

Engineering with SEA

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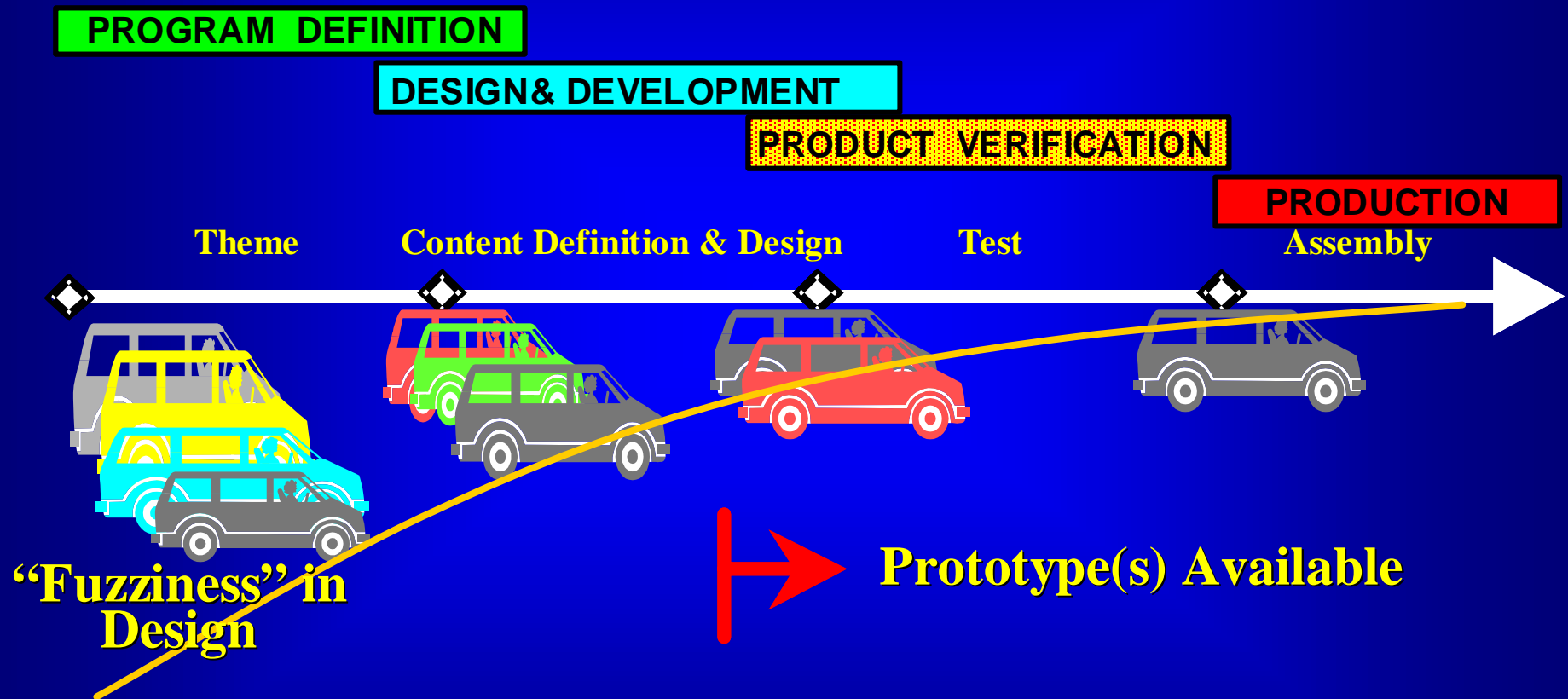
DAIMLERCHRYSLER

***SEA Workshop
SAE Noise & Vibration Conference
Traverse City, May 2003***

Challenge for NVH in year 2003:

- ❑ **COST !!!**
- ❑ **NVH Performance**
- ❑ **Weight**
- ❑ **Packaging**

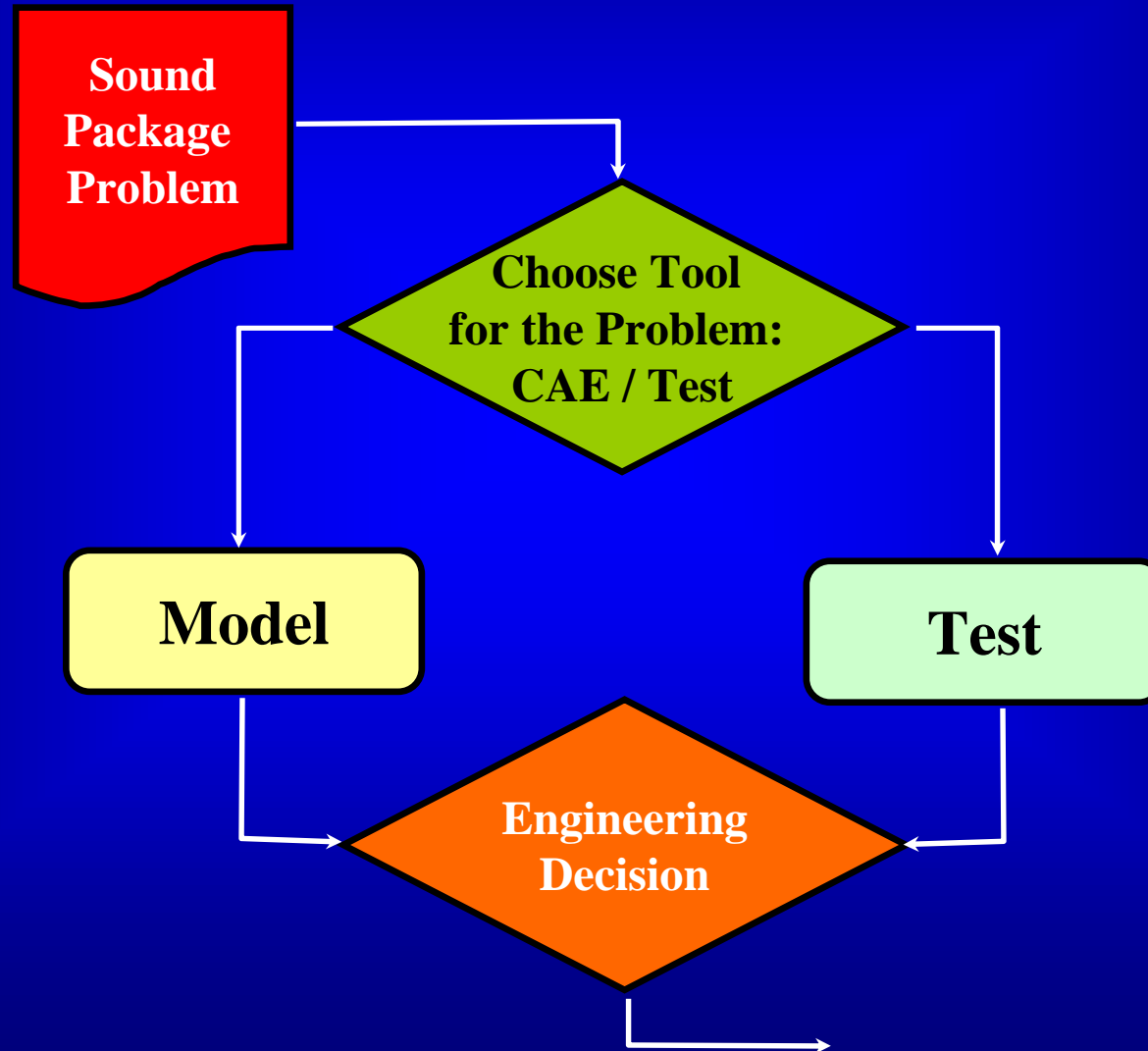
Vehicle Development Process



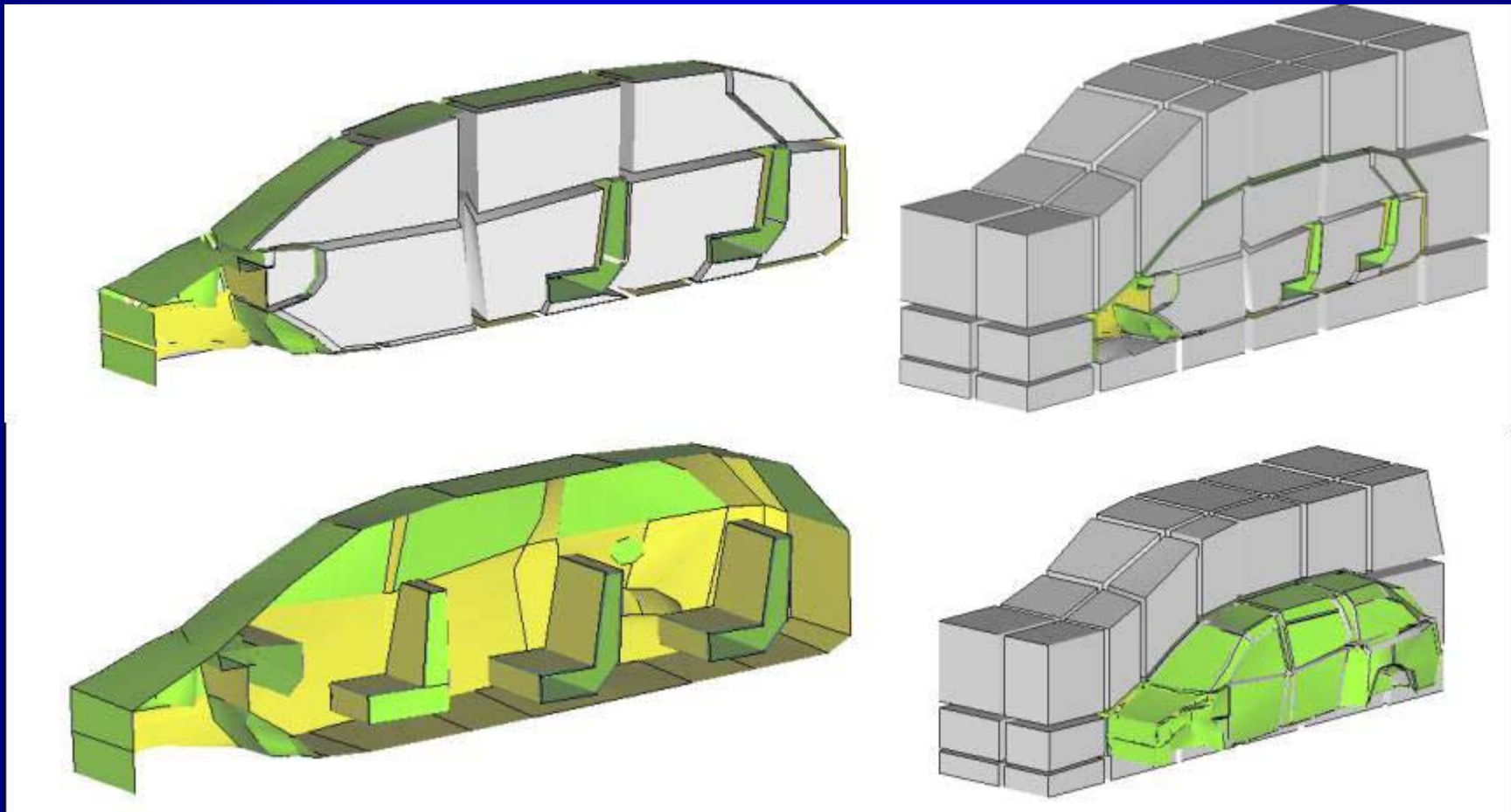
Total Process Time ~ 3-6 years

Production Volume ~ 100 000 – 1 000 000 Vehicles/year

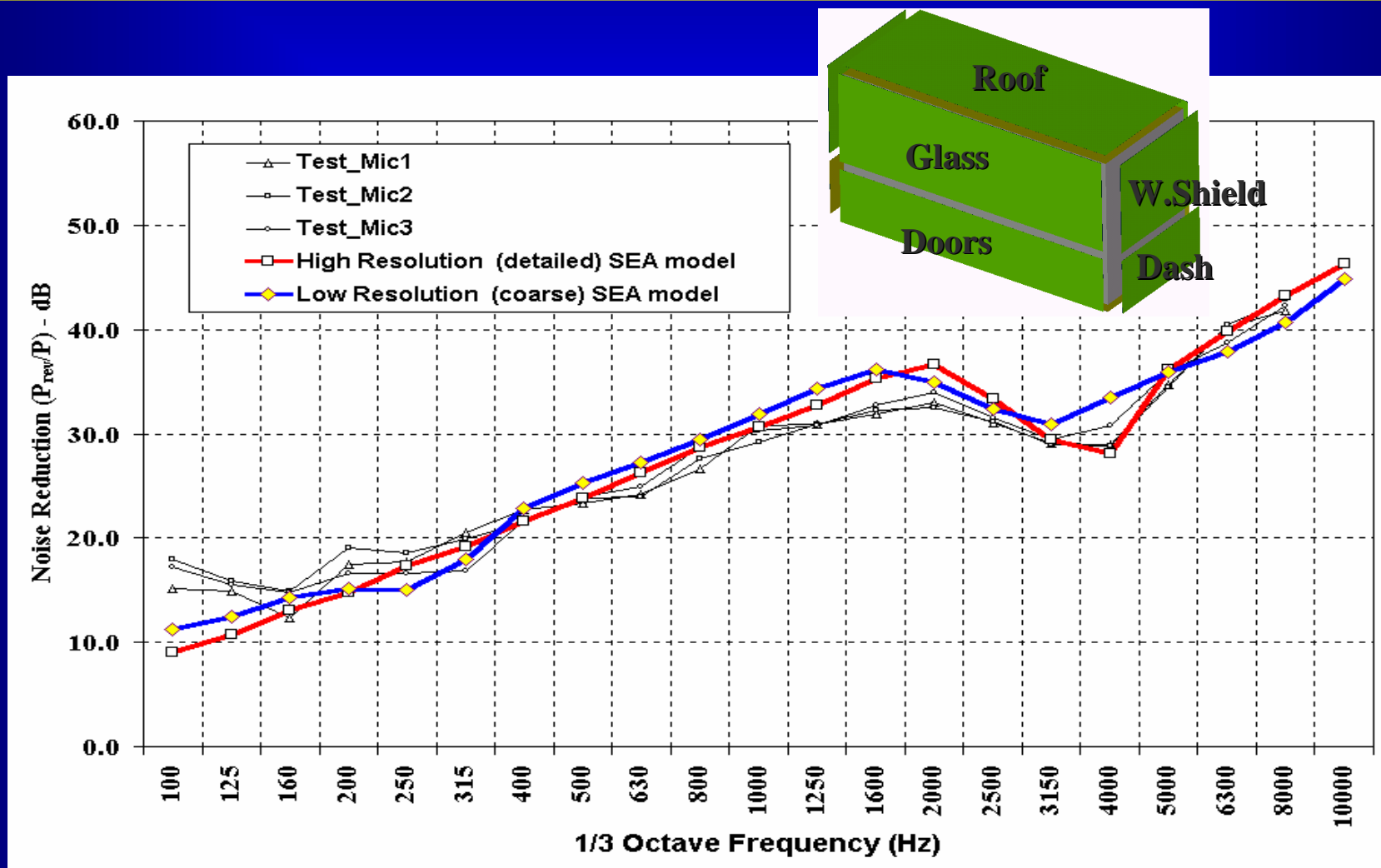
Sound Package Engineering:



Detailed SEA Models



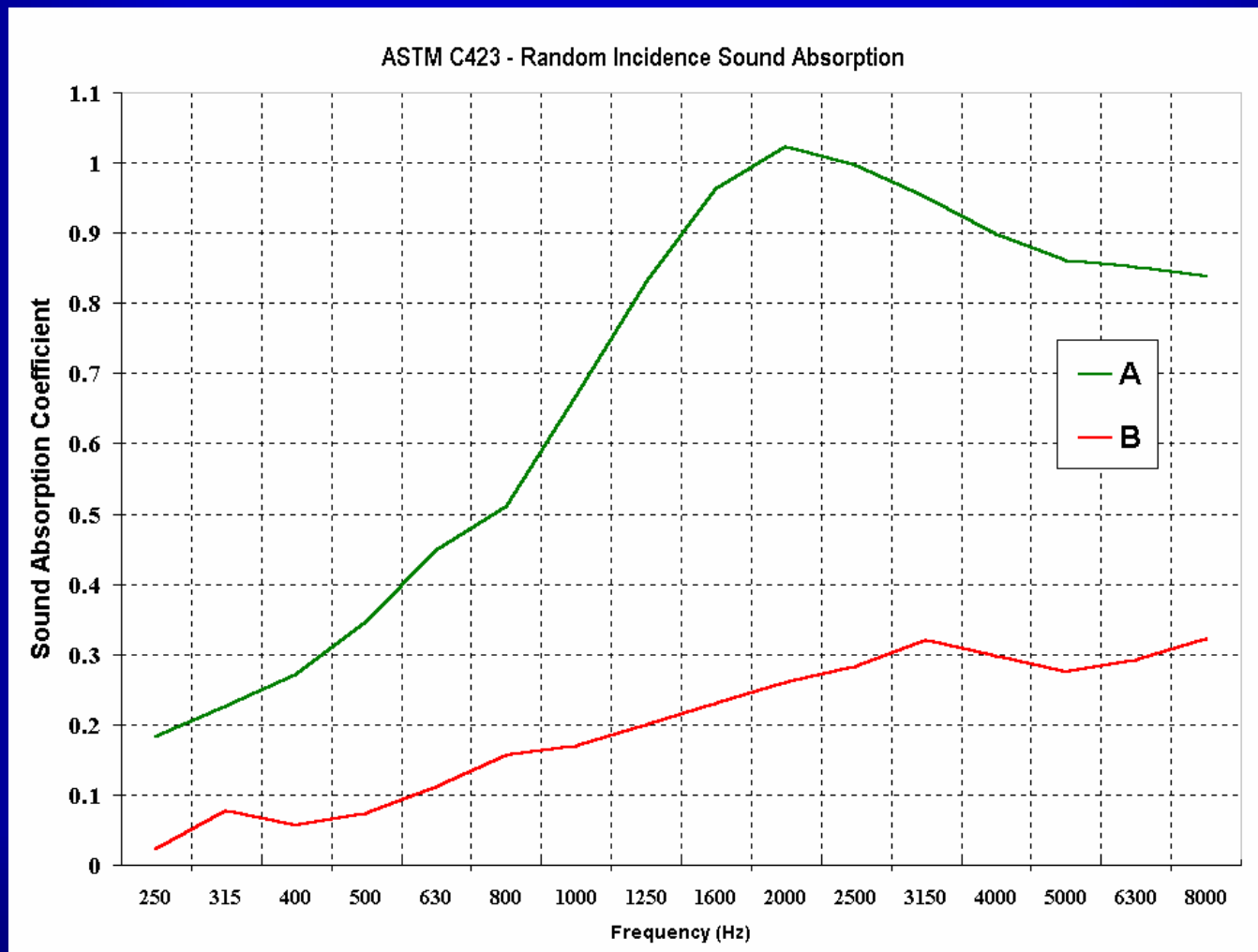
Coarse Conceptual Models:



Design Space – (Air-Borne): Vehicle Sound Package

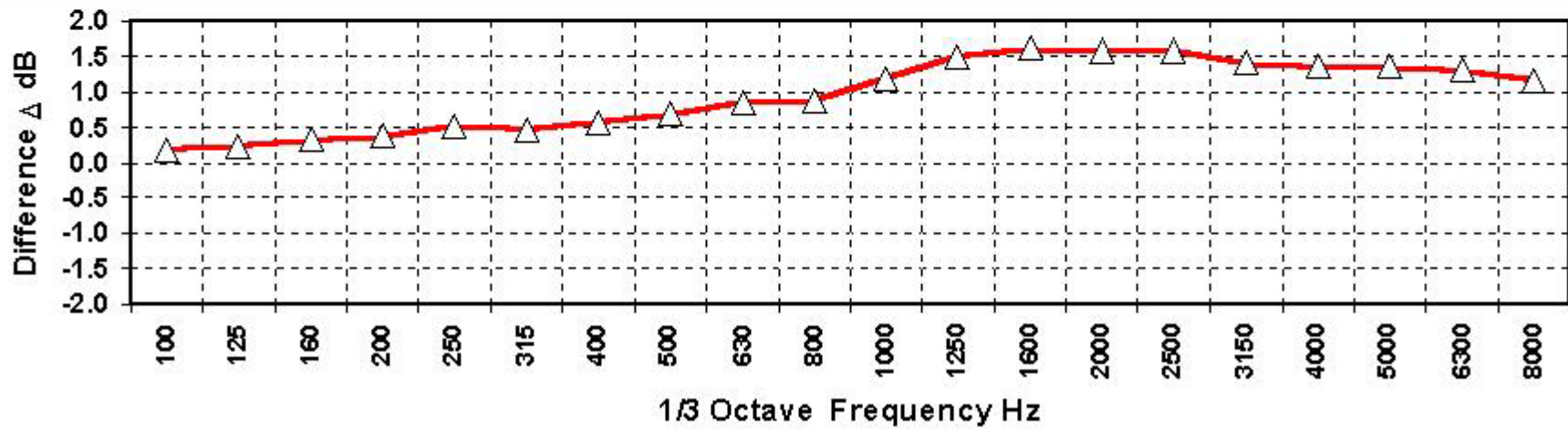
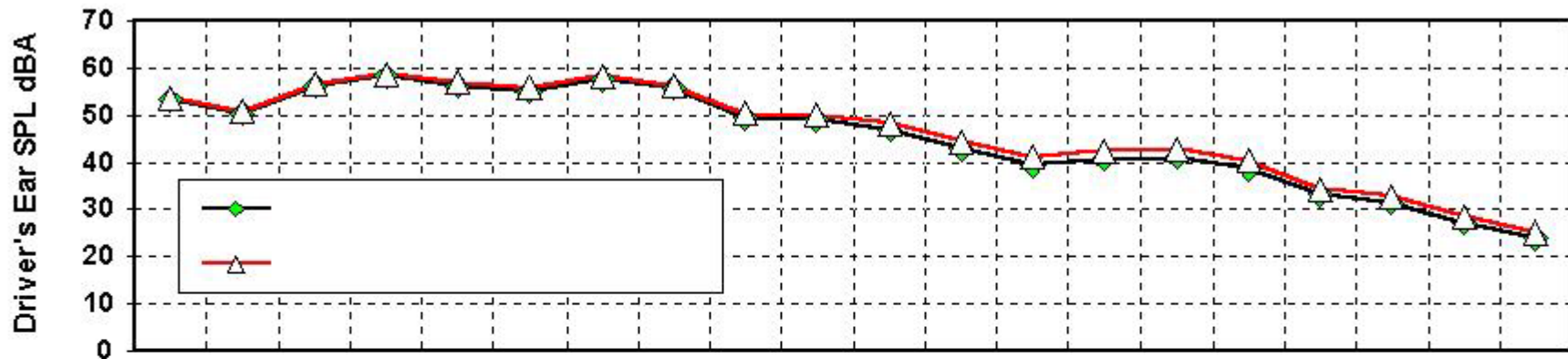
- ❑ **Carpet**
- ❑ **Dash Insulator**
- ❑ **Headliner**
- ❑ **Seats**
- ❑ **Door (absorber, watershield)**
- ❑ **Tunnel Insulator**
- ❑ **Engine-Hoodliner**
- ❑ **Engine-Side Dash Absorber**
- ❑ **Wheelhouse Insulators**
- ❑ **Cowl & Hinge Pillar Insulators**
- ❑ **...**

Example: Acoustic Absorption



SEA Prediction: Effects of Absorption

Effect of Headliner (3500rpm, Gear=L, Smooth Road)



Future Challenges

- ❑ **Cost : Software & Engineering**
- ❑ **Usability : Model Building and Update**
- ❑ **Reliability : Accuracy of First Run.**
- ❑ **Theory: Improve Predictions**
- ❑ **Statistics: Variance Estimate**
- ❑ **Quality: Modeling & Standardization**
- ❑ **Education/Training**