



band/wegdekgeluid: mechanismen en modelvorming

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Inhoud

- Opwekking van band/wegdekgeluid
- Mechanische processen
- Aerodynamische processen
- Afstraling
- Overdracht
- Invloedsfactoren wegdek
- Modelvorming

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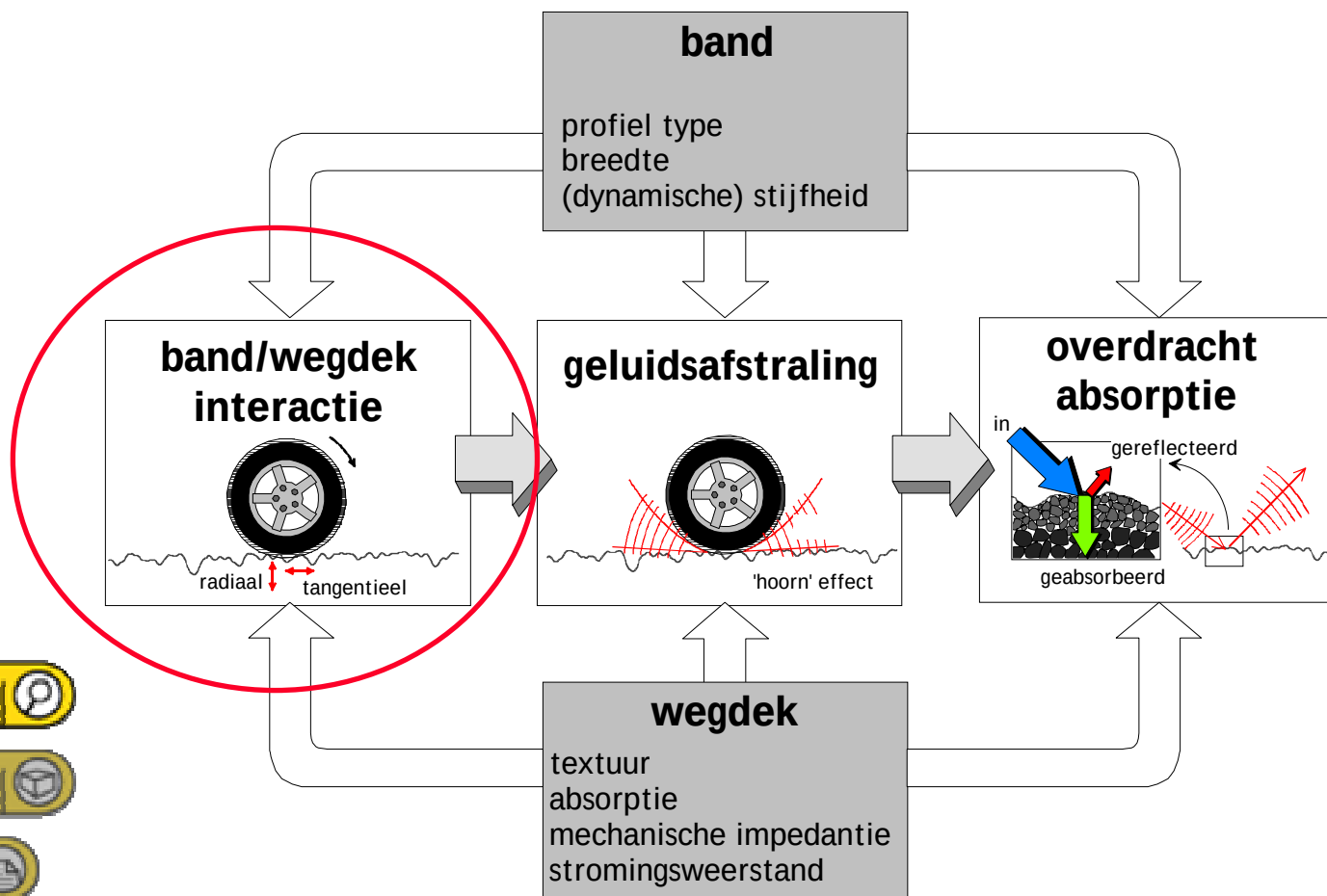
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Opwekking band/wegdekgeluid



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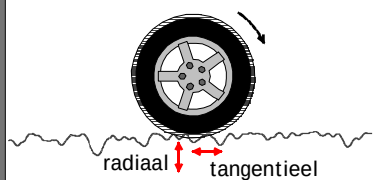
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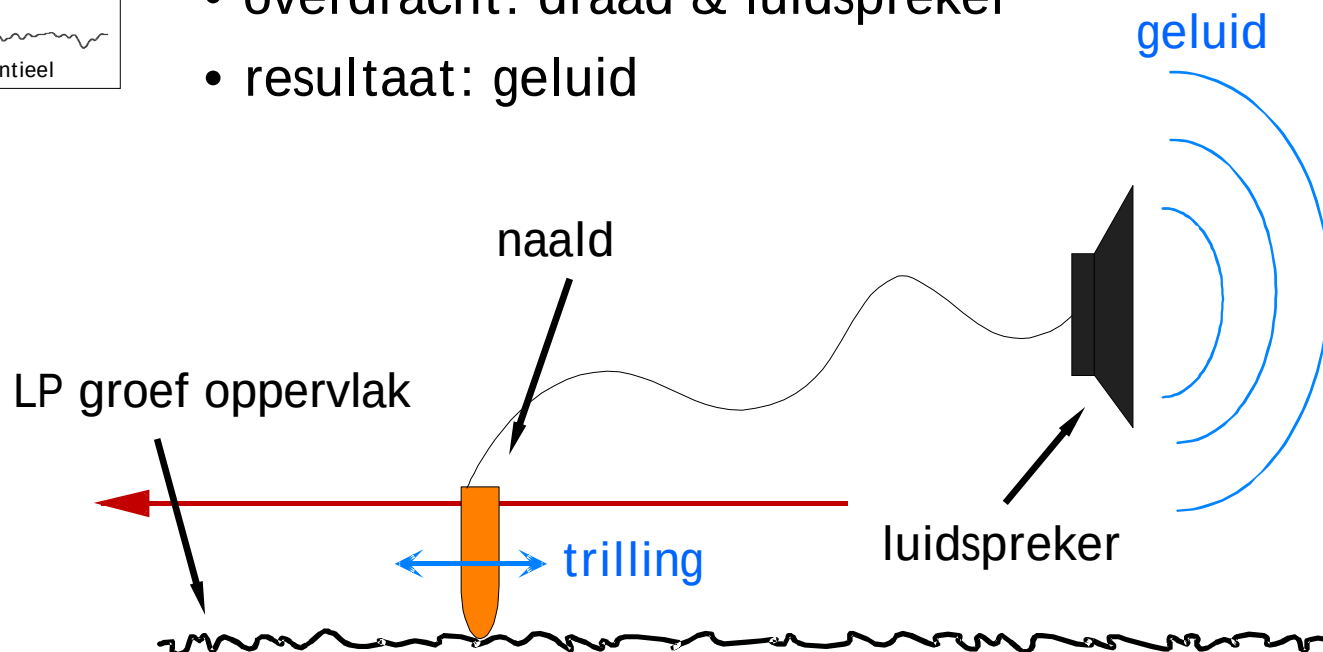


Mechanische processen (I)

band/wegdek interactie



- Analogie: LP wordt afgetast door naald
- bron: trilling (v/d naald)
- overdracht: draad & luidspreker
- resultaat: geluid



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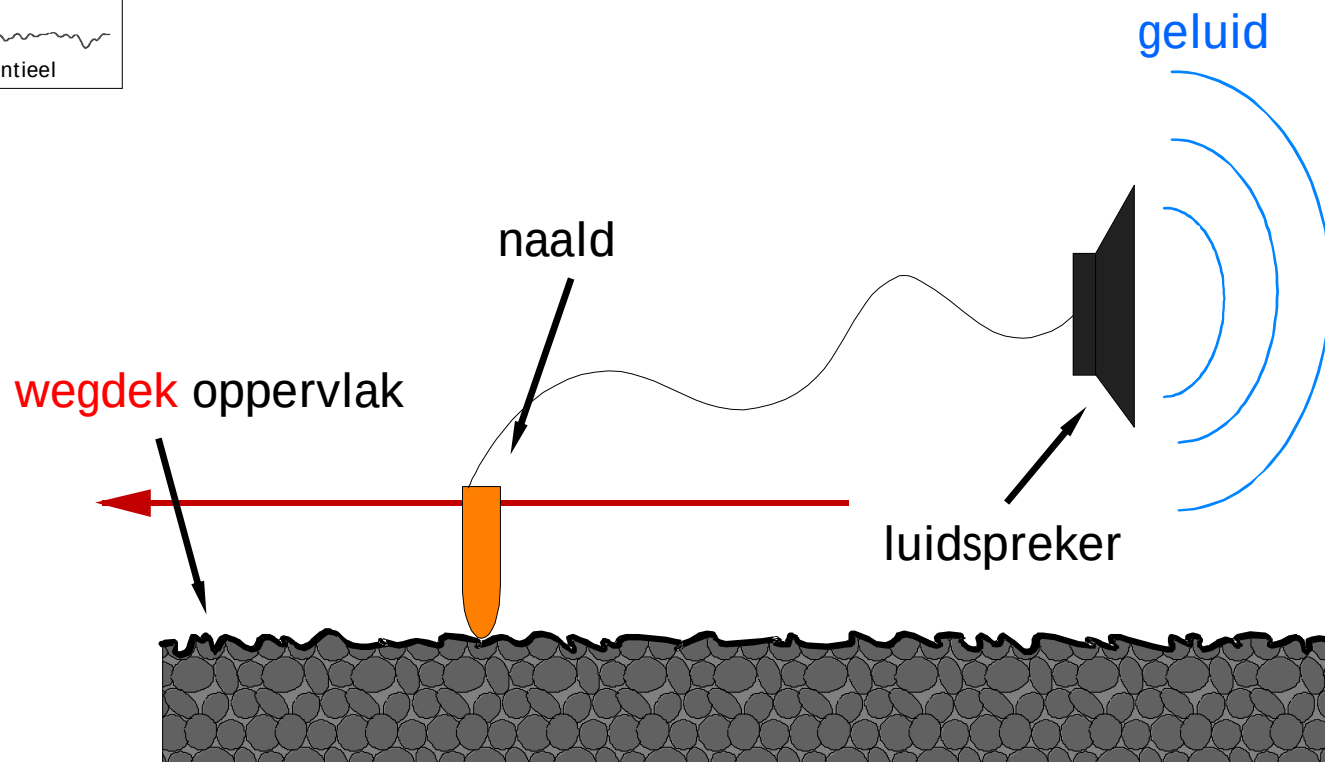
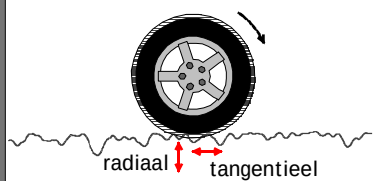
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Mechanische processen (II)

band/wegdek
interactie



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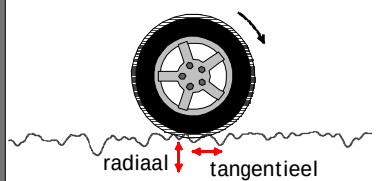
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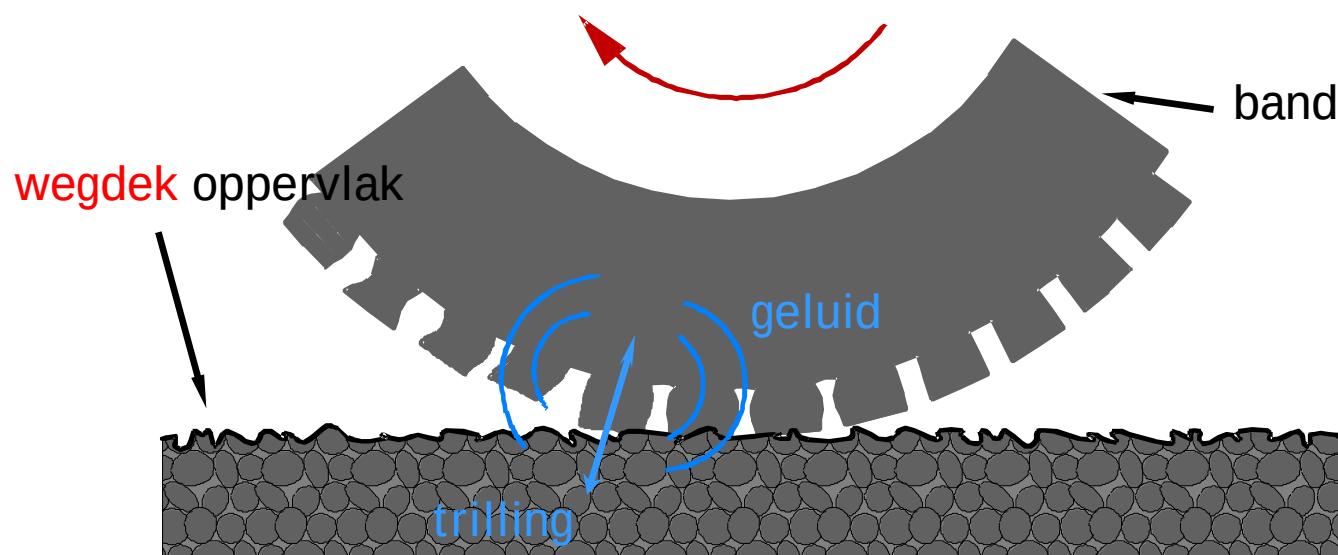


Mechanische processen (II)

band/wegdek interactie



- wegdek oppervlak afgetast door band
- bron: trillingen in het bandprofiel
- overdracht & resultaat: band straalt geluid af



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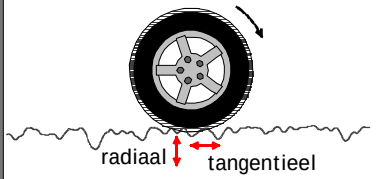
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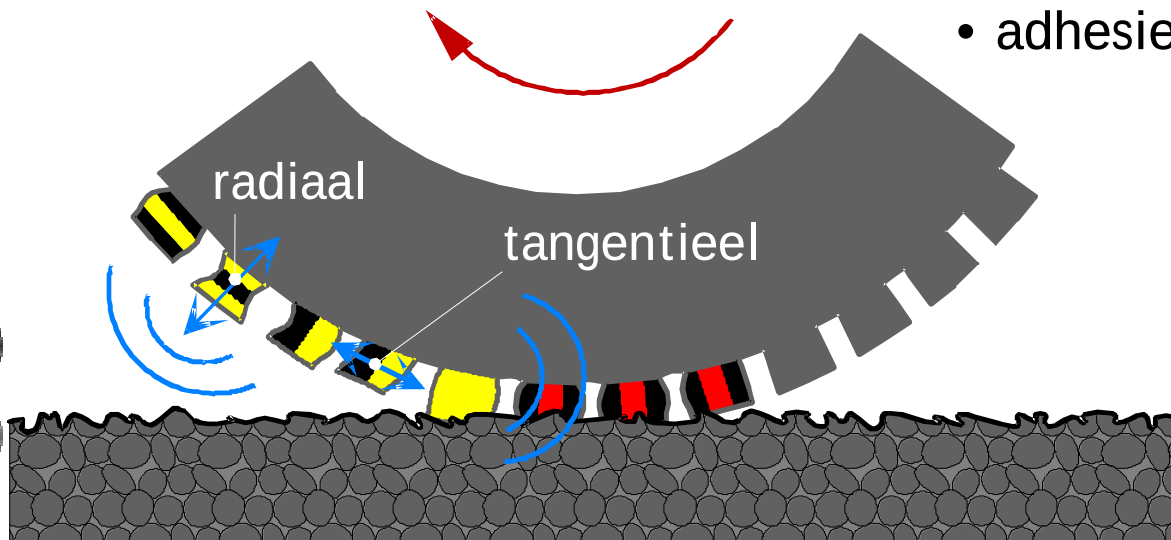


Mechanische processen (III)

band/wegdek interactie



- radiale trillingen
- tangentiële trillingen
- trillingen wang
- “stick-slip”
- adhesie (“stick-snap”)



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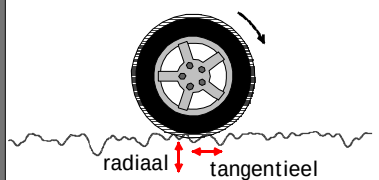
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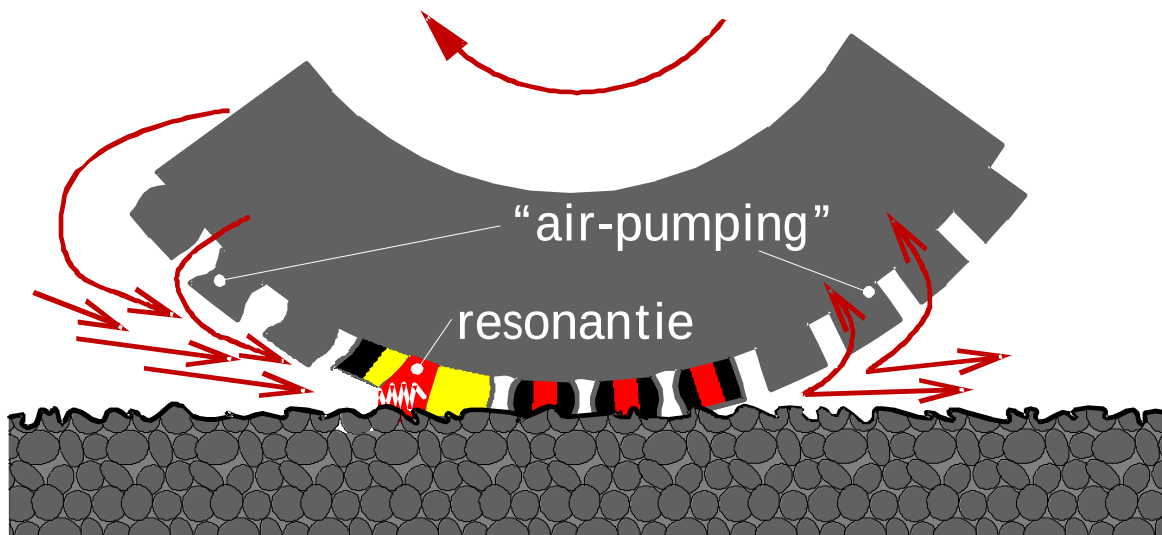


Aerodynamische processen

band/wegdek
interactie



- “air-pumping”
- Helmholtz resonantie
- kanaal resonantie



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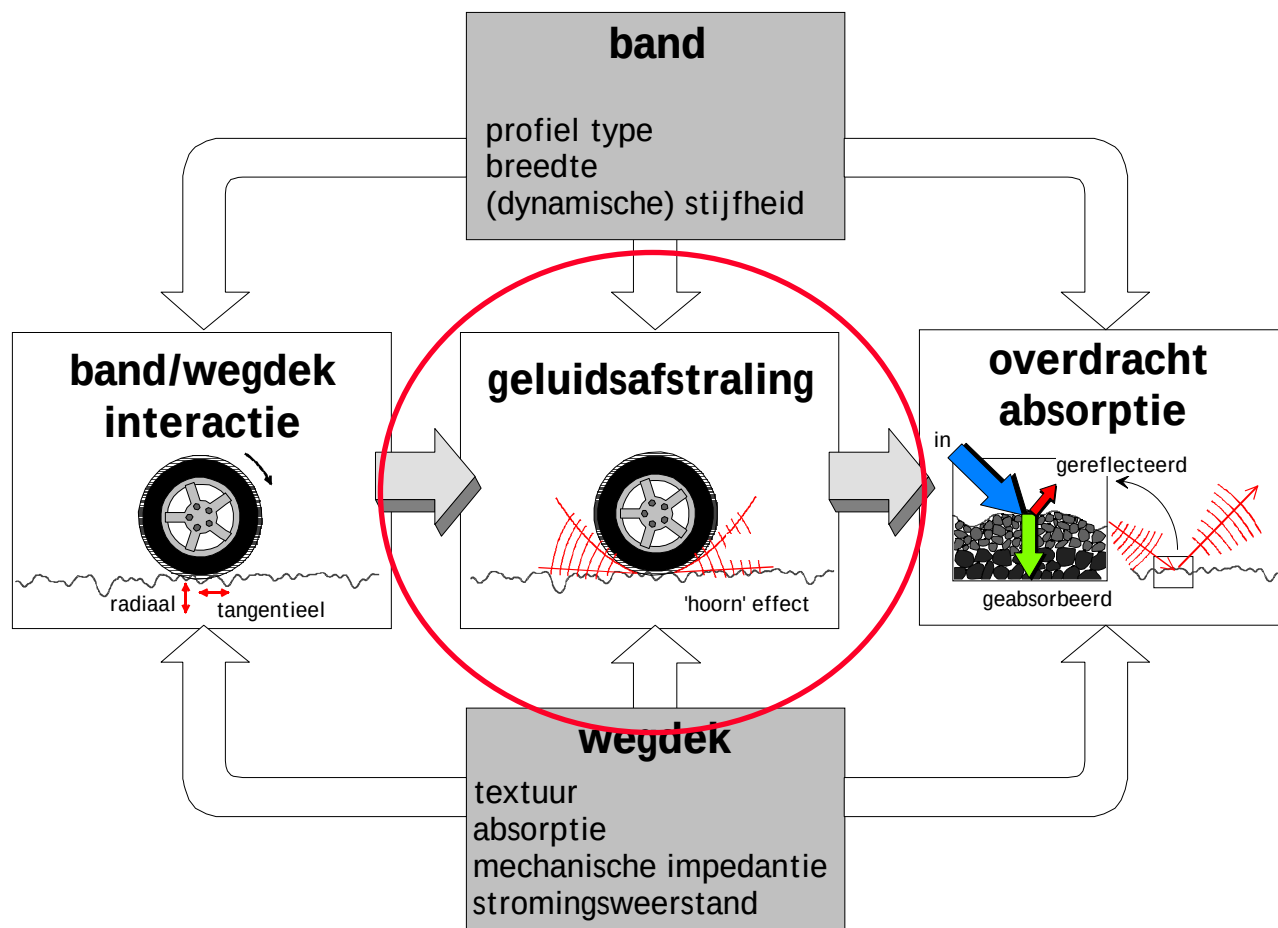
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Opwekking band/wegdekgeluid



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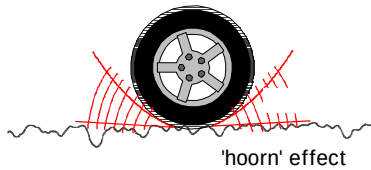
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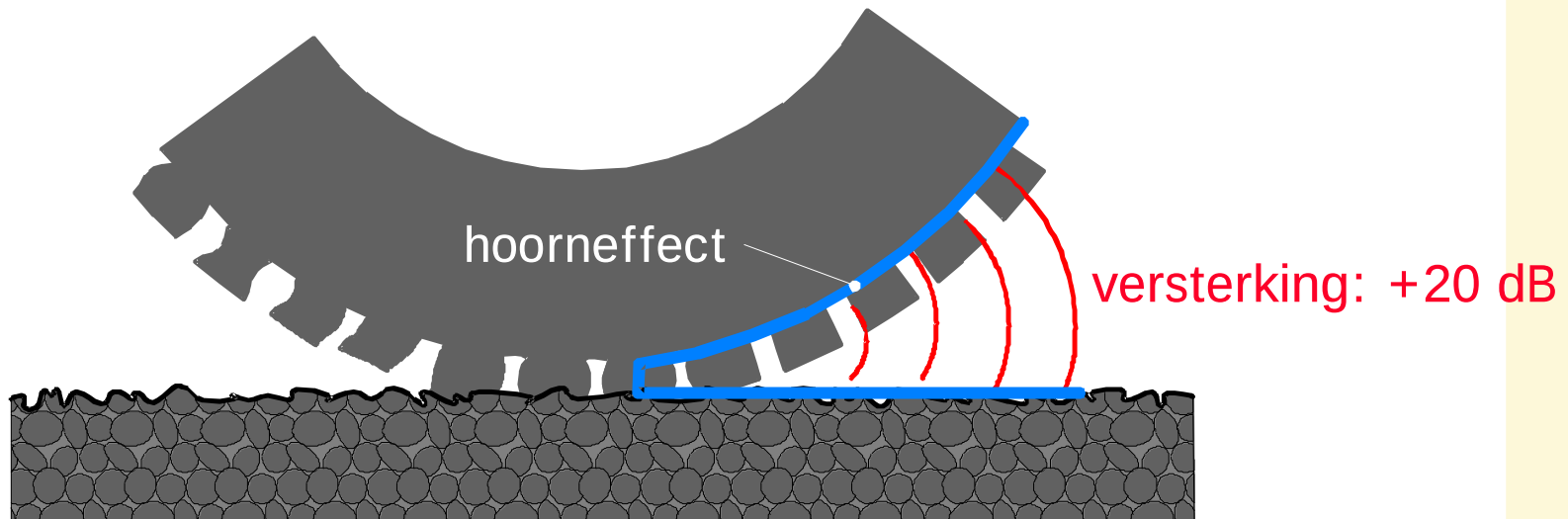


Geluidsafstraling

geluidsafstraling



- Bandtrillingen veroorzaken afstraling geluid
- Afstraling wordt beïnvloed door:
 - Geometrie van band en voertuig
 - Akoestische impedantie ("absorptie") van het wegdek
- Hoorneffect



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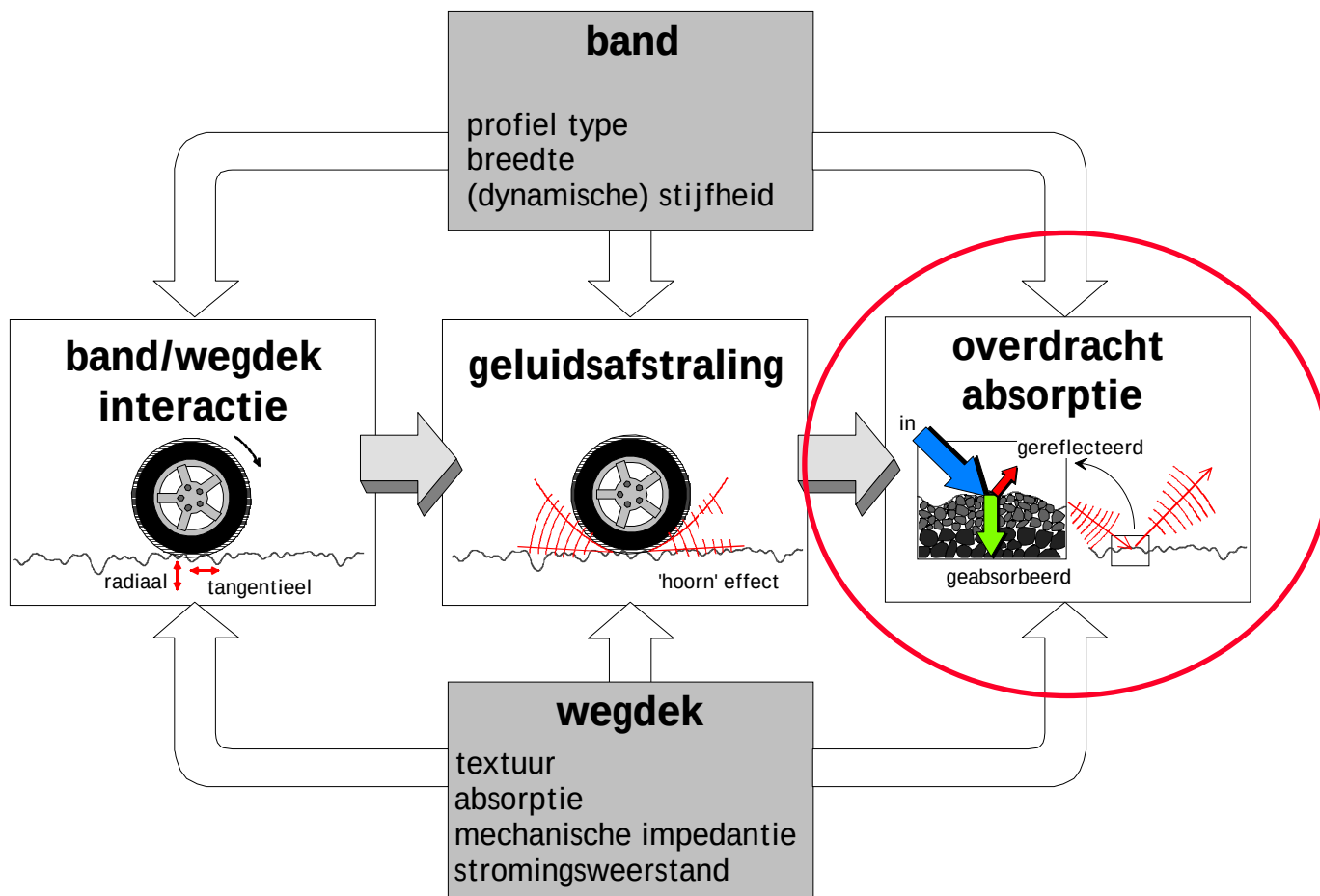
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Opwekking band/wegdekgeluid



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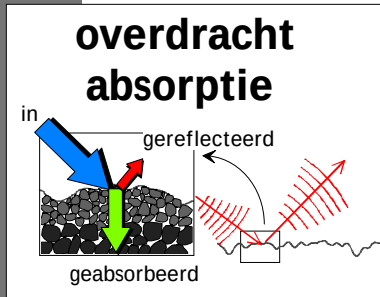
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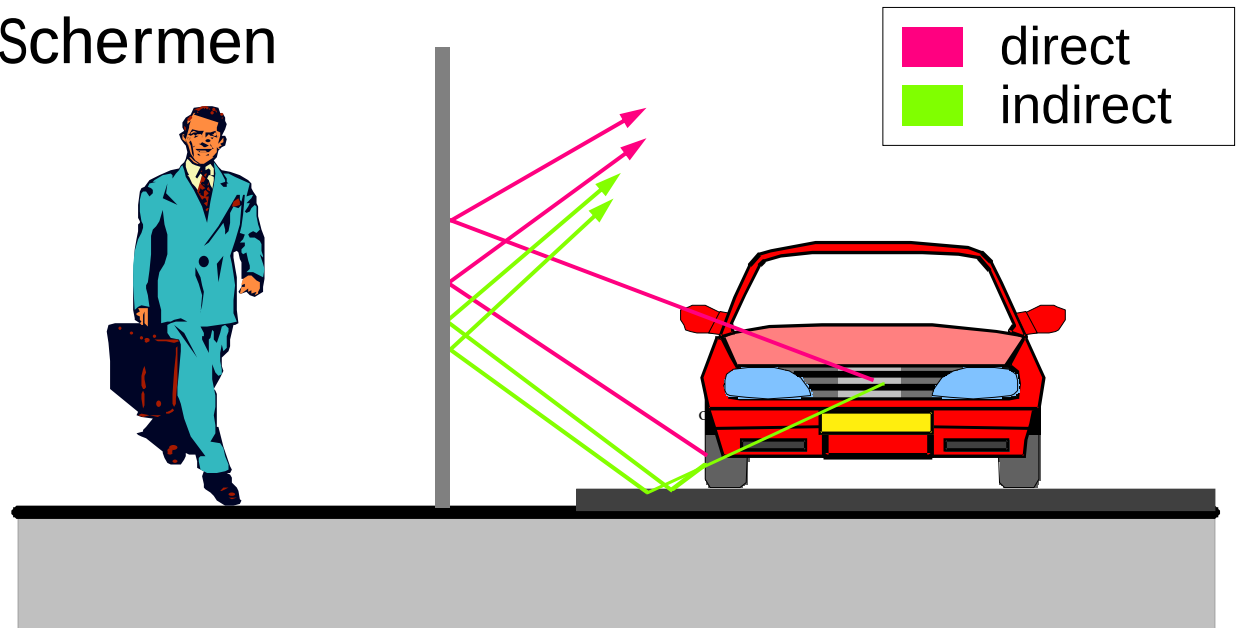
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Overdracht & absorptie



- Absorptie van het wegdek
 - Laagdikte
 - Porositeit
 - Stromingsweerstand
- Schermen



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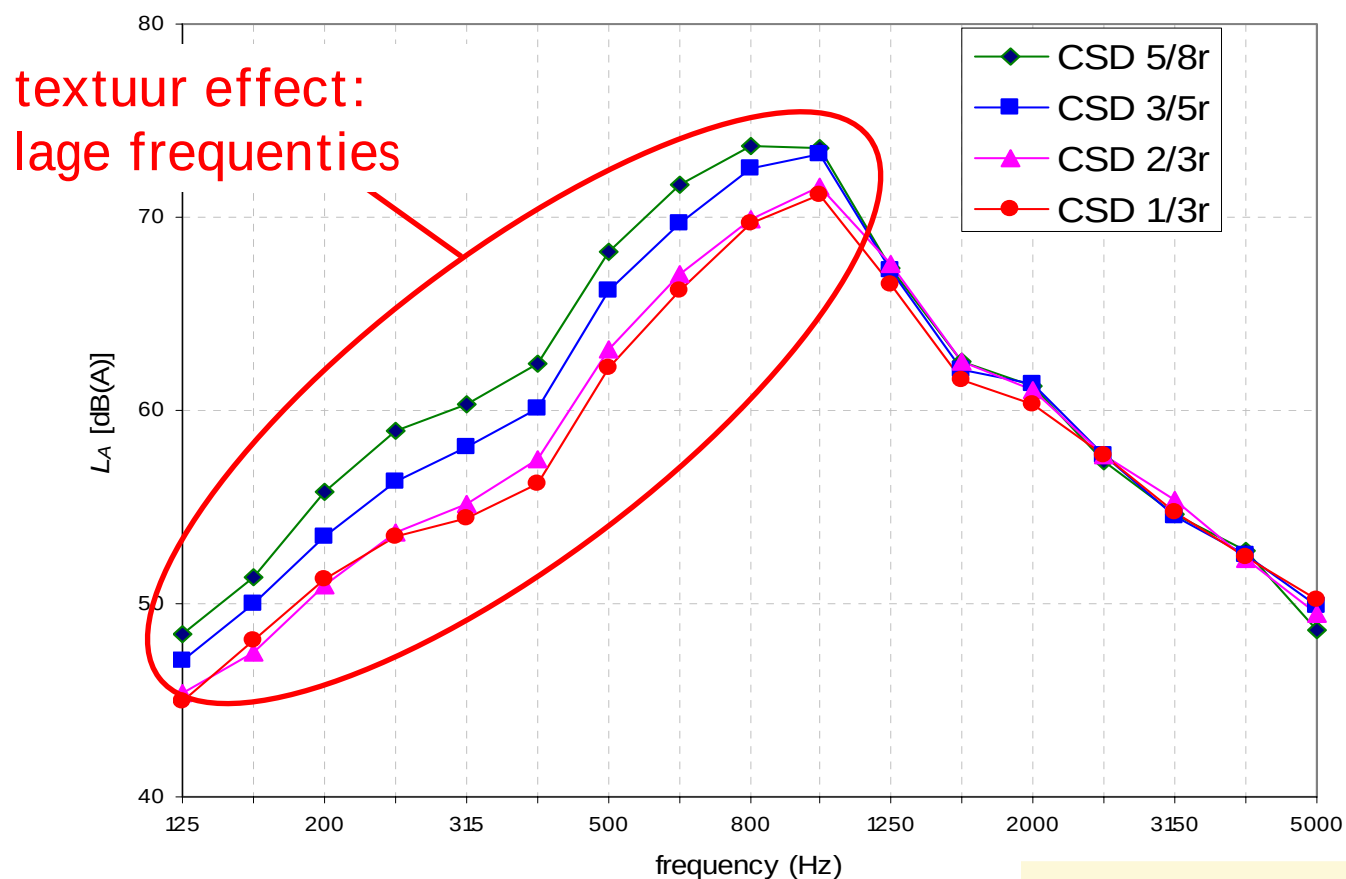
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Invloedsfactoren: textuur

Betonwegdekken met verschillende steengradering



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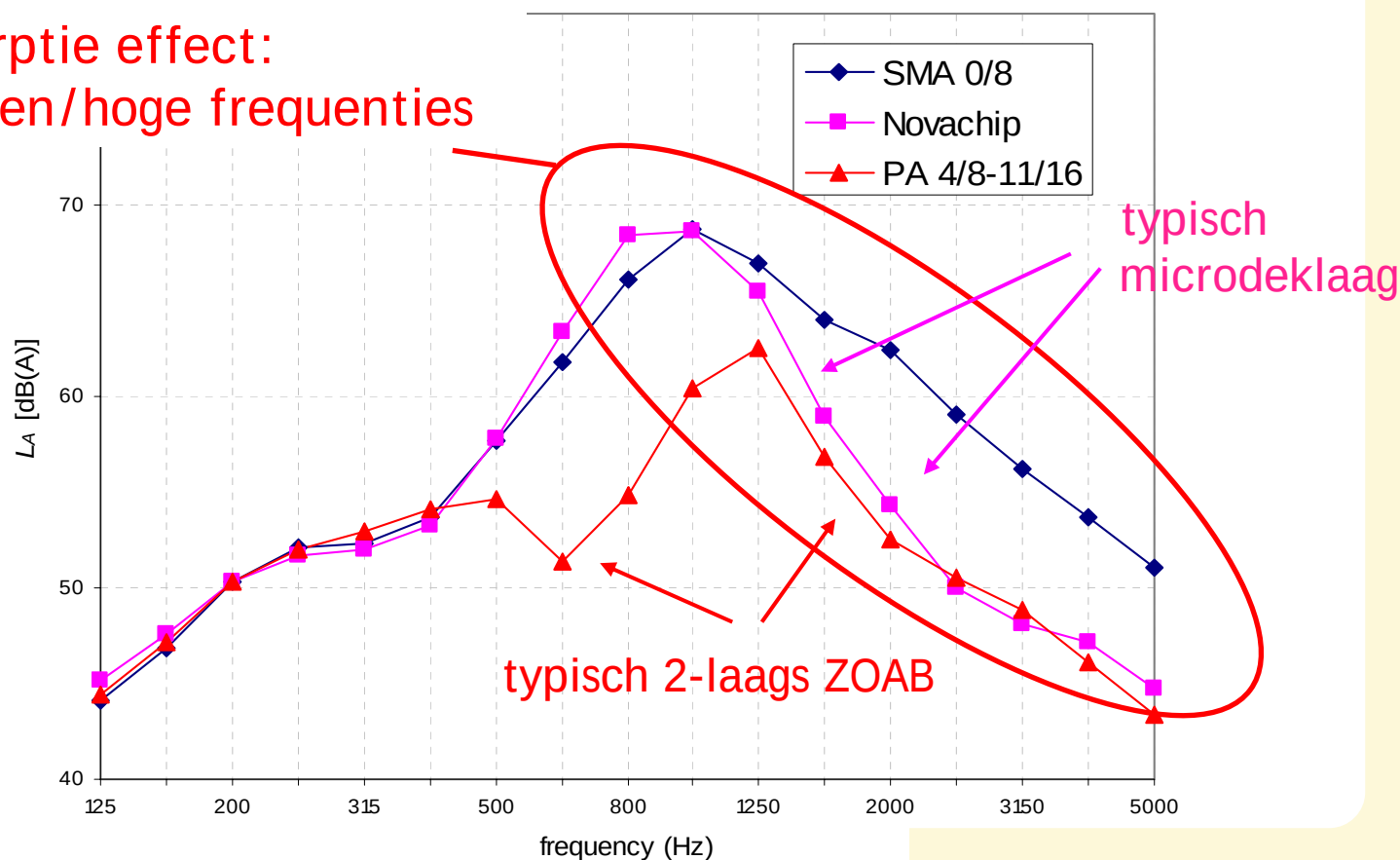
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Invloedsfactoren: absorptie

Asfaltwegdekken met porositeit/absorptie

absorptie effect:
midden/hoge frequenties



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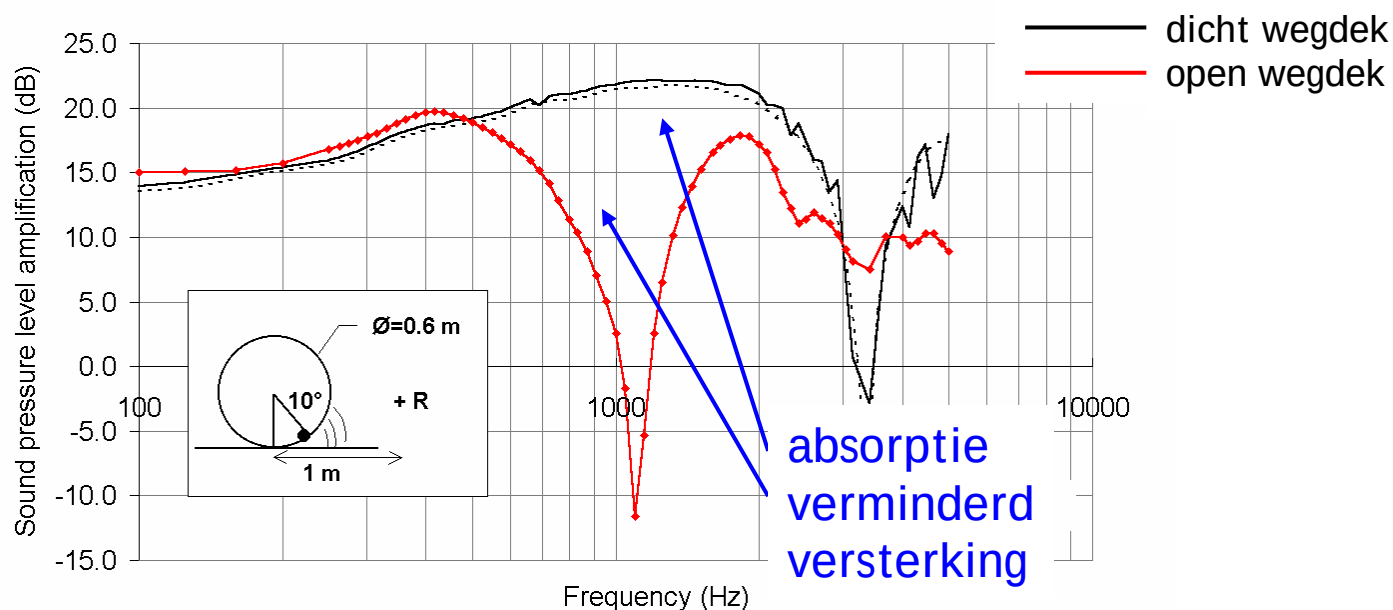
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Invloedsfactoren: absorptie & hoorneffect

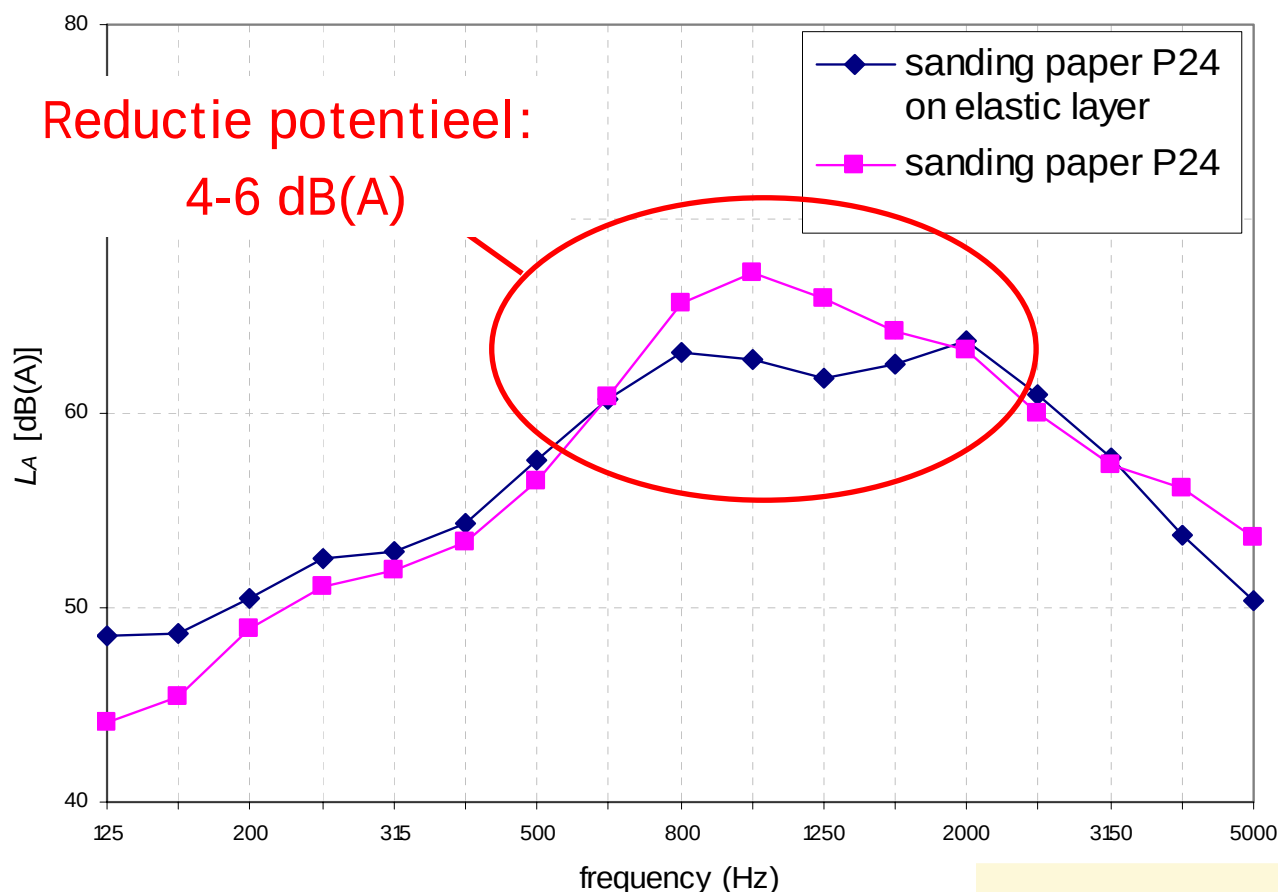
Absorptie wegdek zichtbaar in hoorneffect





Invloedsfactoren: mechanische impedantie

Weg met fijne textuur, met/zonder elastische laag



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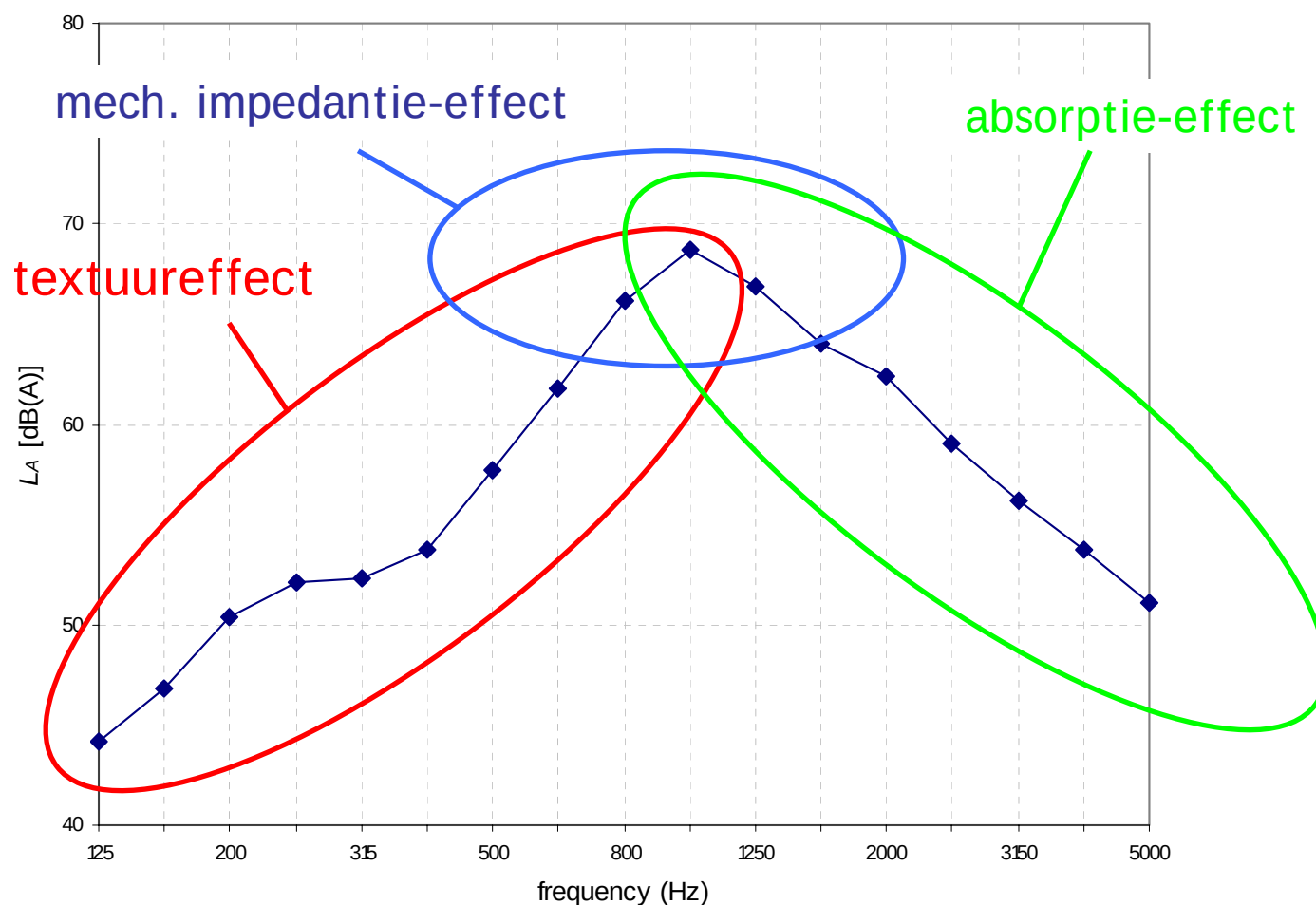
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Invloedsfactoren: samenvatting



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Modelvorming

Doelstellingen van modelvorming

- Begrijpen van fysische processen
- Ontwerp van stille banden
- Ontwerp van stille wegdekken

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Stand van zaken modelvorming

Begrijpen van fysische processen

- We begrijpen de deelprocessen
- Modellen geven alleen kwalitatief antwoord

Ontwerp van stille banden

➔ Presentatie Jan Leyssens

Ontwerp van stille wegdekken

- Modellen voor textuurinvloed
- Modellen voor akoestische absorptie
- Modellen voor lokale trillingen in profiel (“air-pumping”)

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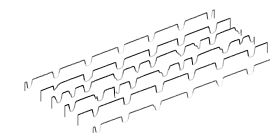
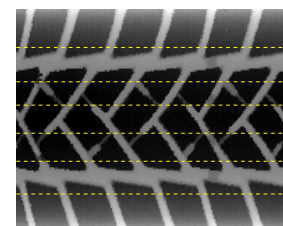
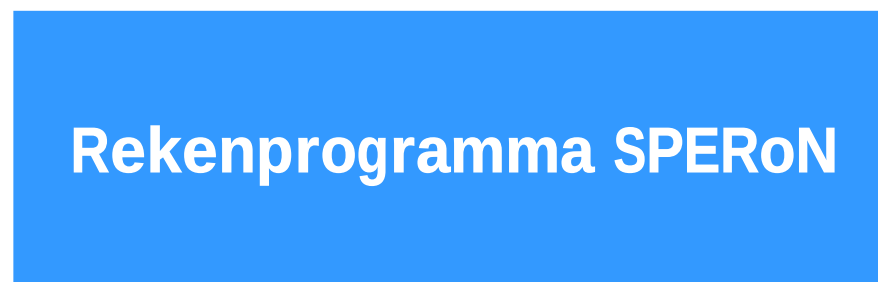
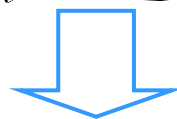
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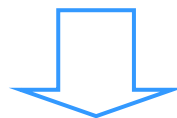


Modelvorming: ontwerp van stille textuur

textuureffect: SPERoN model



bandprofiel



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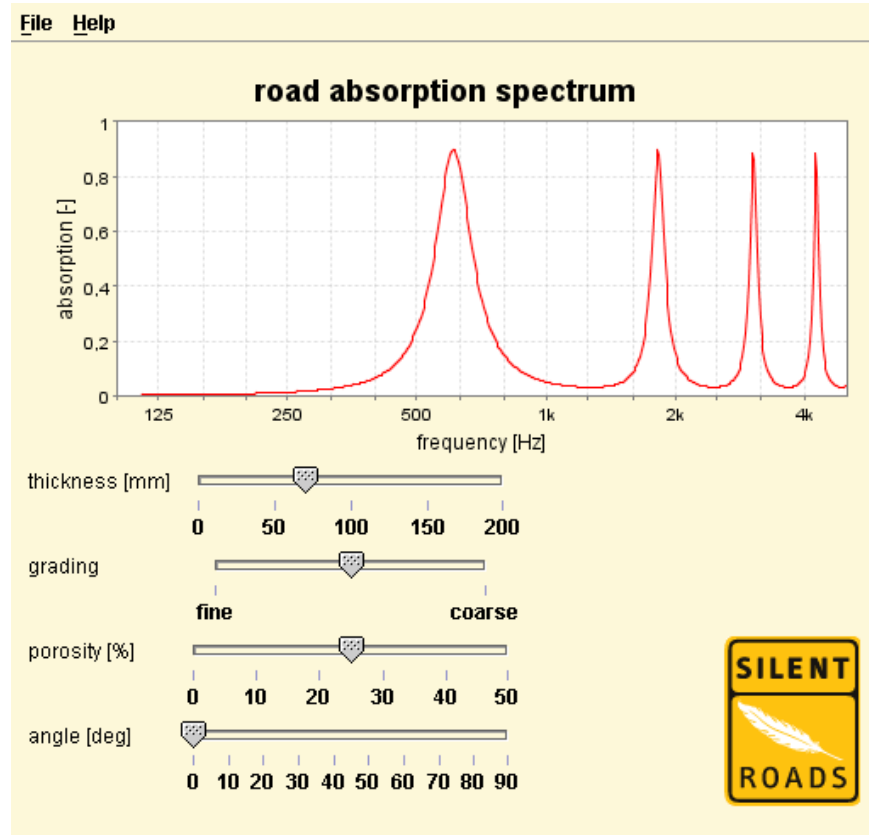
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Modelvorming: ontwerp goede absorptie

absorptie-effect: demonstratie



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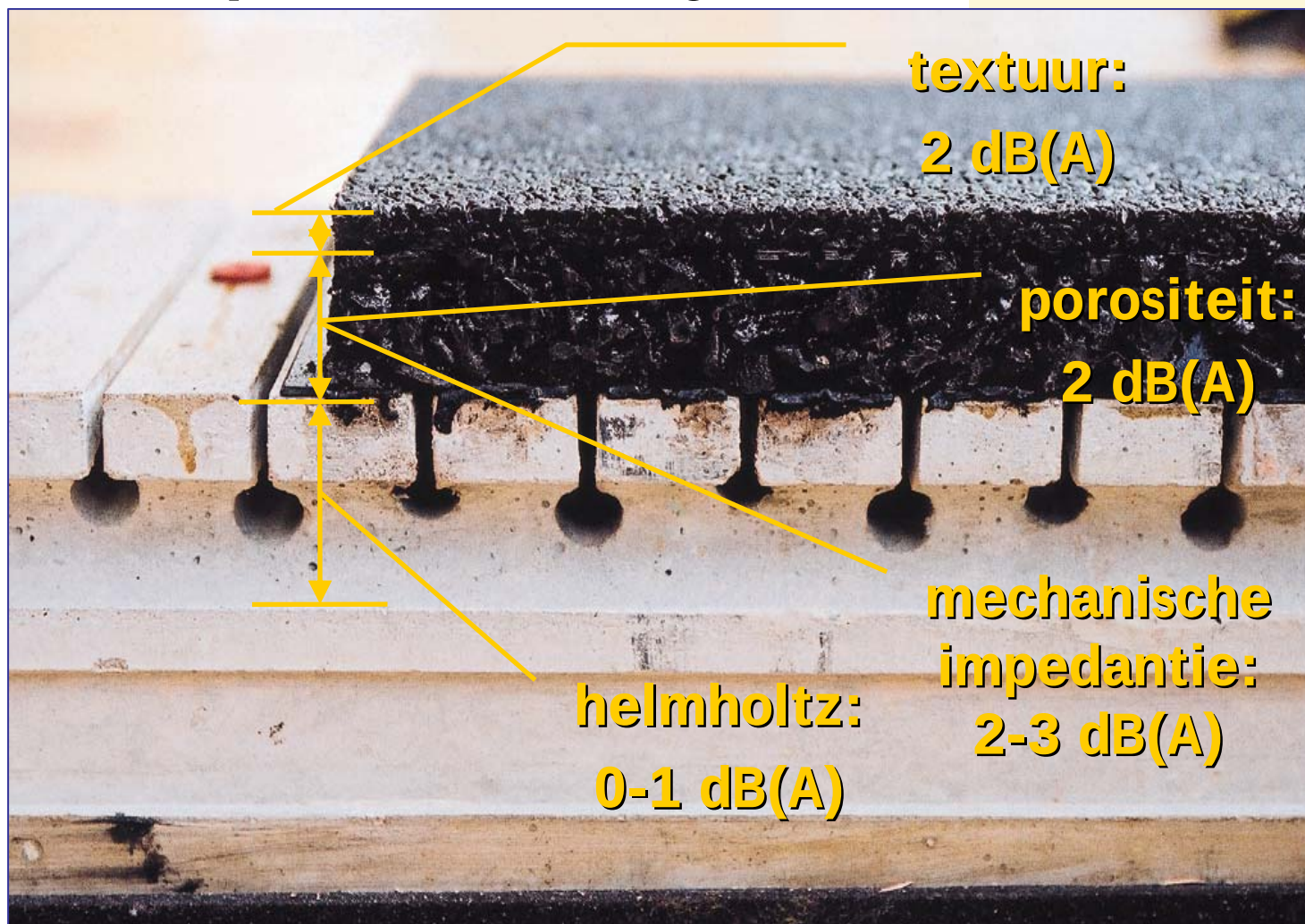
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Modelvorming: ontwerp van stille wegdekken



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Samenvatting

- Mechanismen:
mechanisch en “aerodynamisch”
- Invloedsfactoren wegdekken:
textuur, absorptie en mechanische impedantie
- Modellen: textuur- en absorptieinvloed
- Invloedsfactoren banden:
➔ Jan Leyssens (Goodyear Research)

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