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## Vibro-acoustic simulation of a car window

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► **To cite this version:**

Christophe Barras. Vibro-acoustic simulation of a car window. Acoustics 2012, Apr 2012, Nantes, France. <hal-00810759>

**HAL Id: hal-00810759**

**<https://hal.science/hal-00810759v1>**

Submitted on 23 Apr 2012

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# ACOUSTICS 2012

## Vibro-acoustic simulation of a car window

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**HUTCHINSON** multimedia

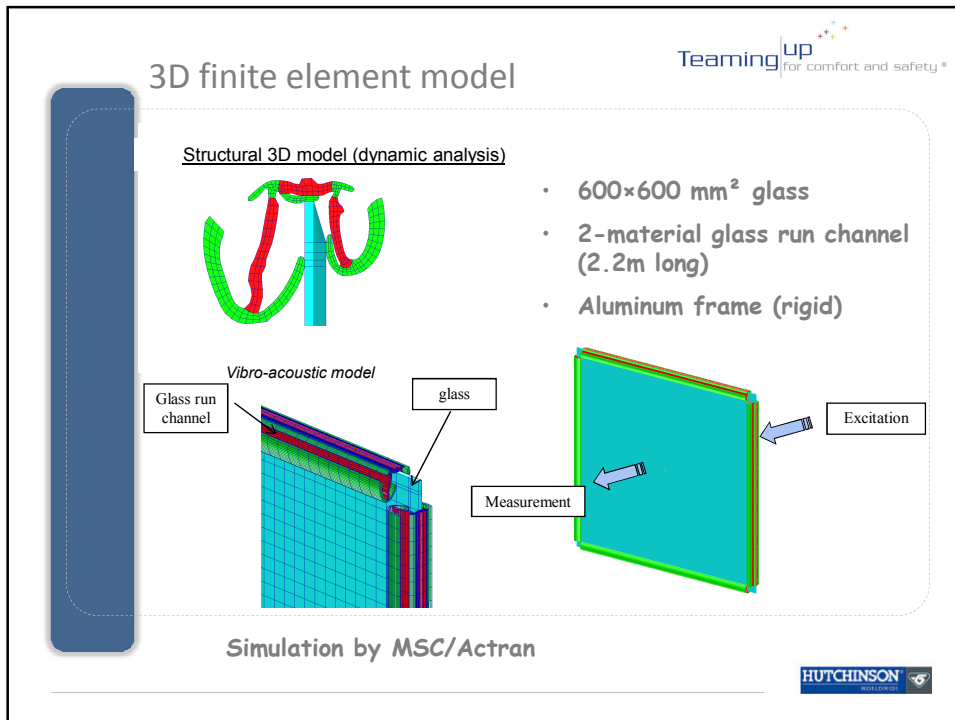
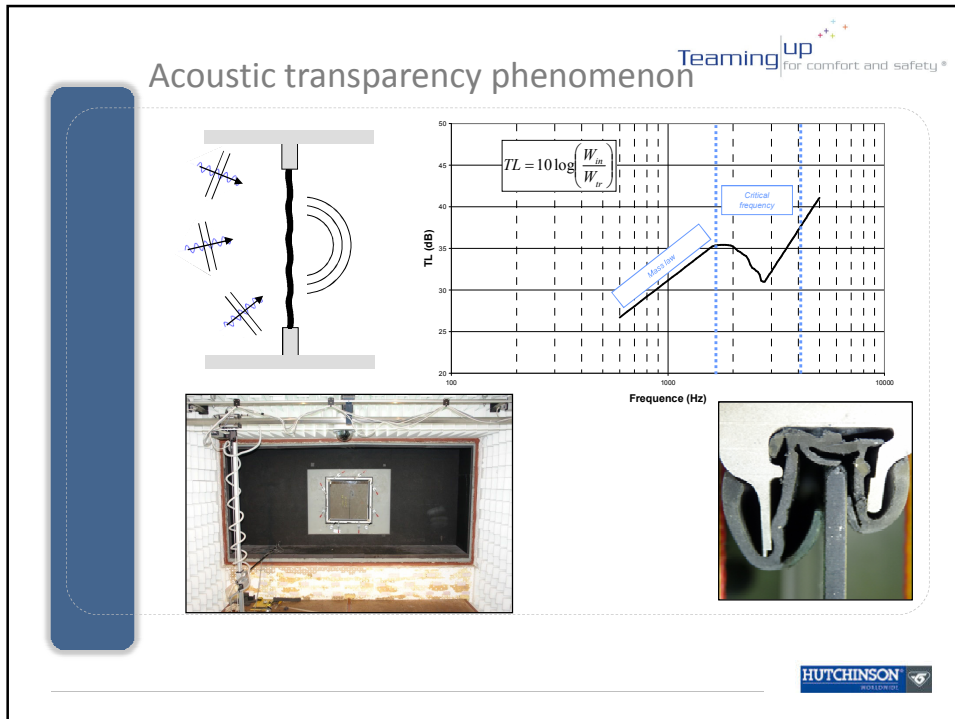
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## Introduction

```

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

**HUTCHINSON** multimedia



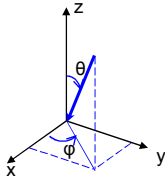


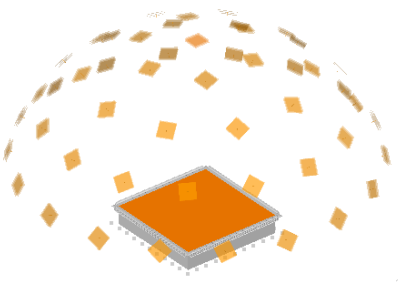
## Acoustic excitation


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


incidence ( $\theta$ )	number of azimuthal waves ( $\phi$ )	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

<b>Total waves</b>	<b>50</b>
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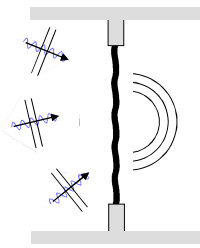


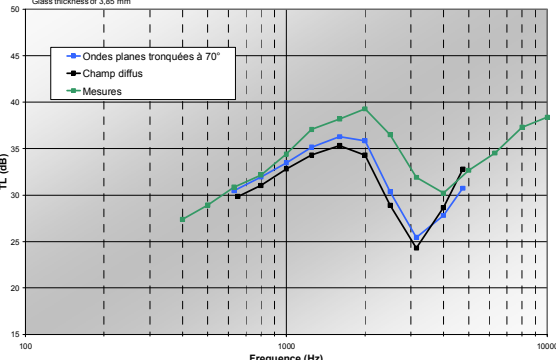


## Acoustic excitation

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


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

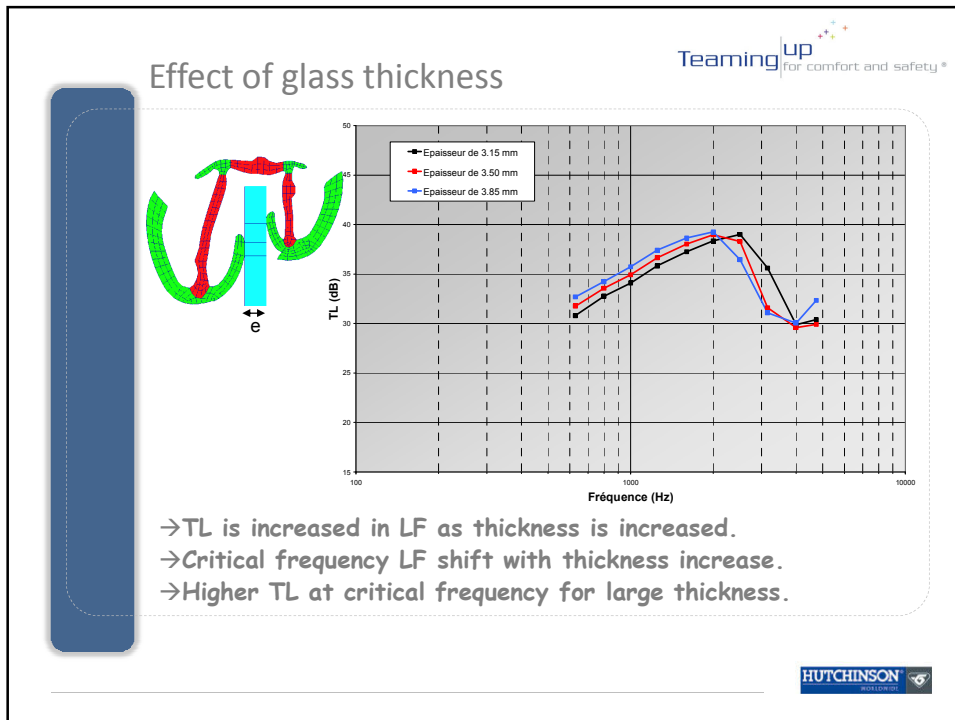
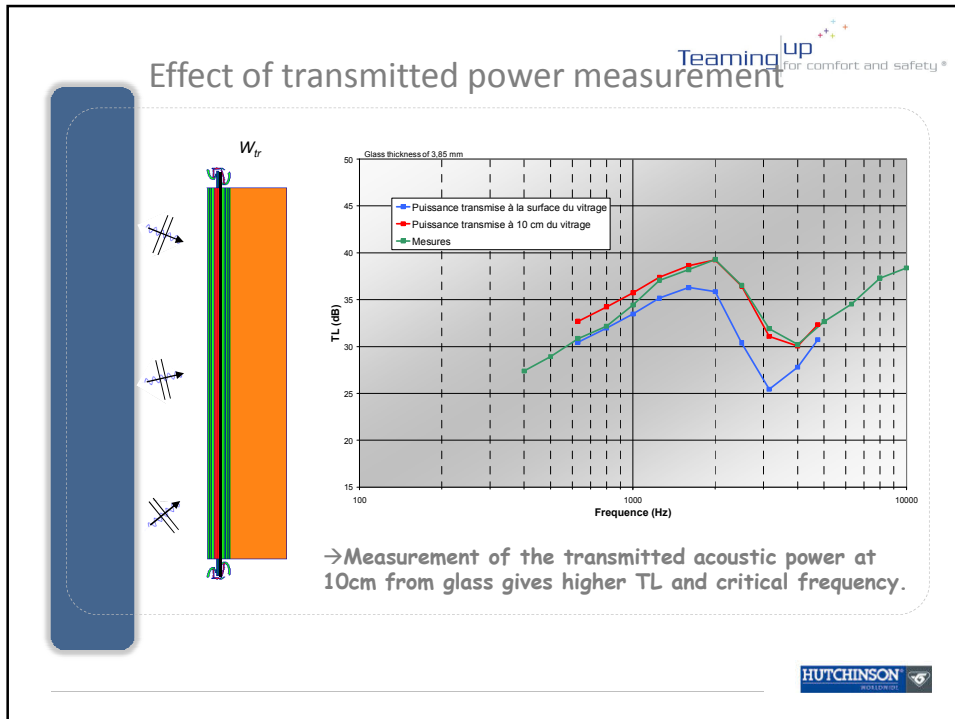


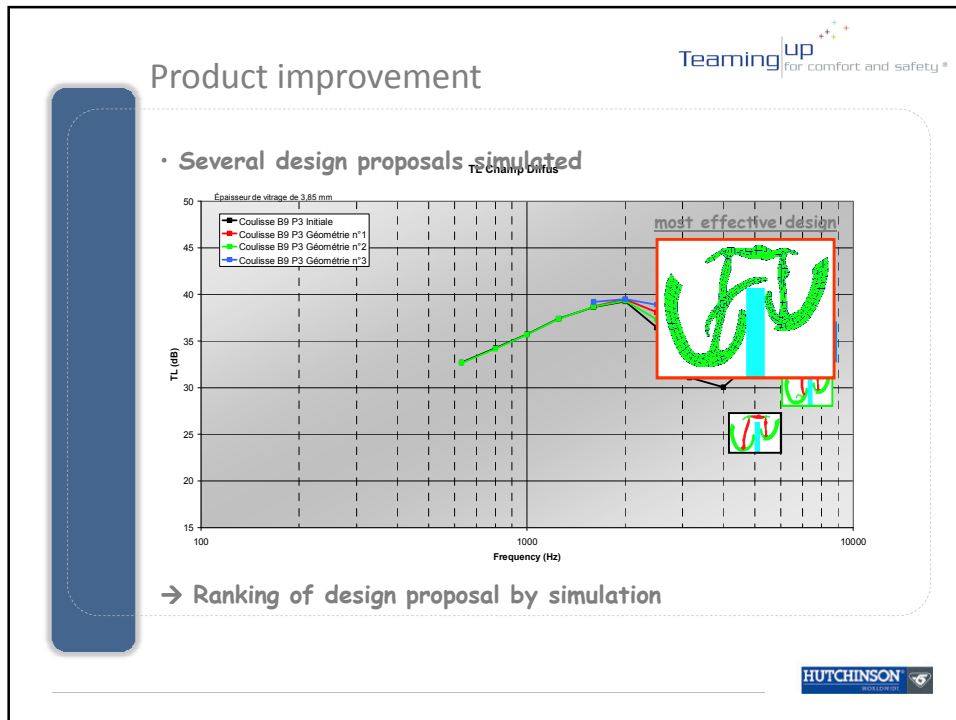
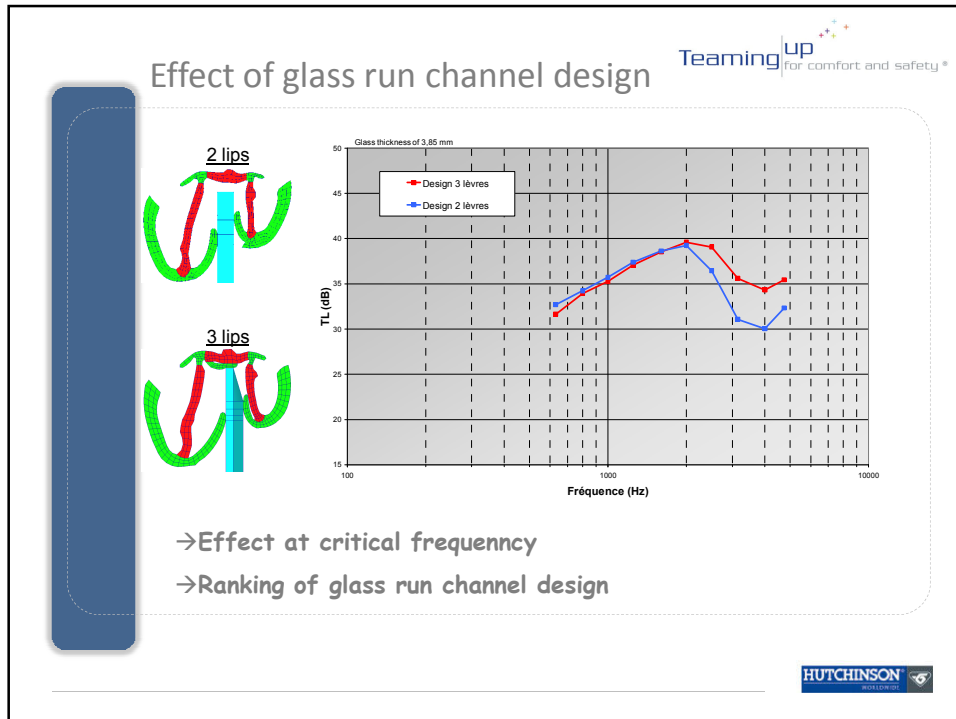



Frequency (Hz)	Ondes planes tronquées à 70° (TL dB)	Champ diffus (TL dB)	Mesures (TL dB)
100	28	28	28
200	30	30	30
500	32	32	32
1000	34	34	34
2000	36	36	36
5000	38	38	38
10000	38	38	38

→ 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



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