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Vibro-acoustic simulation of a car window

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ACOUSTICS 2012

Vibro-acoustic simulation of a car window

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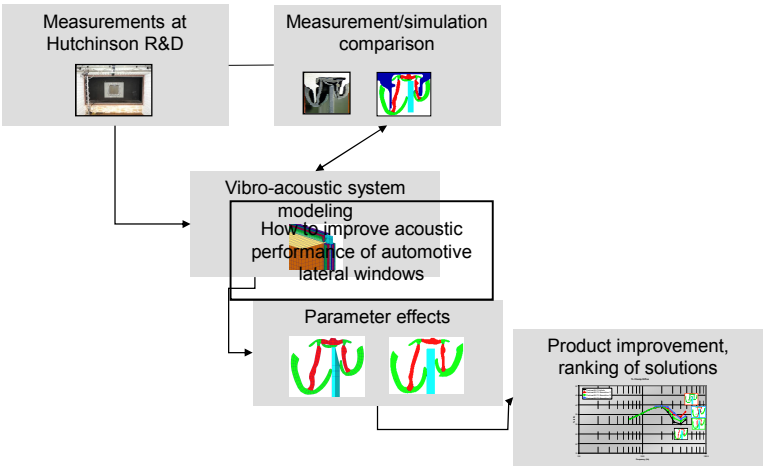
CONTENT

- Introduction
- Acoustic transparency phenomenon
- 3D finite elements model
 - Acoustic excitation
 - Power evaluation
- Parameter study
- Conclusions






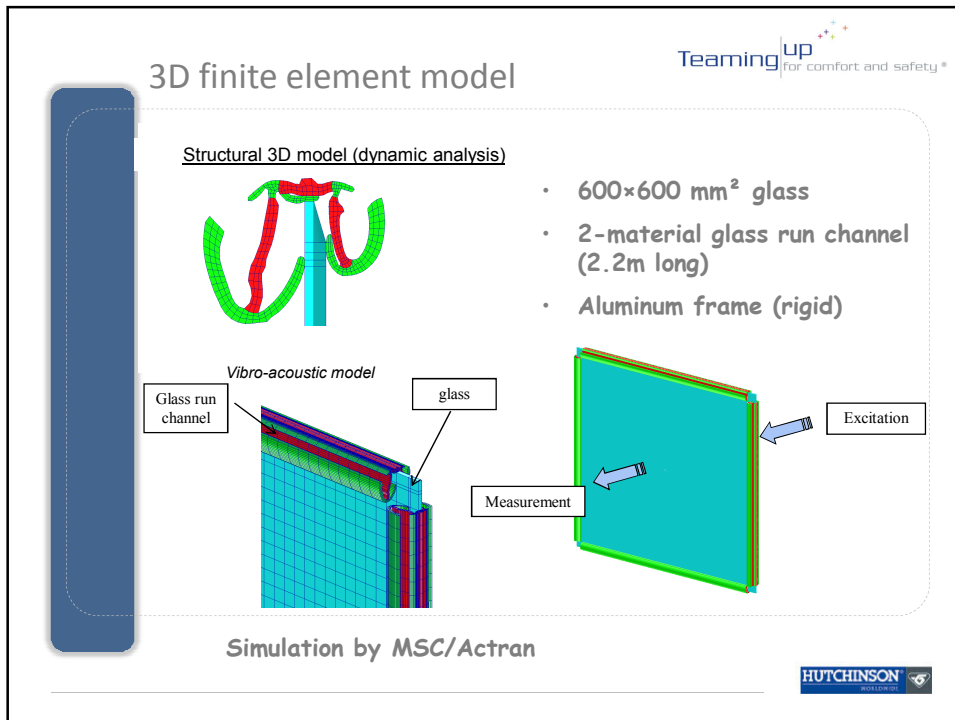
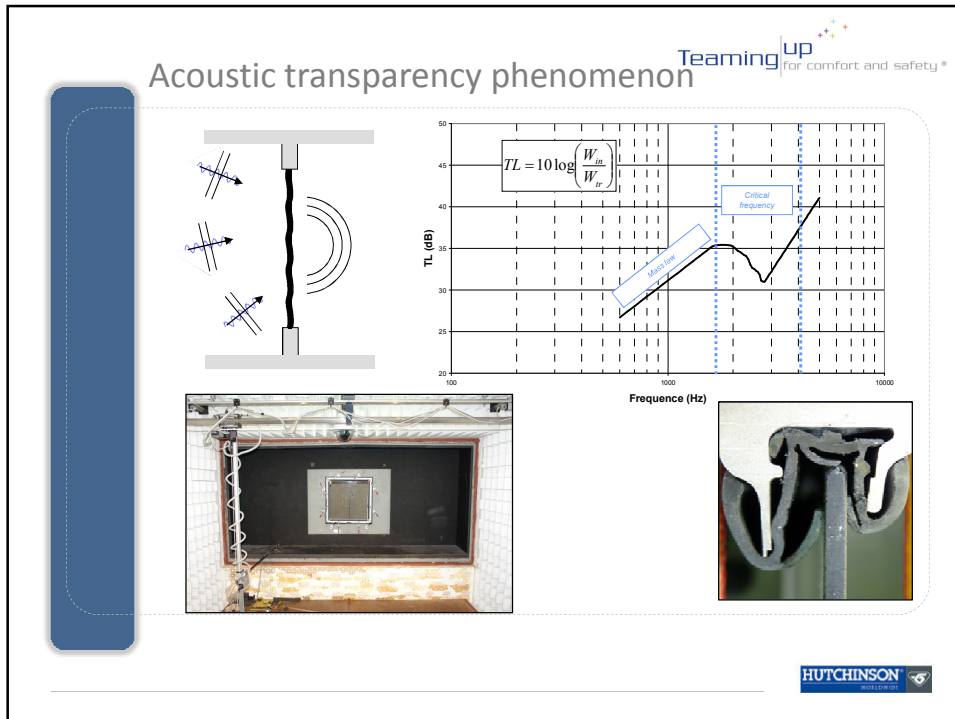
Introduction




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graph TD
    A[Measurements at Hutchinson R&D] --> B[Measurement/simulation comparison]
    A --> C[Vibro-acoustic system modeling  
How to improve acoustic performance of automotive lateral windows]
    C --> B
    C --> D[Parameter effects]
    D --> E[Product improvement, ranking of solutions]
    
```





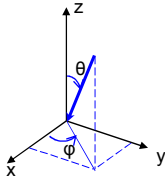


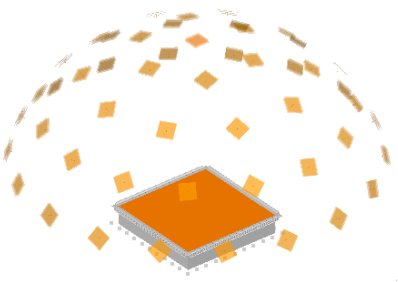
Acoustic excitation


Diffused field :
 - same probability for every directions of plane waves


incidence (θ)	number of azimuthal waves (ϕ)	weighting of wave
0	1	0.2704
17.5	6	0.3095
35	10	0.3311
52.5	15	0.3180
70	18	0.3159

Total waves	50
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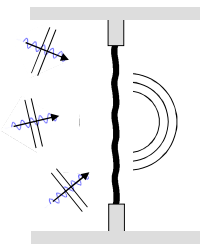




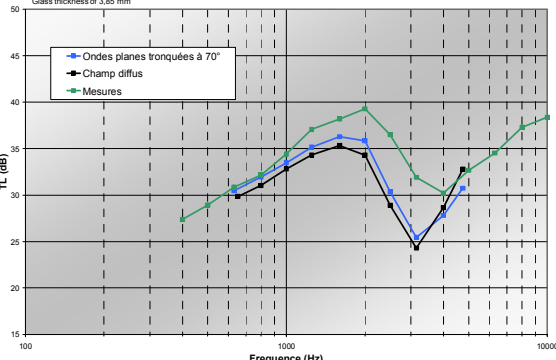
Acoustic excitation

Diffused field :
 - same probability for every directions of place waves


Real life measurement :
 - truncation of some waves (wall proximity)

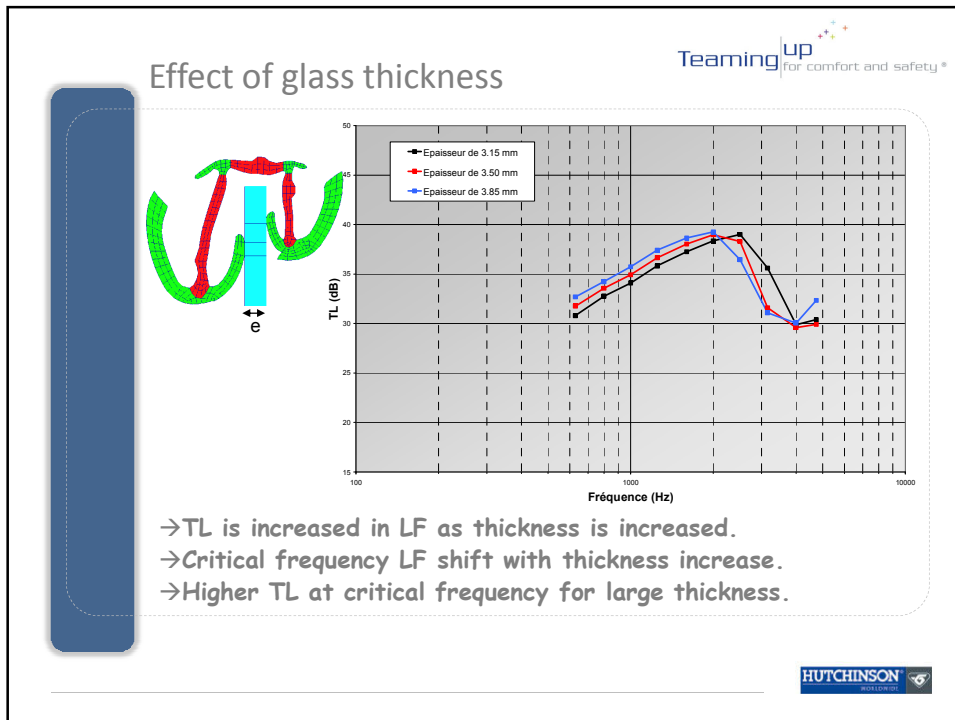
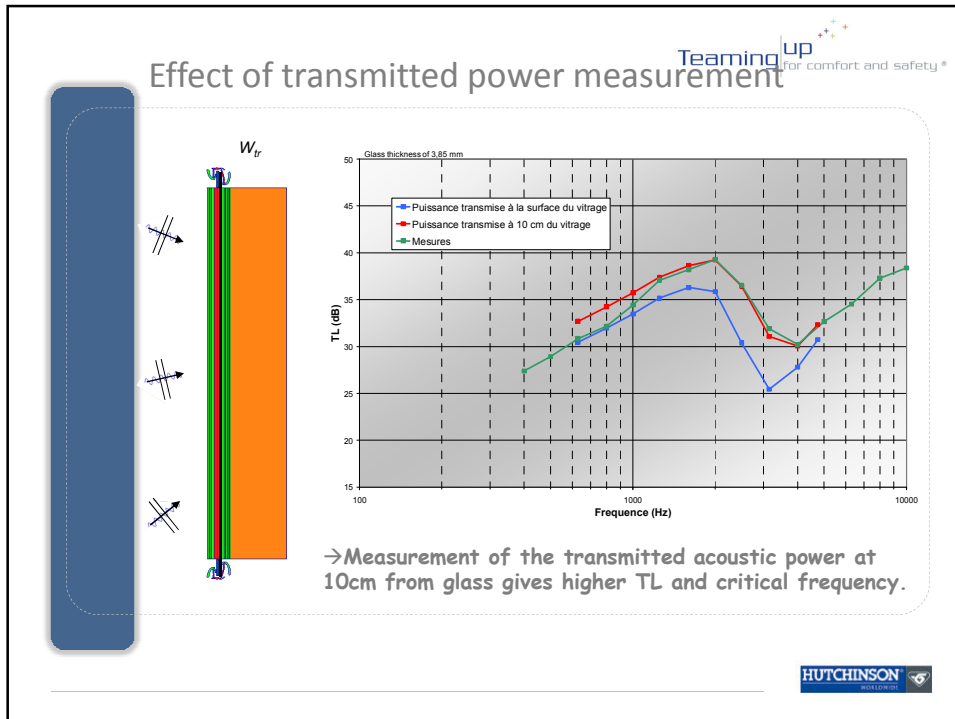


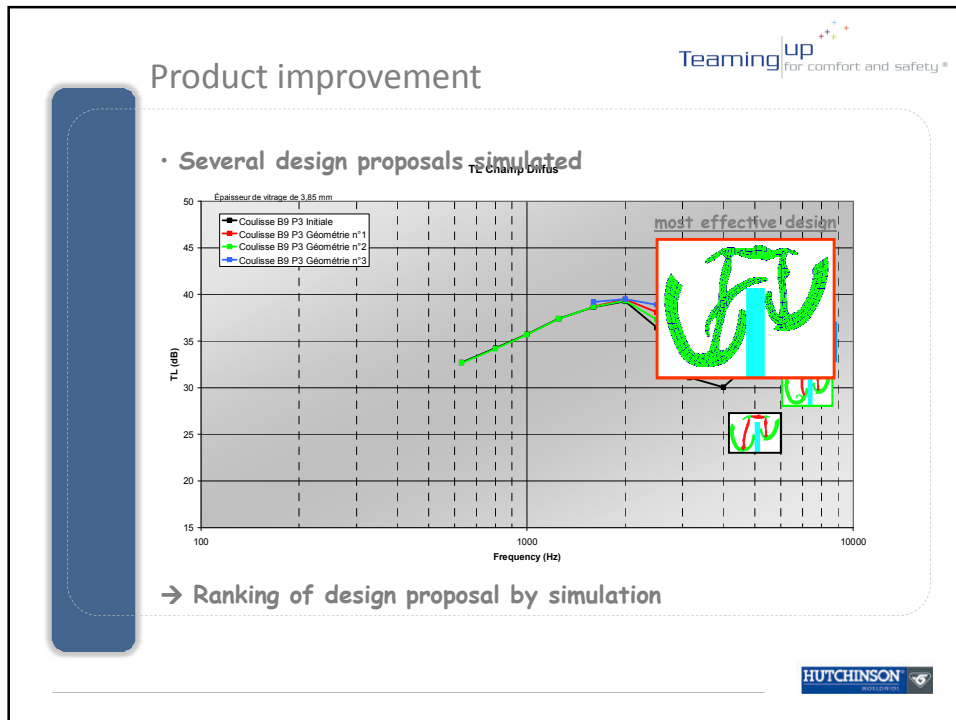
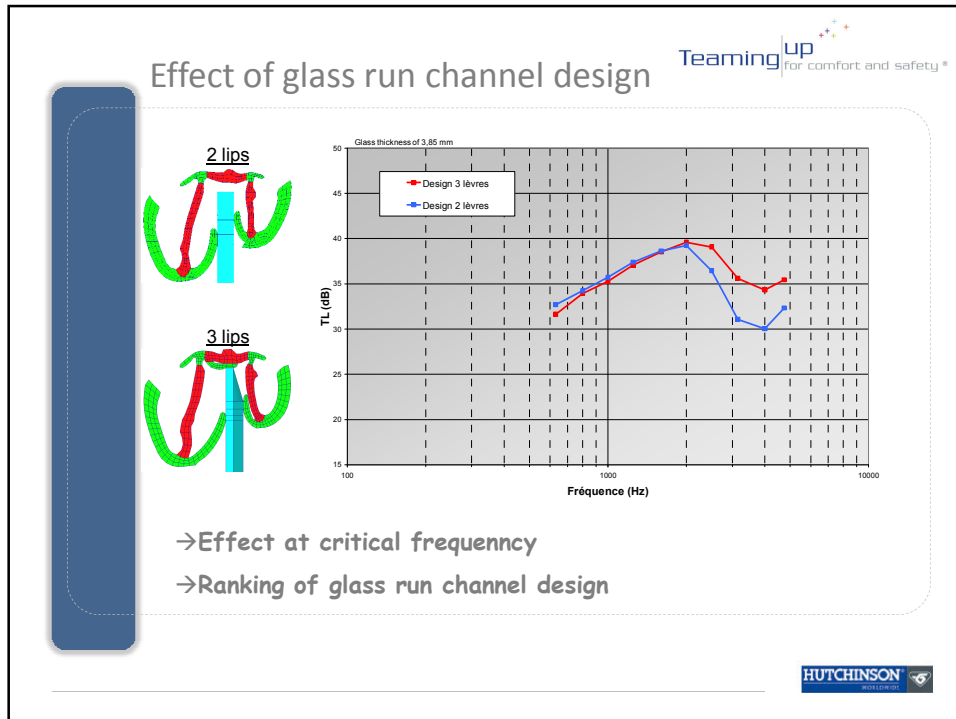
Glass thickness of 3,85 mm




→ Truncation of waves gives higher TL









KEY POINTS

1. 3D finer mesh
2. Representative excitation
3. Computed of transmitted power at 10cm above glass

CONCLUSION

Validated and reliable model that can be used for:

- sensitivity studies on parameters such as thickness of the glass, design of the glass run channel
- comparison and ranking of different designs by simulation, allowing less prototypes and measurements

