

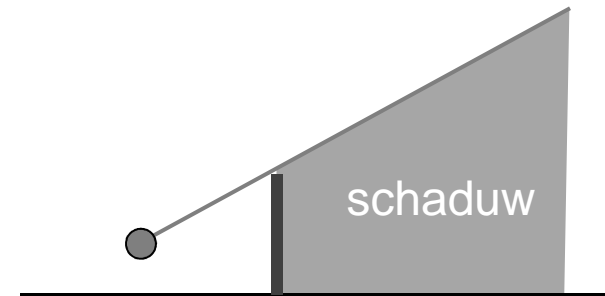
› EFFECTEN VAN GELUIDSCHERMEN

Erik Salomons

TNO innovation
for life

Presentatie gehouden op een NSG bijeenkomst over Geluidschermen in de Jaarbeurs in Utrecht op 6 september 2016.

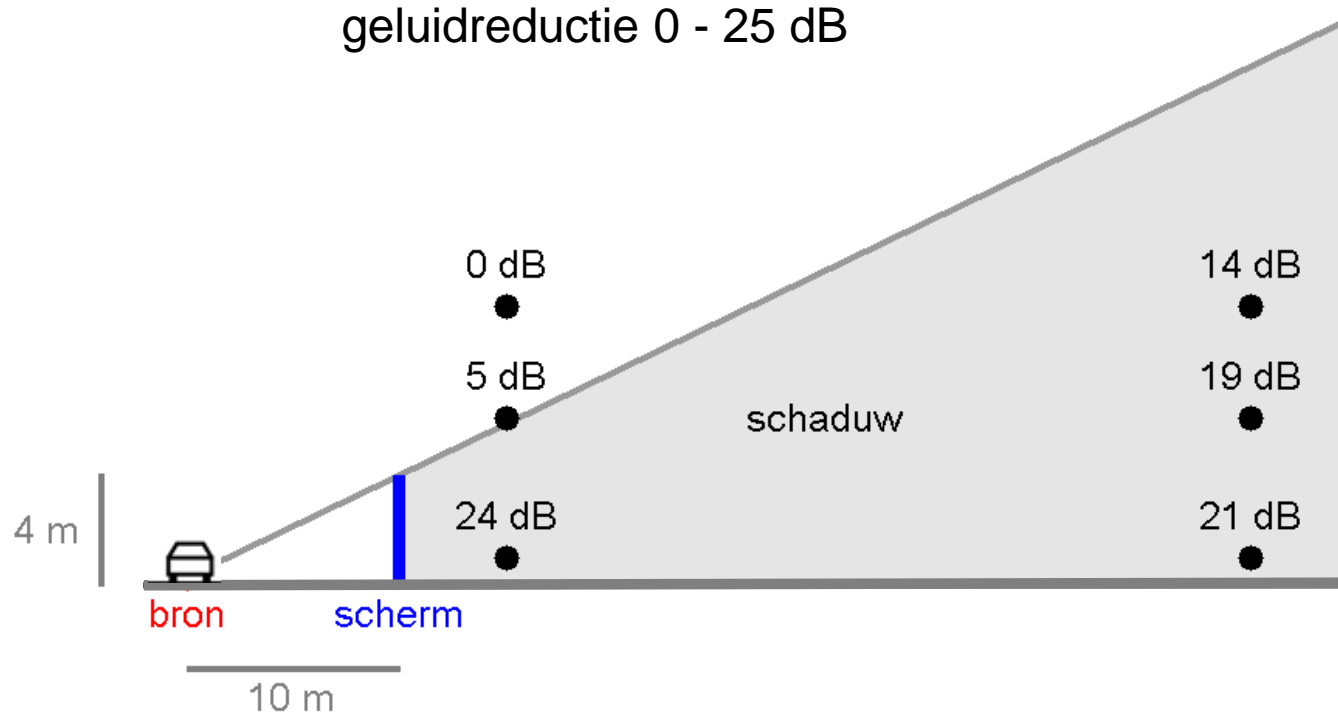
- › Fysica van geluidafscherming
 - › zonder wind: eenvoudig
 - › met wind: complex



- › Rekenmodellen en geluidschermen
 - › SRM: te optimistisch
 - › Cnossos, Harmonoise, TNM

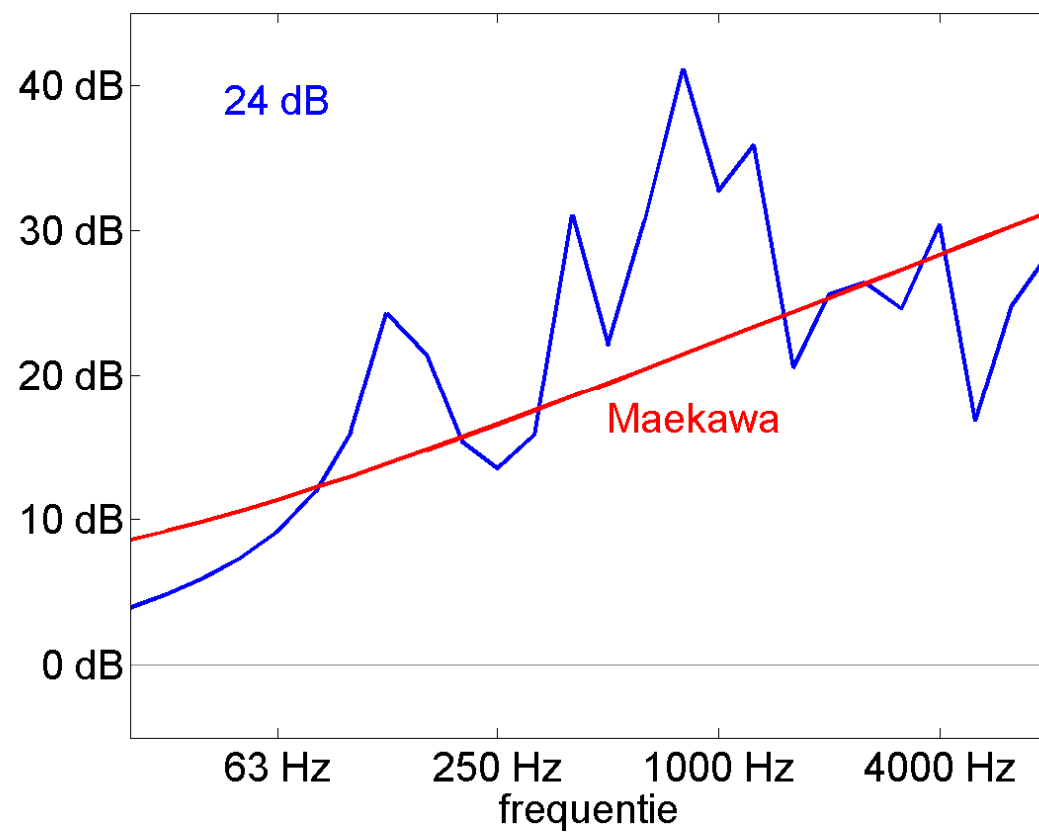
EFFECT VAN GELUIDSCHERM

geluidreductie 0 - 25 dB

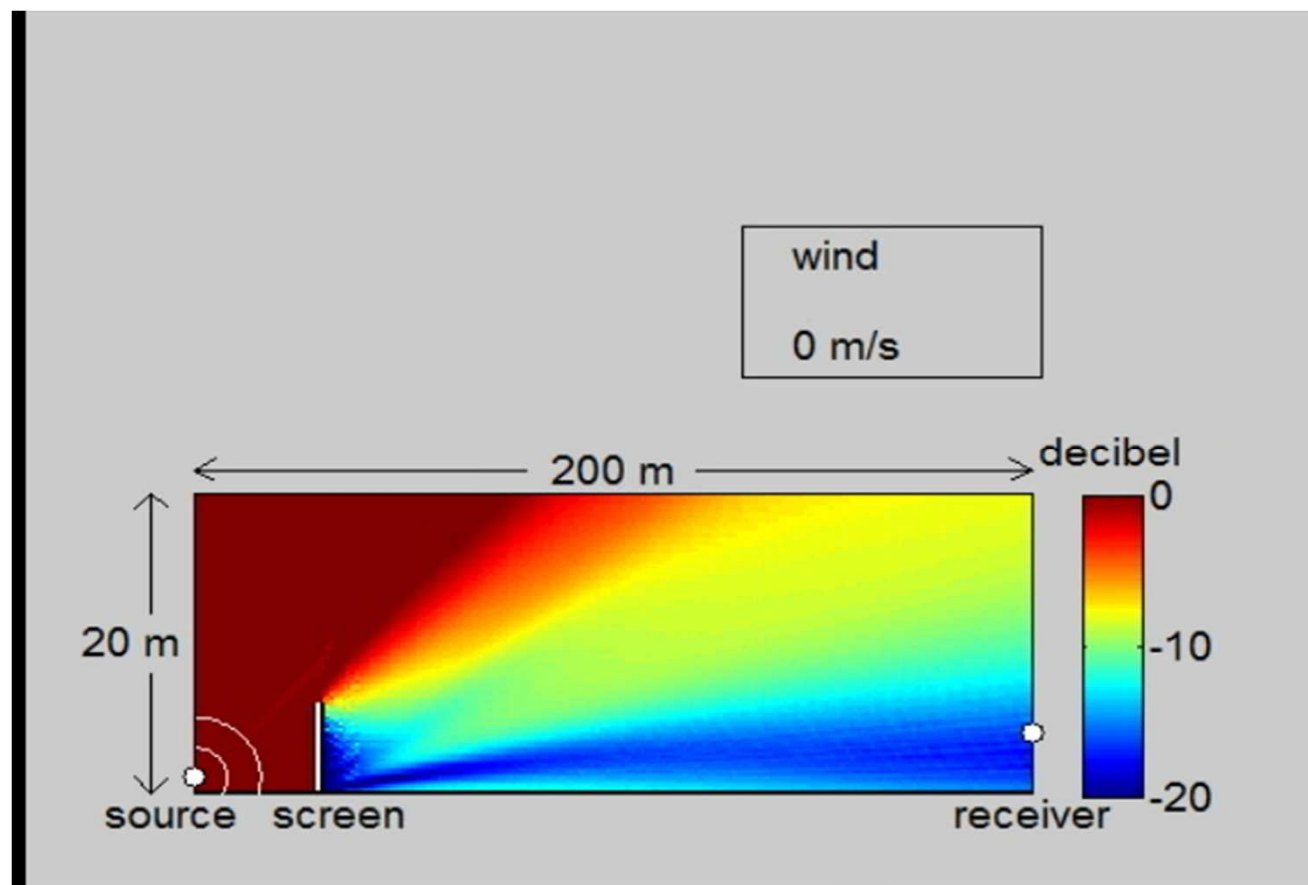


GELUIDSPECTRUM

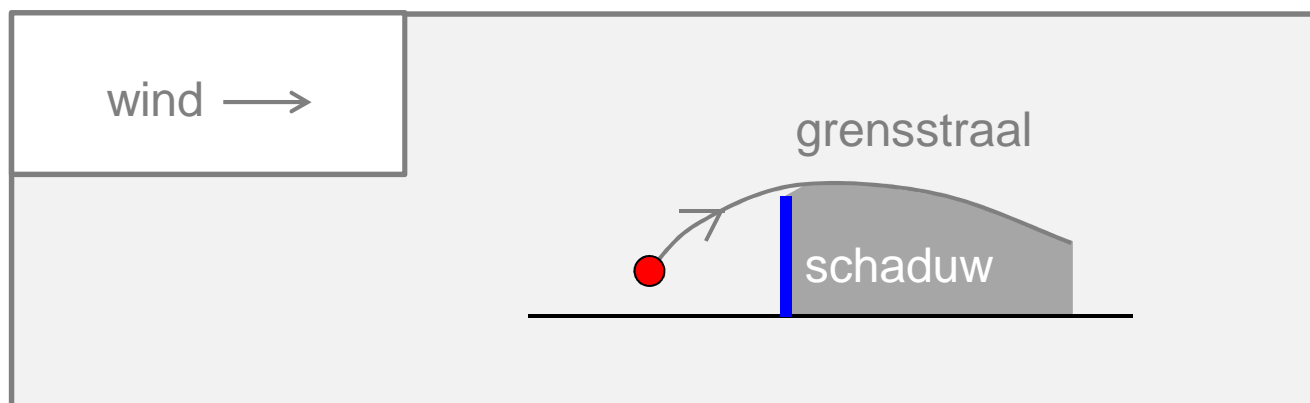
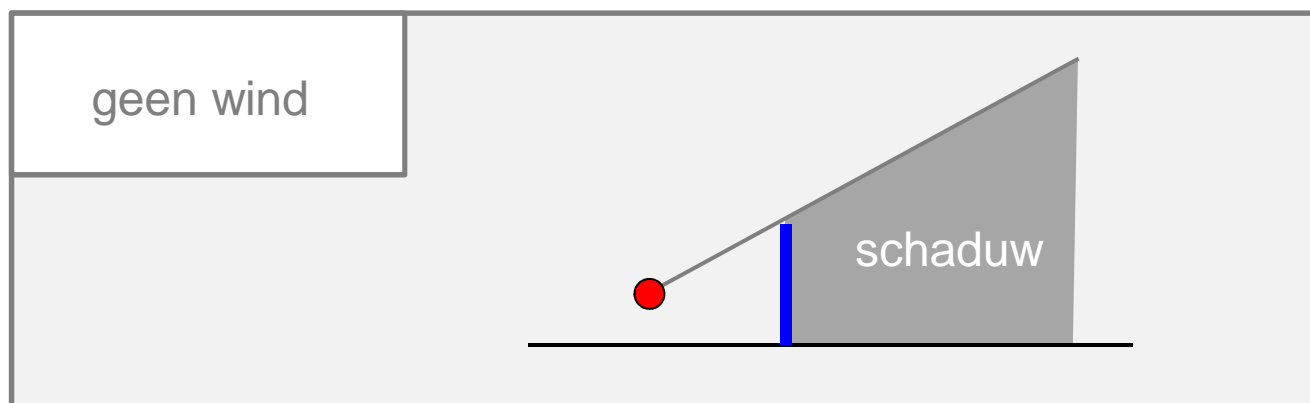
geluidreductie



INVLOED VAN WIND

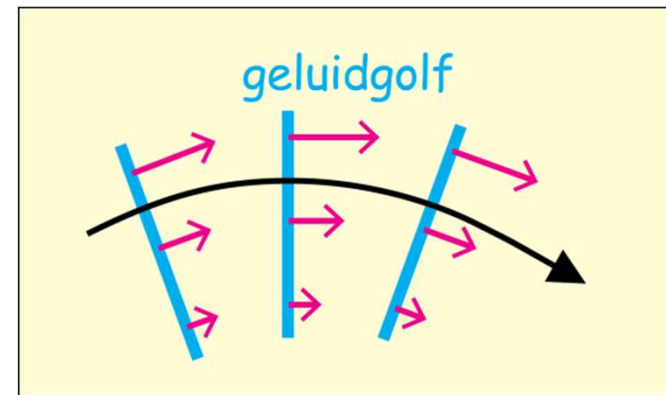
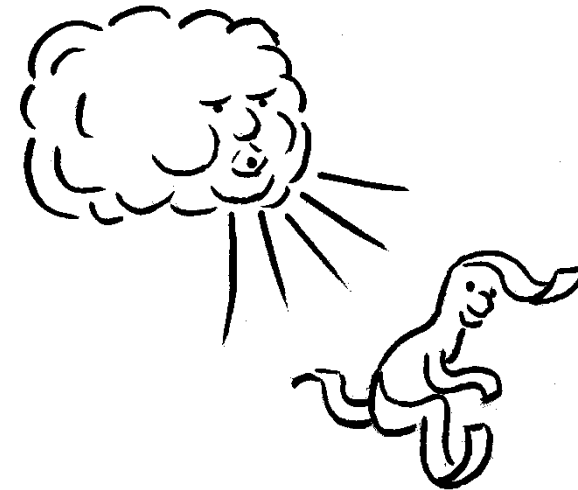
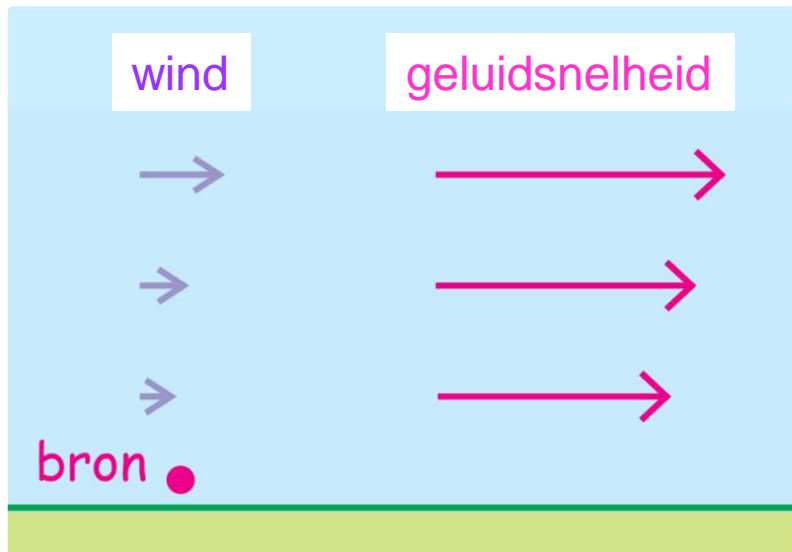


INVLOED VAN WIND



KROMMING VAN GELUIDSTRALEN

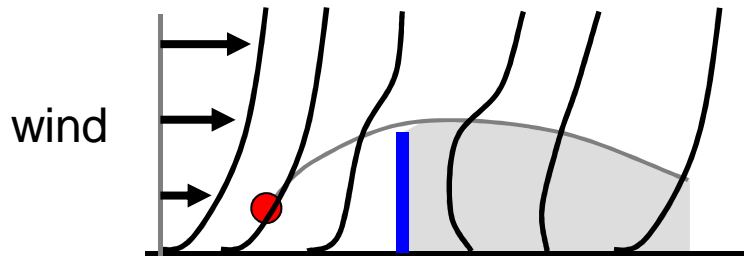
wind + 340 m/s = geluidsnelheid



website: geluid en wind

home.kpn.nl/msalomons/geluidindex.html

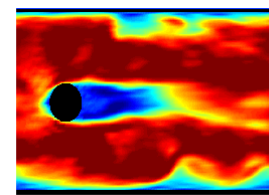
WINDPROFIEL



TNO onderzoek

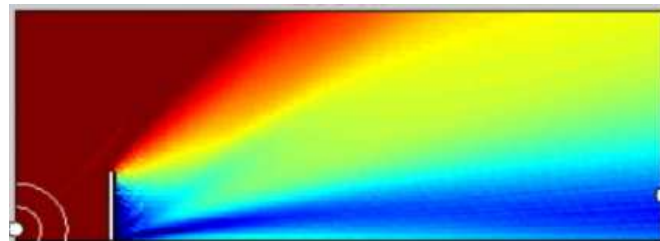
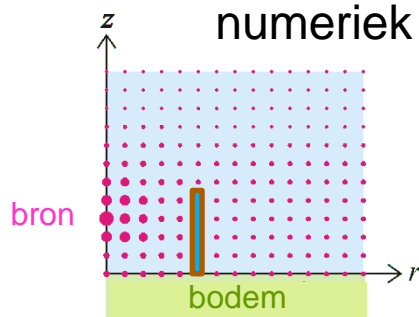


schaalmodel

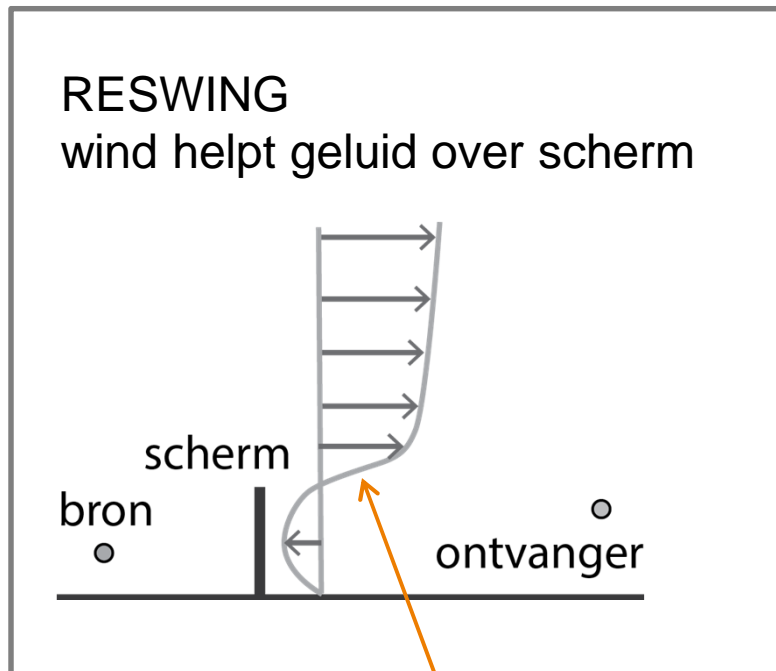


CFD modellen

numeriek rekenmodel: PE (parabolic equation)

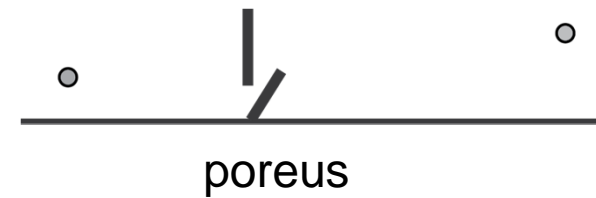


RESWING



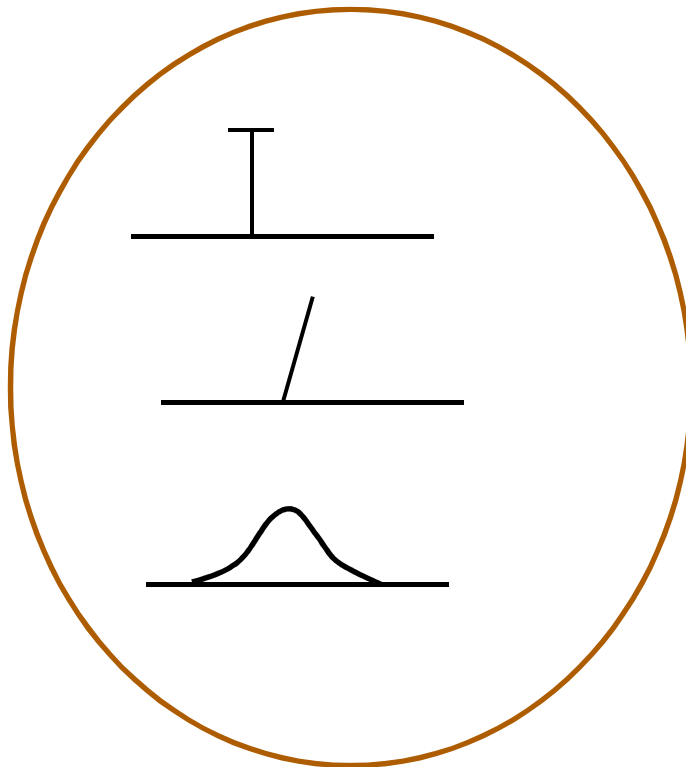
REFraction by
Screen-induced WINDspeed Gradients
JASA 105 (1999) 2287-2293

reductie RESWING?



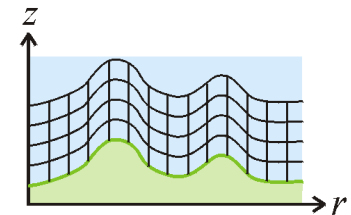
heuvel: 50% reductie

ANDERE SCHERMEN



PE
BEM
TOMAS
BEM-PE
TOMAS-PE
Euler (FDTD)
LBM
GTPE

Complexe rekenmodellen

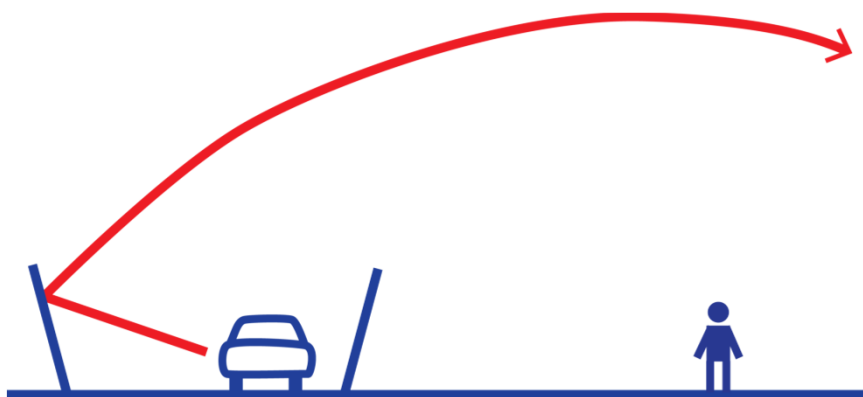


DUBBELE SCHERMEN

probleem:
reflectie via overkant

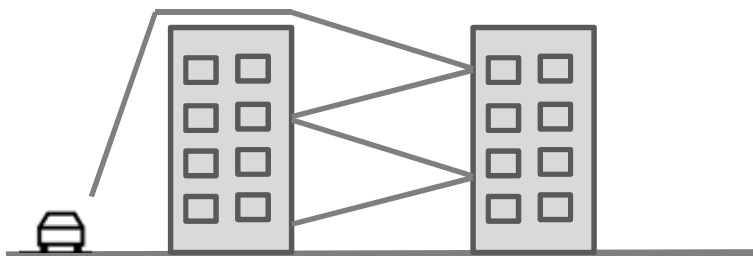


oplossing



SCHERMEN IN STAD

reflecties tussen gebouwen



TNO onderzoek



EU project QSIDE (2010-2013)

- afscherming door gebouwen
- minder hinder door stille achterkant

zie www.qside.eu

PRAKTISCHE REKENMODELLEN

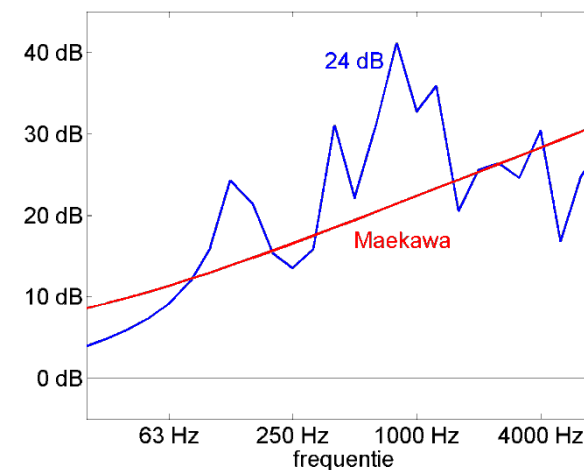
STANDAARD REKENMETHODE (SRM)

Schermwering

- basisformule **Maekawa**
- correctie voor wind

OK?
RESWING?

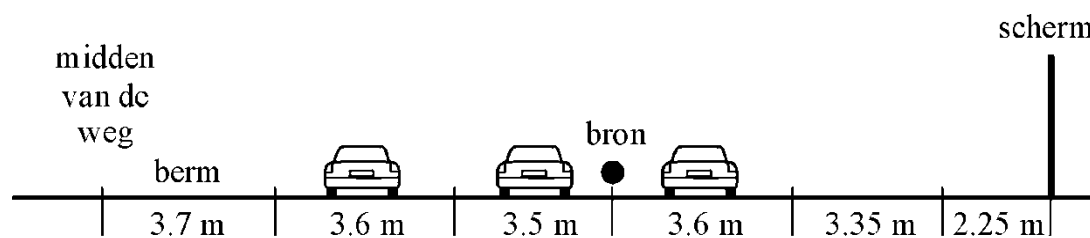
geluidreductie



NAUWKEURIGHEID SRM SCHERMWERKING?

Onderzoek voor VROM (2003)

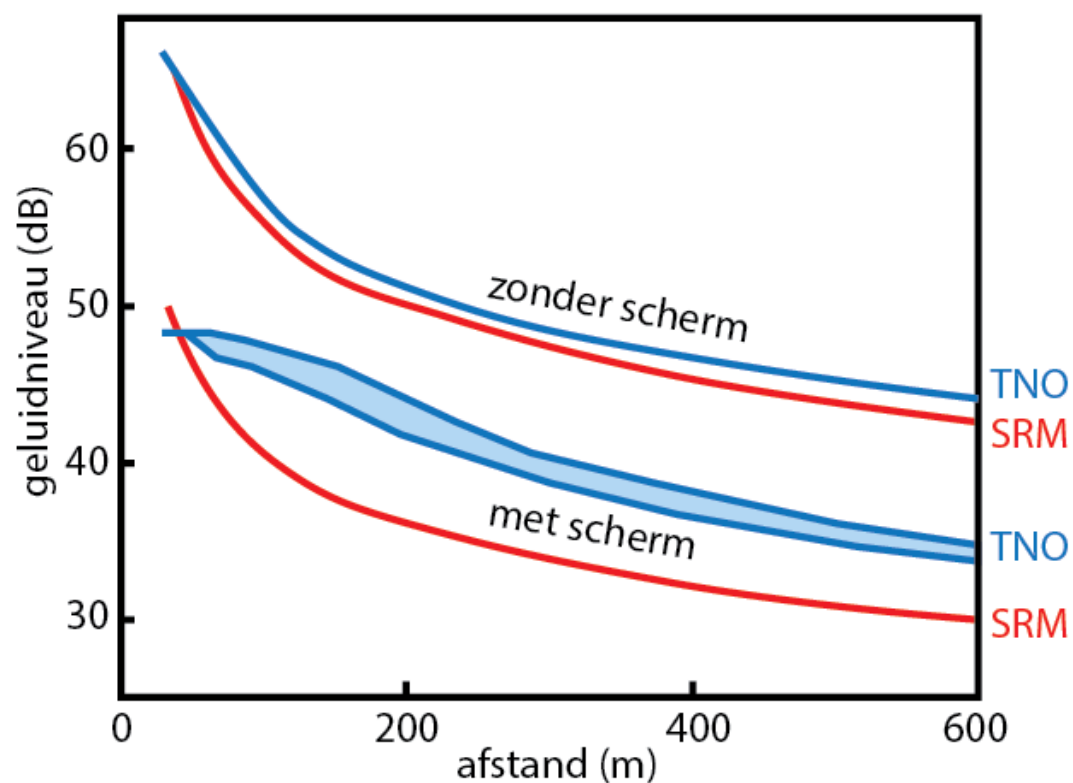
- langtijdig-gemiddeld geluidniveau
- statistiek meteo KNMI



SRM TE OPTIMISTISCH

6m scherm

waarnemers 200m x 10m



Gemiddelde* afwijking SRM

3m scherm: 2 dB

6m scherm: 5 dB

Snelweg in het zuidwesten

3m scherm: 3 dB

6m scherm: 7 dB

* Gemiddeld over waarneemgebied 200m x 10m.

De afwijking van SRM varieert binnen dit gebied:

- 3m scherm: -2 tot 8 dB (gemiddeld 2 dB)
- 6m scherm: -2 tot 12 dB (gemiddeld 5 dB)

EU MODELLEN: CNOSSOS, HARMONOISE

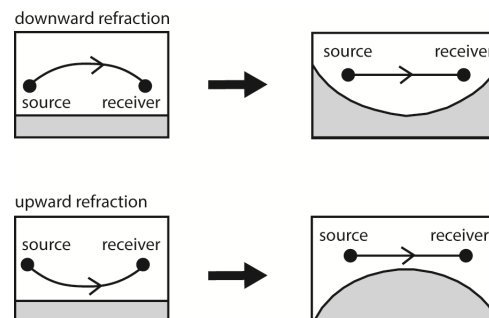
CNOSSOS

- vervangt SRM na 2018?
- afscherming zoals SRM
- twee meteotoestanden

Harmonoise

- complex
- Invloed wind: truc met de bodem

straalkromming → bodemkromming



complexer

nauwkeuriger?

AMERIKAANS SRM: TNM

invloed wind verwaarloosd

hoe groot zijn afwijkingen?

- metingen
- modelberekeningen

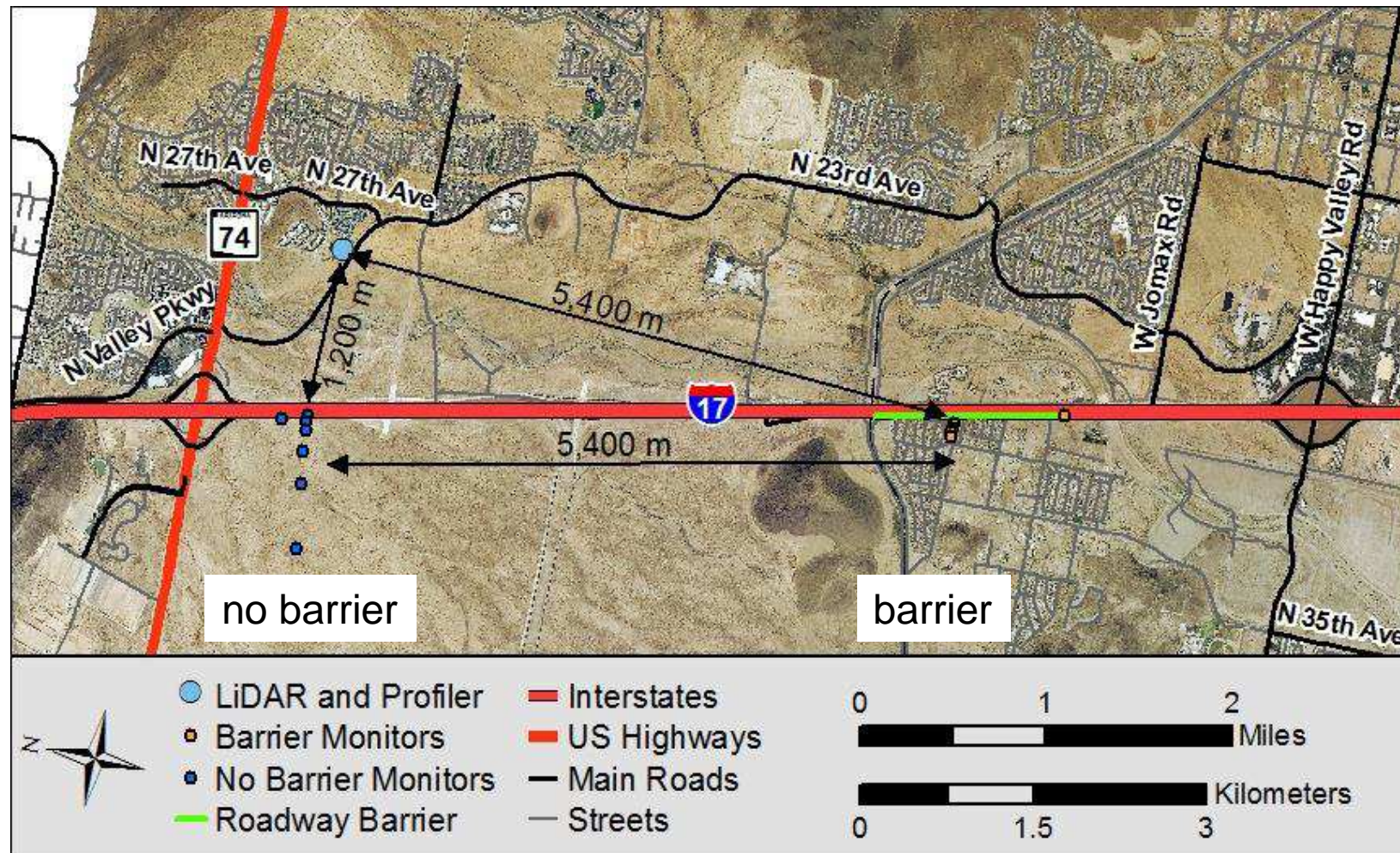
project NCHRP 25-52
(2015-2017)

ACTA ACUSTICA UNITED WITH ACUSTICA
Vol. 97 (2011) 62-74

The Harmonoise Sound Propagation Model

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Dirk van Maercke, CSTB Grenoble, France
Jérôme Defrance, CSTB Grenoble, France
Foort de Roo, TNO The Hague, Netherlands

NCHRP 25-52 PROJECT



CONCLUSIES

Invloed wind op afscherming

Modellen steeds complexer
niet nauwkeuriger

› **BEDANKT VOOR UW AANDACHT**

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