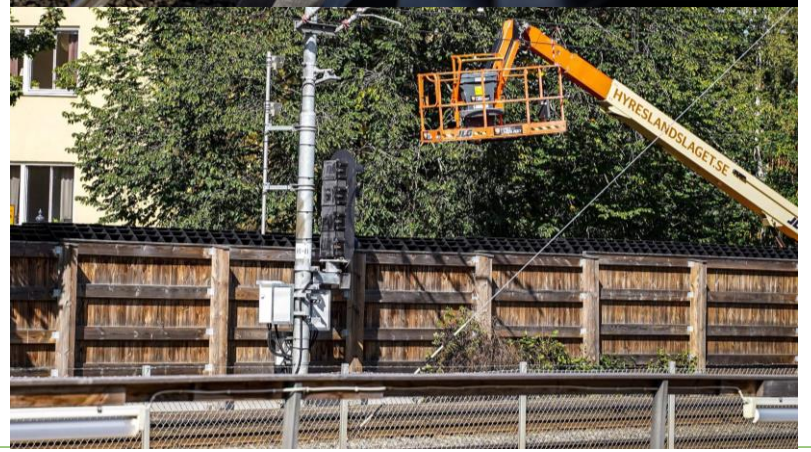
Sound level difference between Reference mic & Floor 3, 2 and 1, dBA

Reference case = existing noise wall (wood)
Control case = increased height 20 cm (wood)
Wavebreaker case = Wavebreaker built on existing noise wall

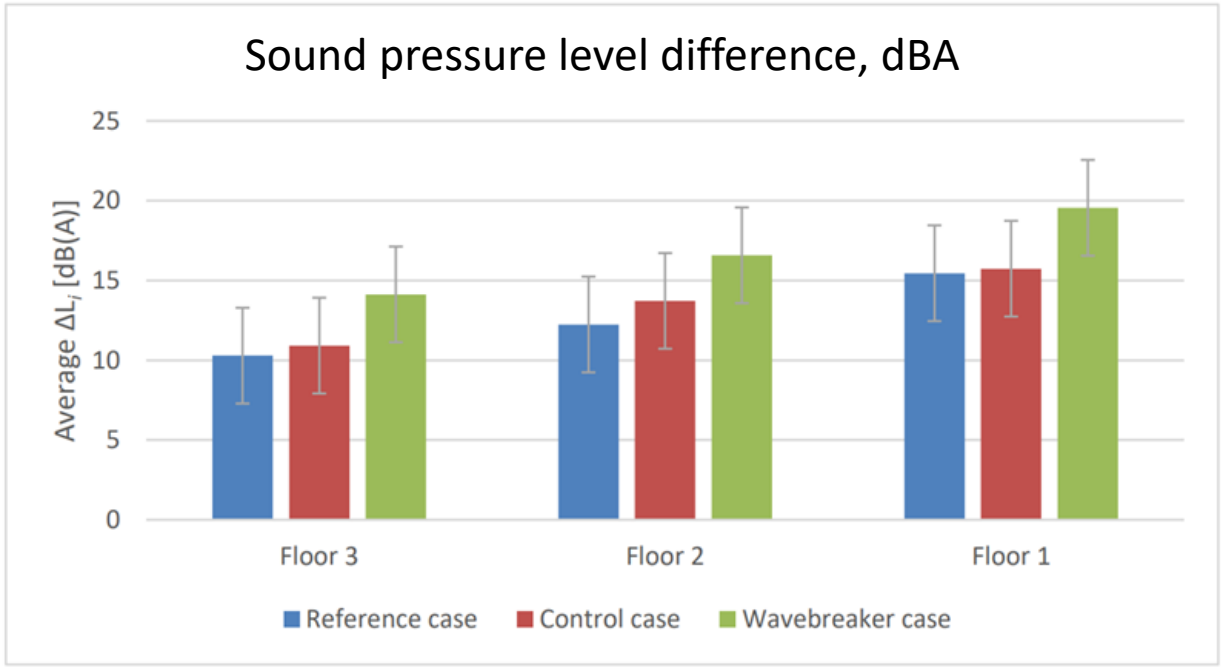


TEST TRACK KONSTGJUTAREVÄGEN - CASES

TEST TRACK KONSTGJUTAREVÄGEN – INSTALLATION



TEST TRACK – RESULTS MEET REQUIREMENTS!



- Up to 5 dBA improvement.
- Installation was very easy.
- Cost savings compared with higher noise screens.
- Increased visibility possible.
- Estetics acceptable compared to alternative solutions.

WAVEBREAKER

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LESSONS LEARNED

- Early prototype testing in laboratory
- Laboratory tests give nominal values with very high precision (+/- 0.1 dBA)
- Field measurements are submitted to a lot of uncertainties (+/- 3 dBA)
- Summarization of performance – cost – benefits is necessary

- Production partners in Europe
  - Tools from Portugal and Sweden
  - Production in Sweden / Norway
- Find and build a network of key partners

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SUMMARY

- End of development phase in Vinnova-projects
- From startup -> serial production completed
- Start of marketing / sales phase

Next step:

- Communication strategy
  - Instructions for acoustic engineers
  - Summary performance – cost – benefits
  - Environmental focus – policy, sustainability, product
- Complementary products
- Maintenance instructions

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