

# **SEA Vehicle Applications**

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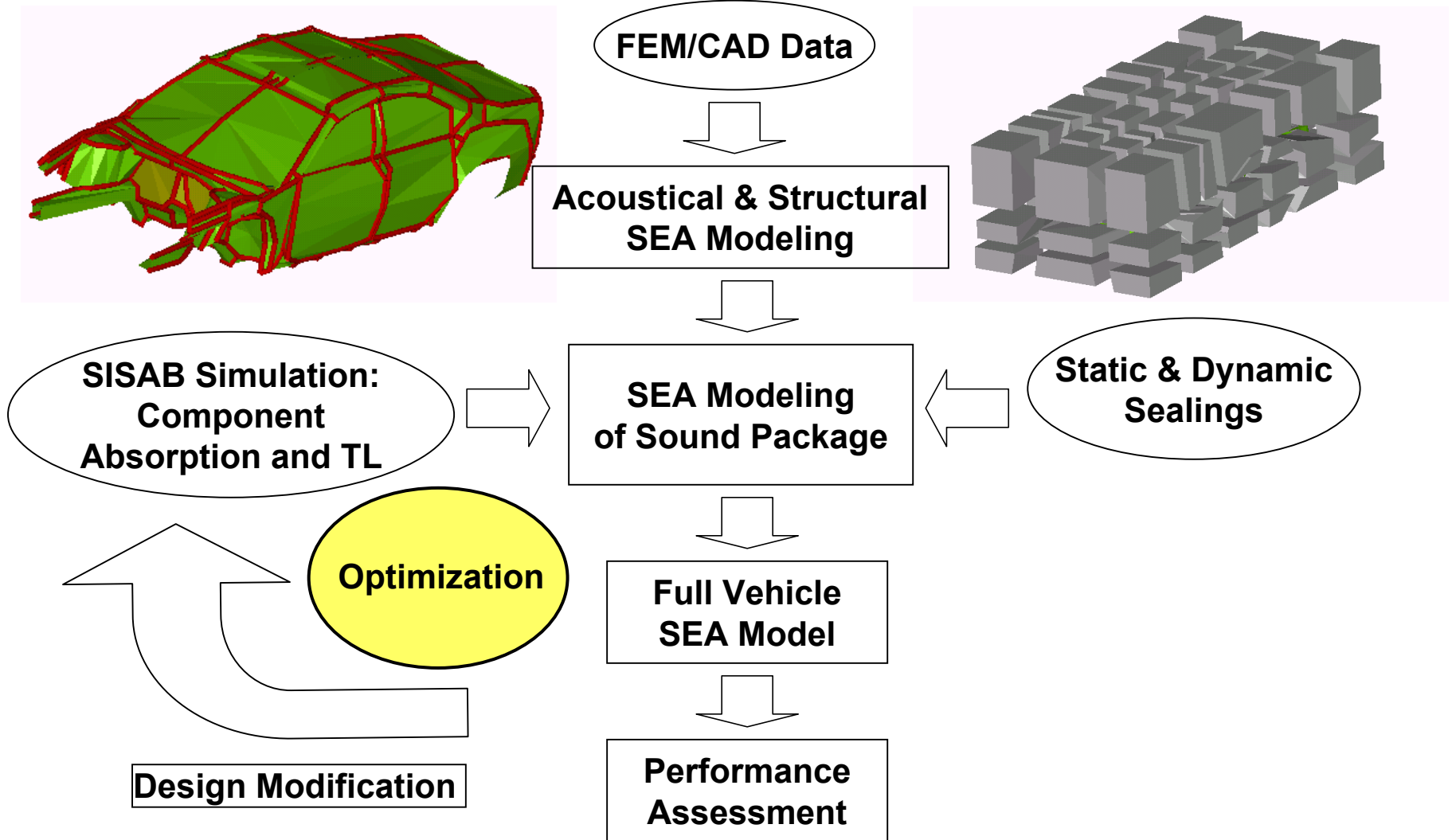
*2003 SEA Modeling Workshop*



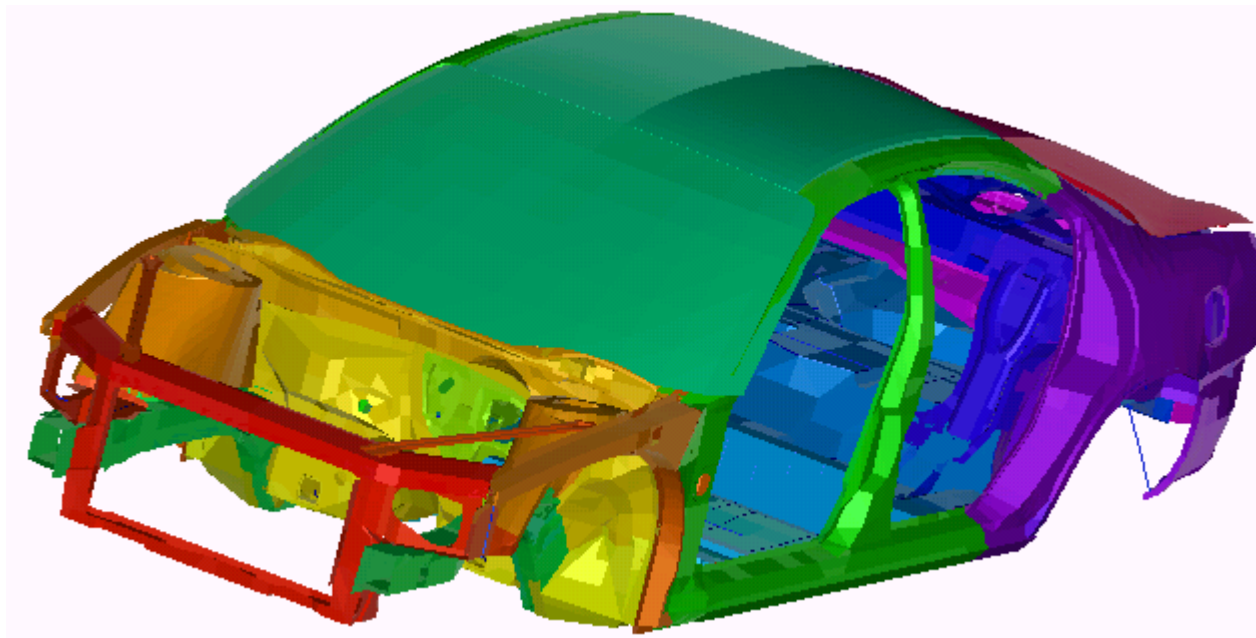
# Typical SEA analyses:

- Target assessment,
- Design alternative study and recommendation,
- Optimization,
- ...

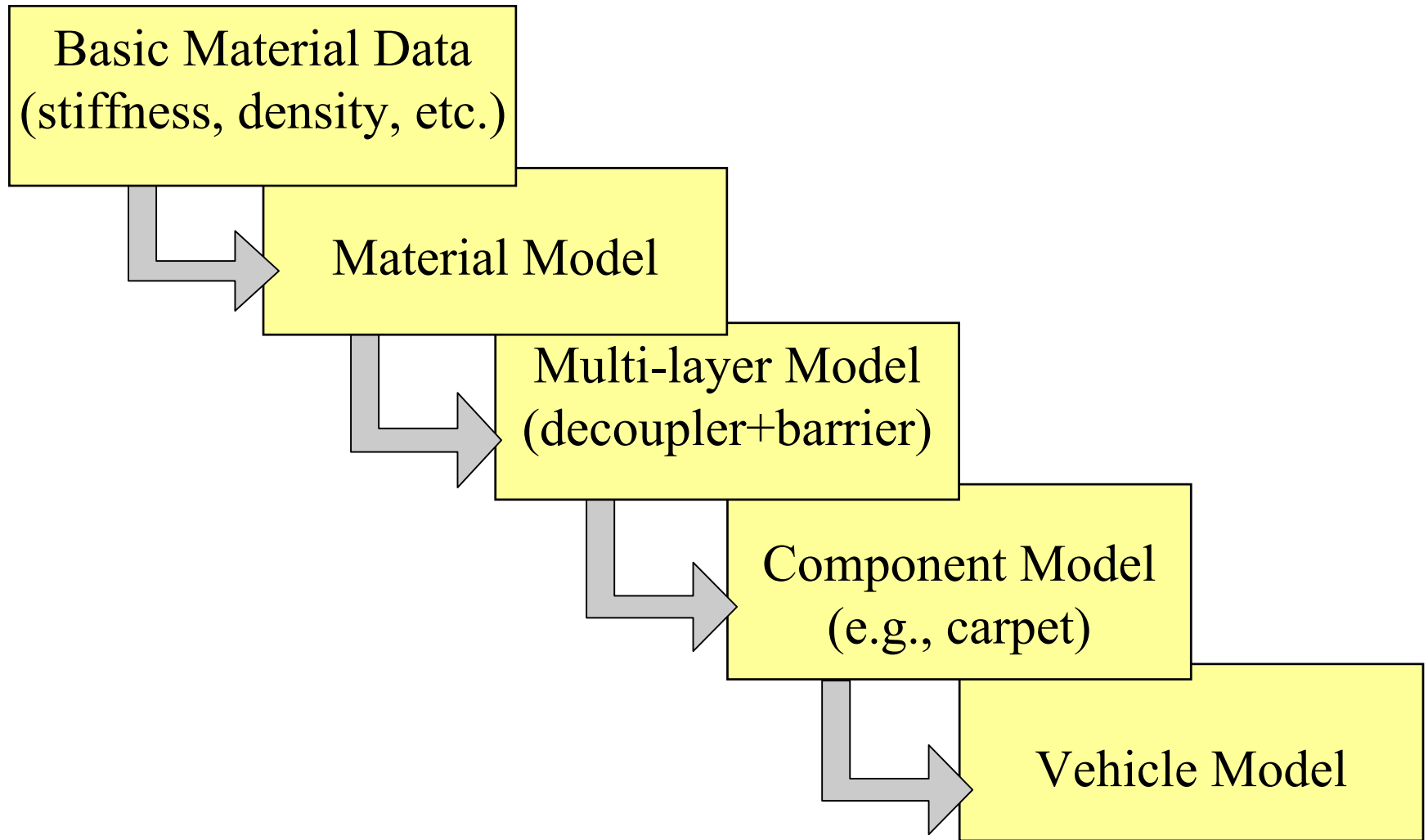
# Vehicle SEA Modeling



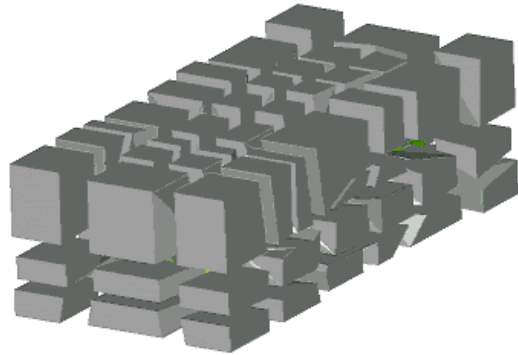
## Geometry (FE model or CAD)



# Sound Package Modeling



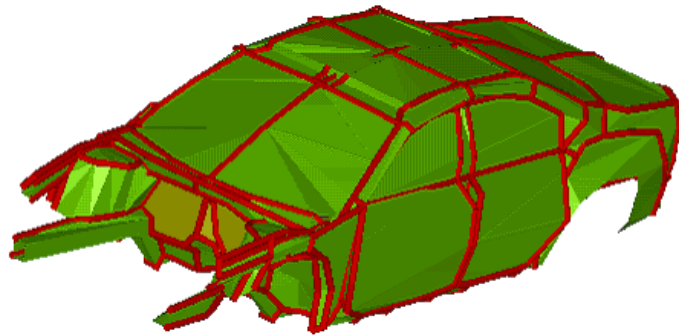
# Trimmed Body SEA Model - Example



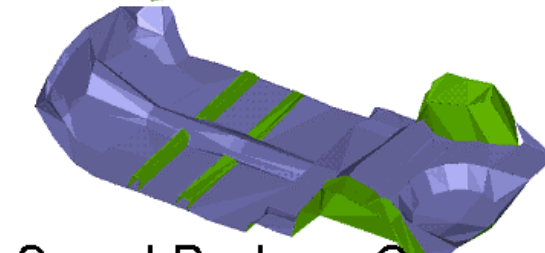
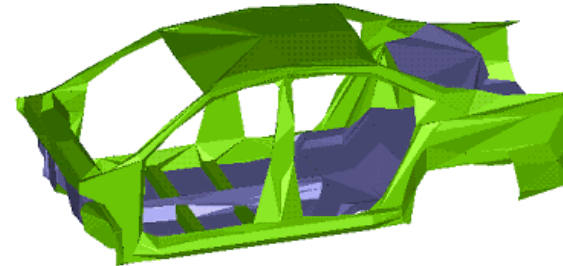
Exterior Acoustical Subsystems



Interior Acoustical Subsystems



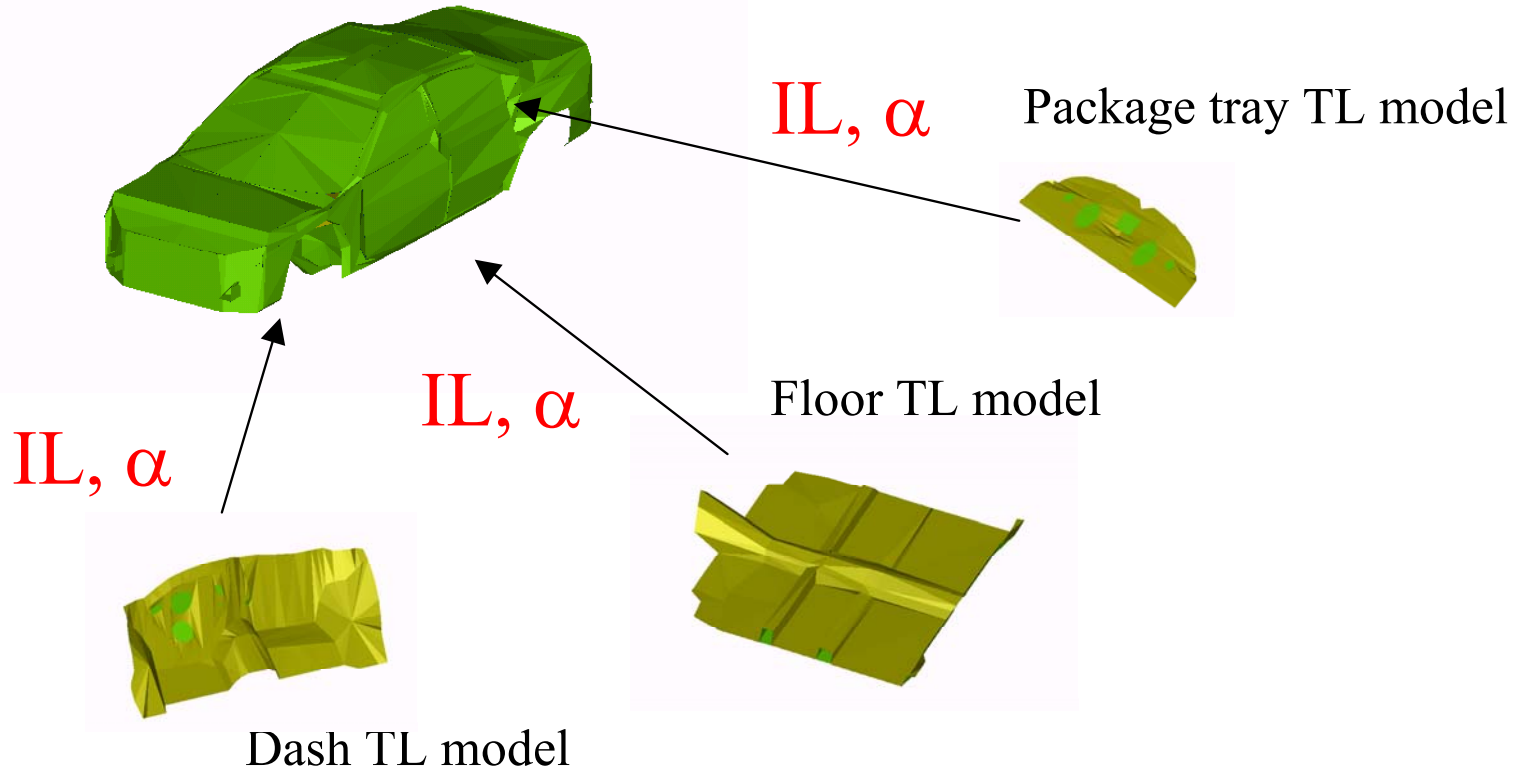
Inter-connected  
Structural Subsystems



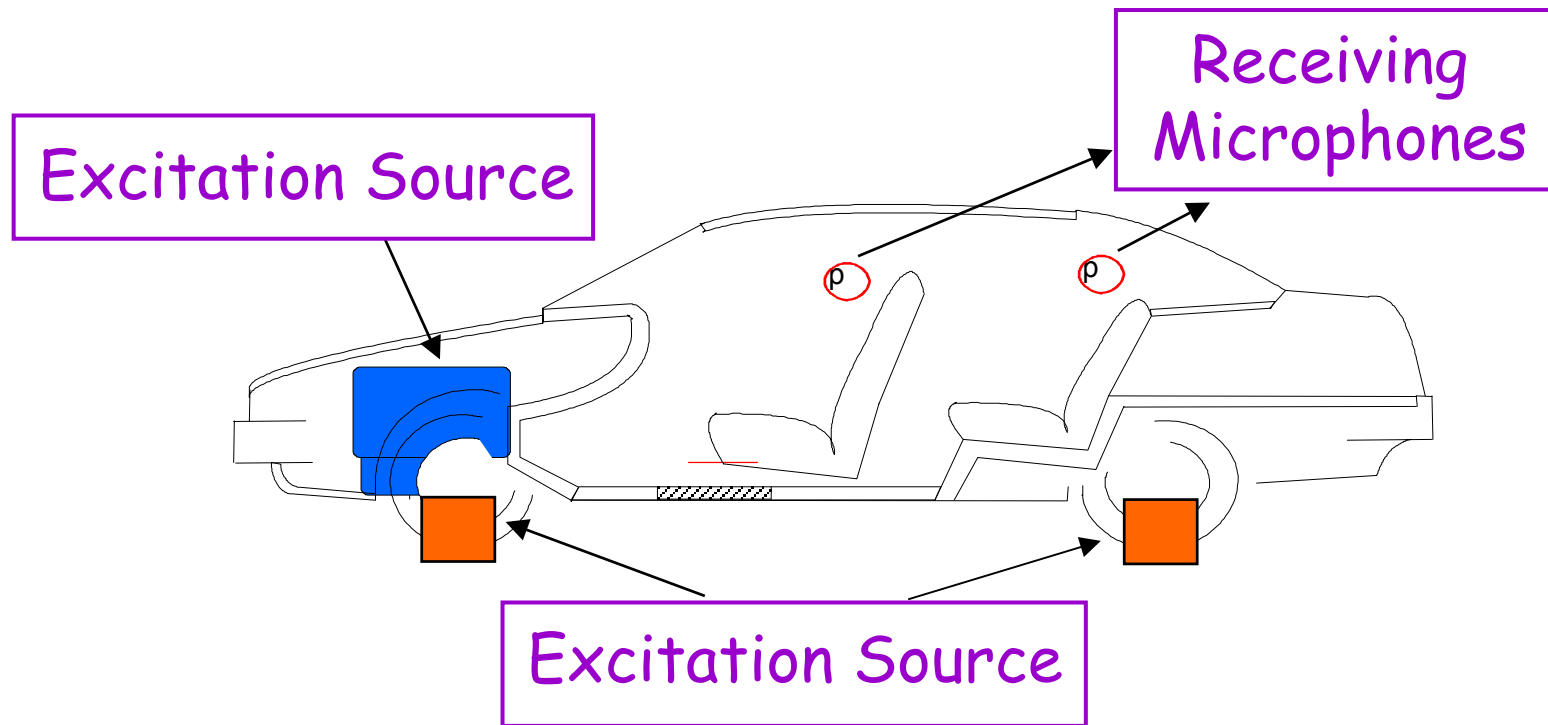
Sound Package Components  
Represented as Acoustical  
Treatments

# Vehicle and Component Models - Example

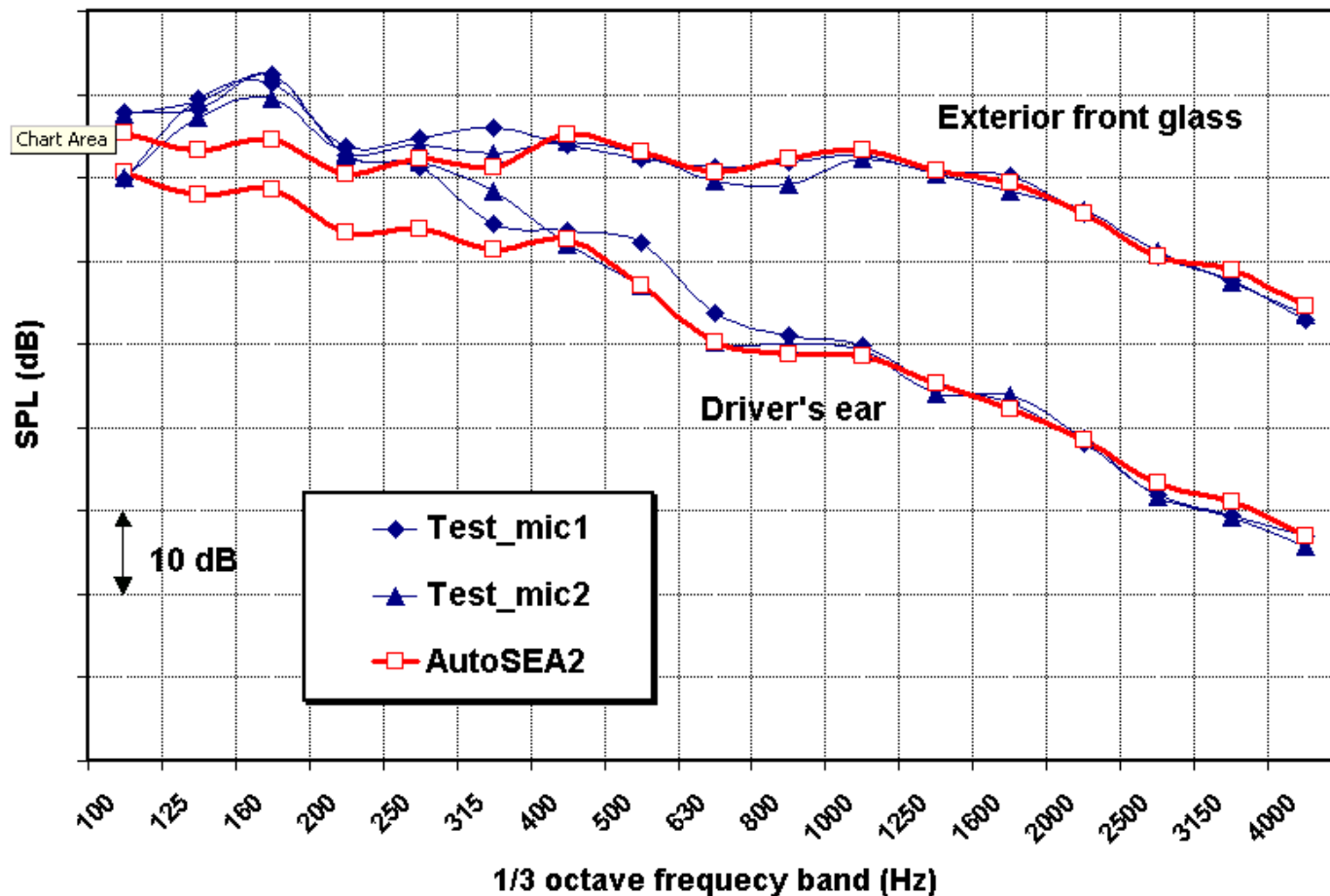
Full-vehicle model



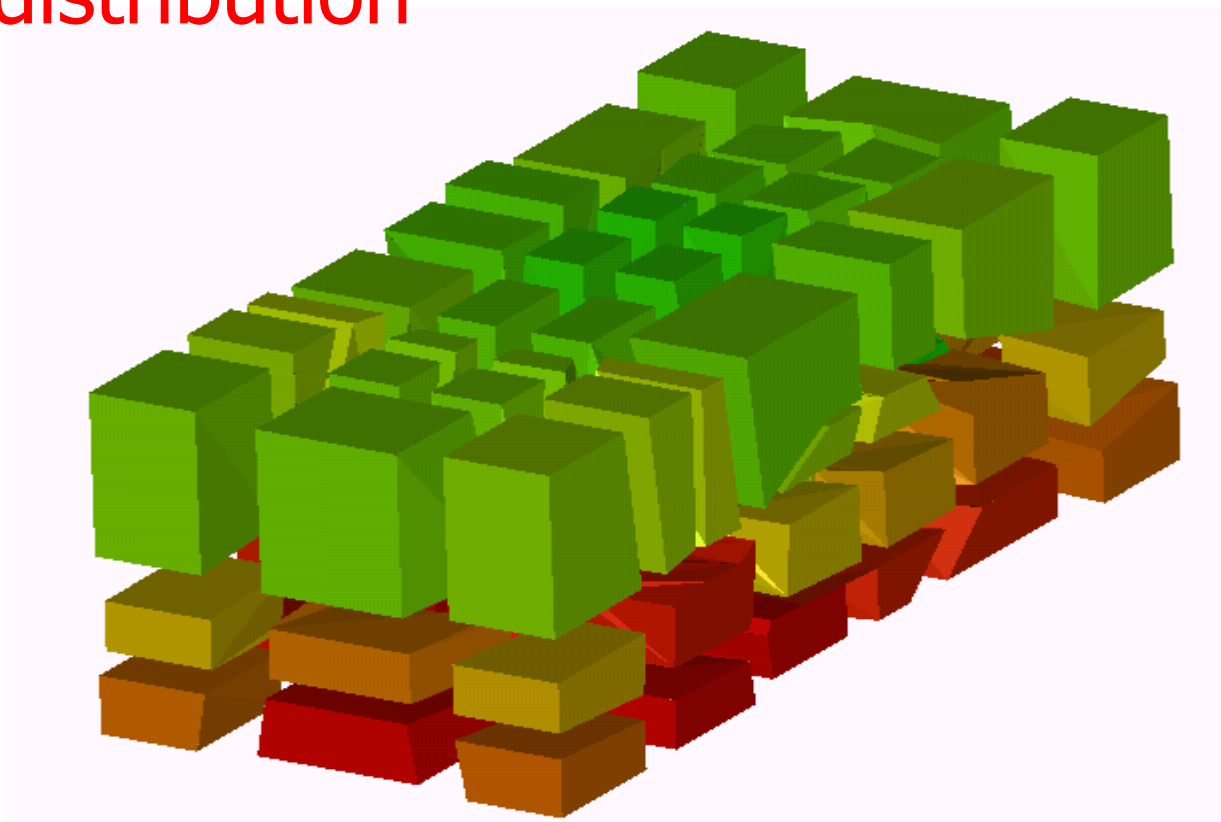
# SEA Model Validation Tests



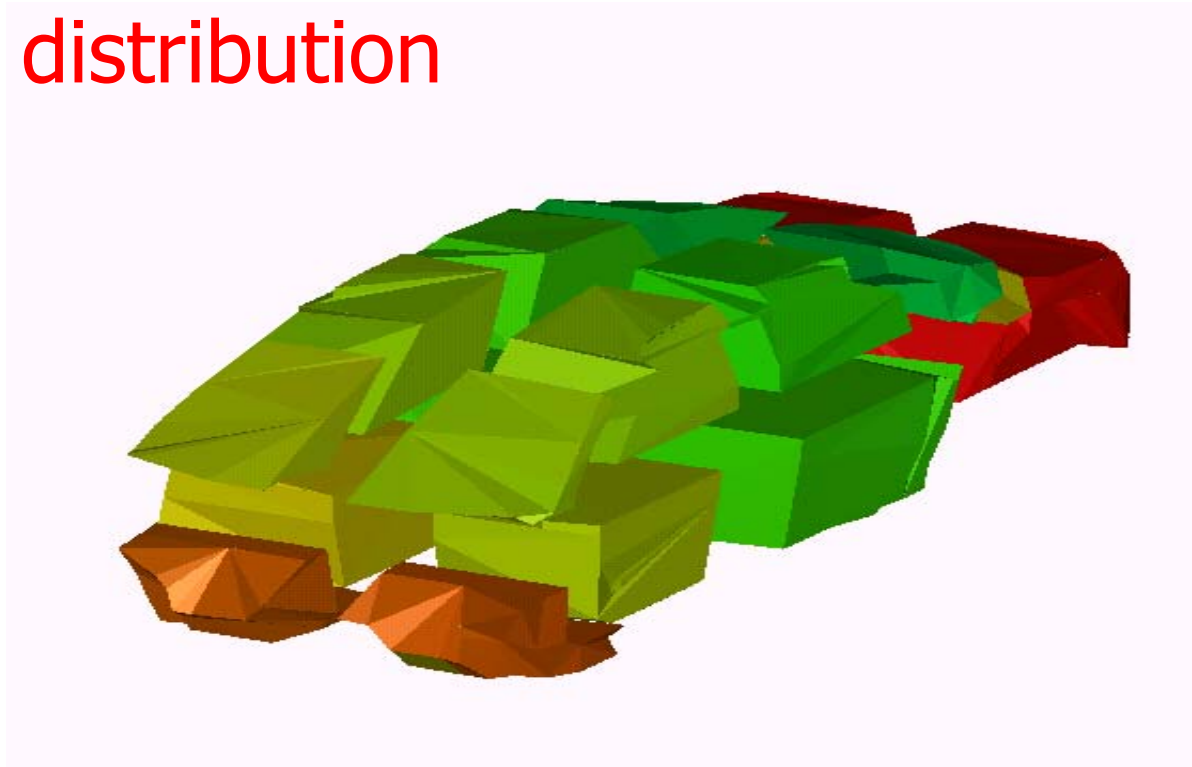
# SEA Model Validation



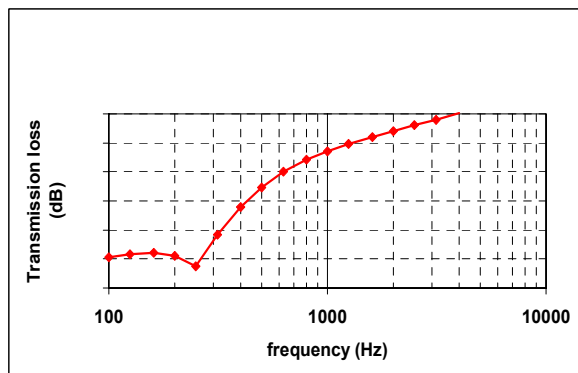
# Color coded sound pressure distribution



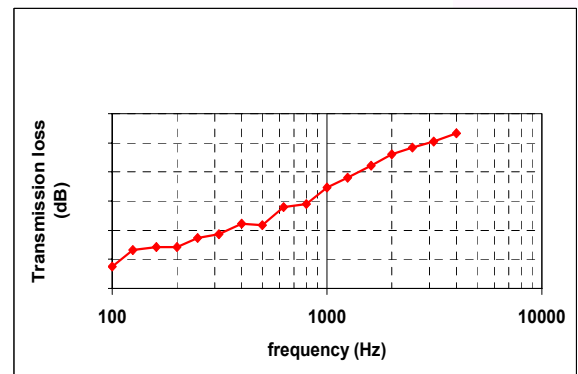
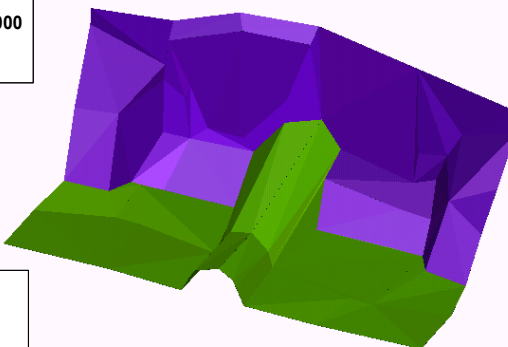
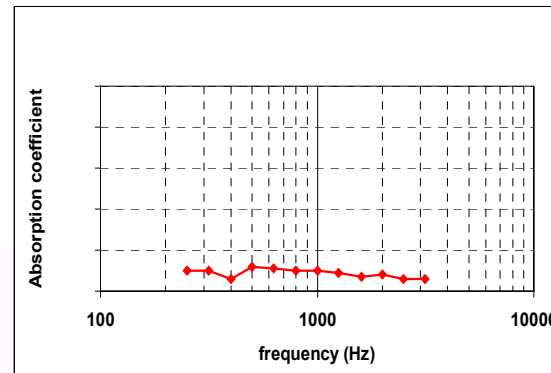
# Color coded sound pressure distribution



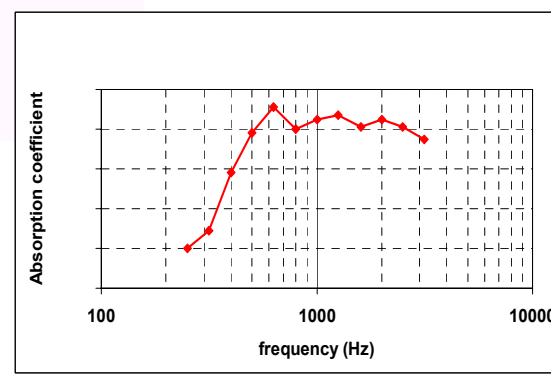
# Design Alternative Study - Example



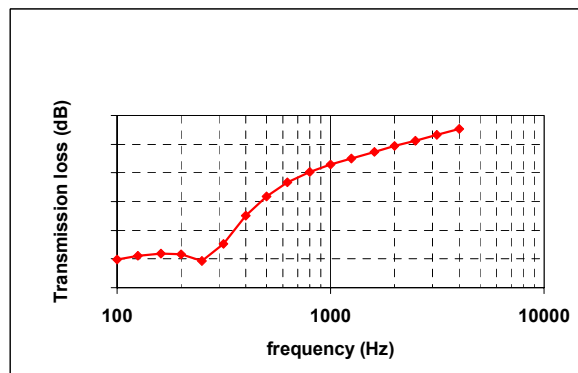
Dash Ins. 1



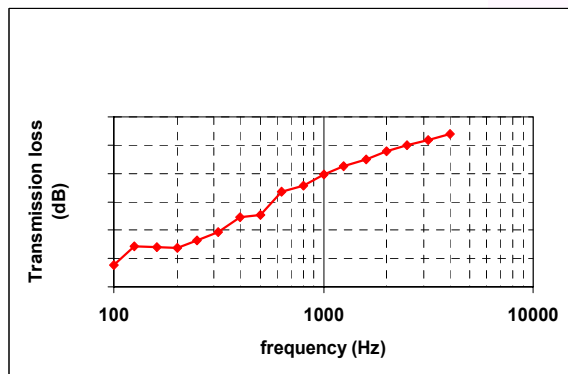
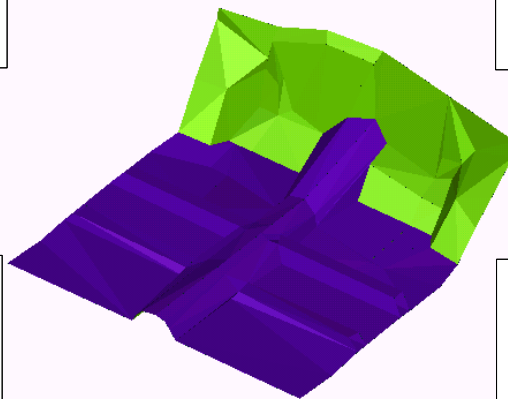
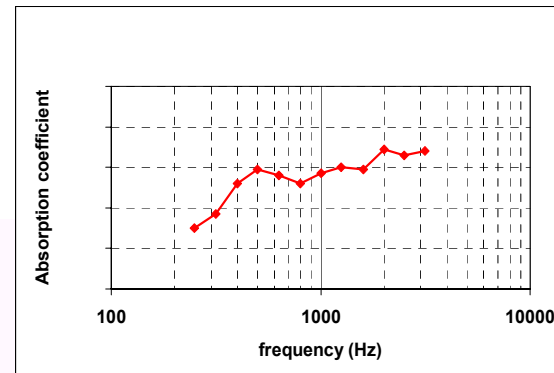
Dash Ins. 2



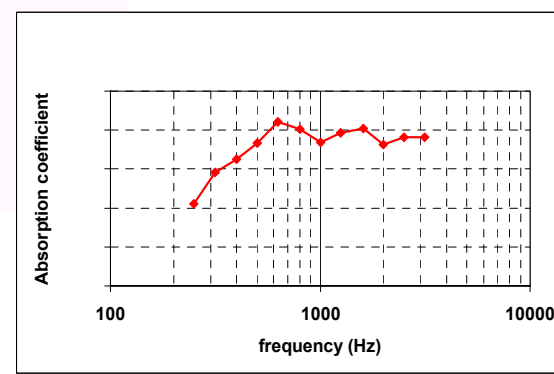
# Design Alternative Study - Example



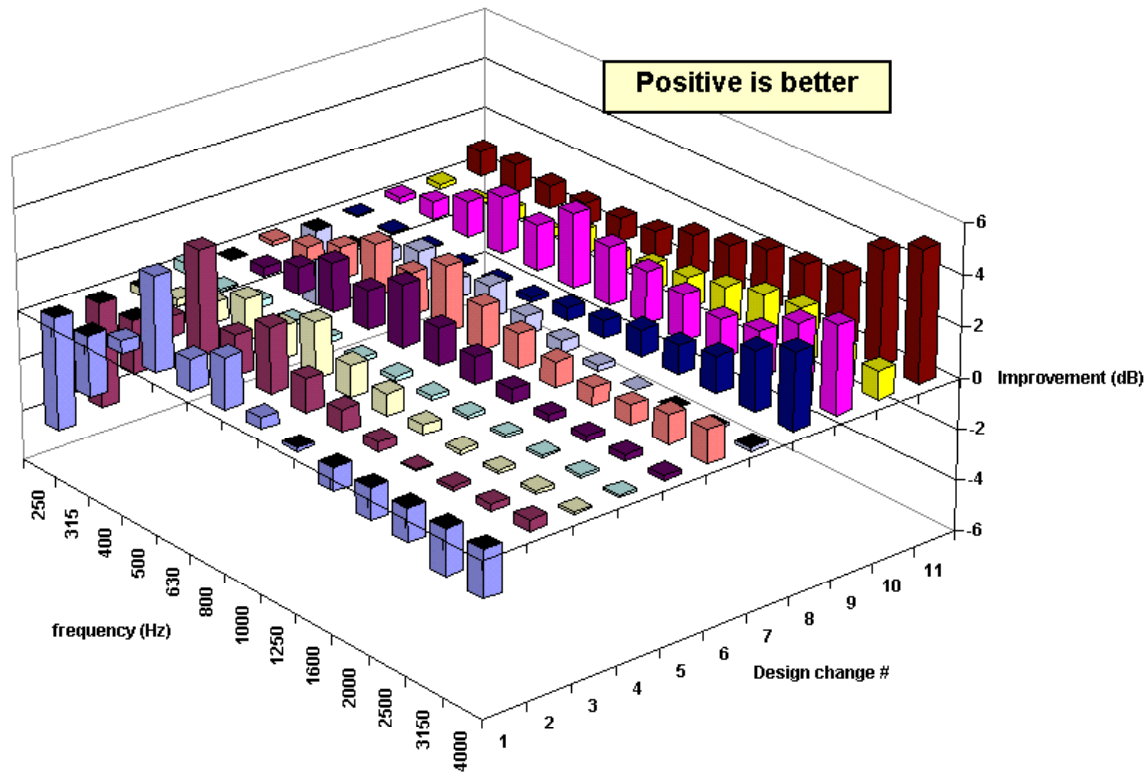
Carpet 1



Carpet 2



# Design Alternative Study - Example



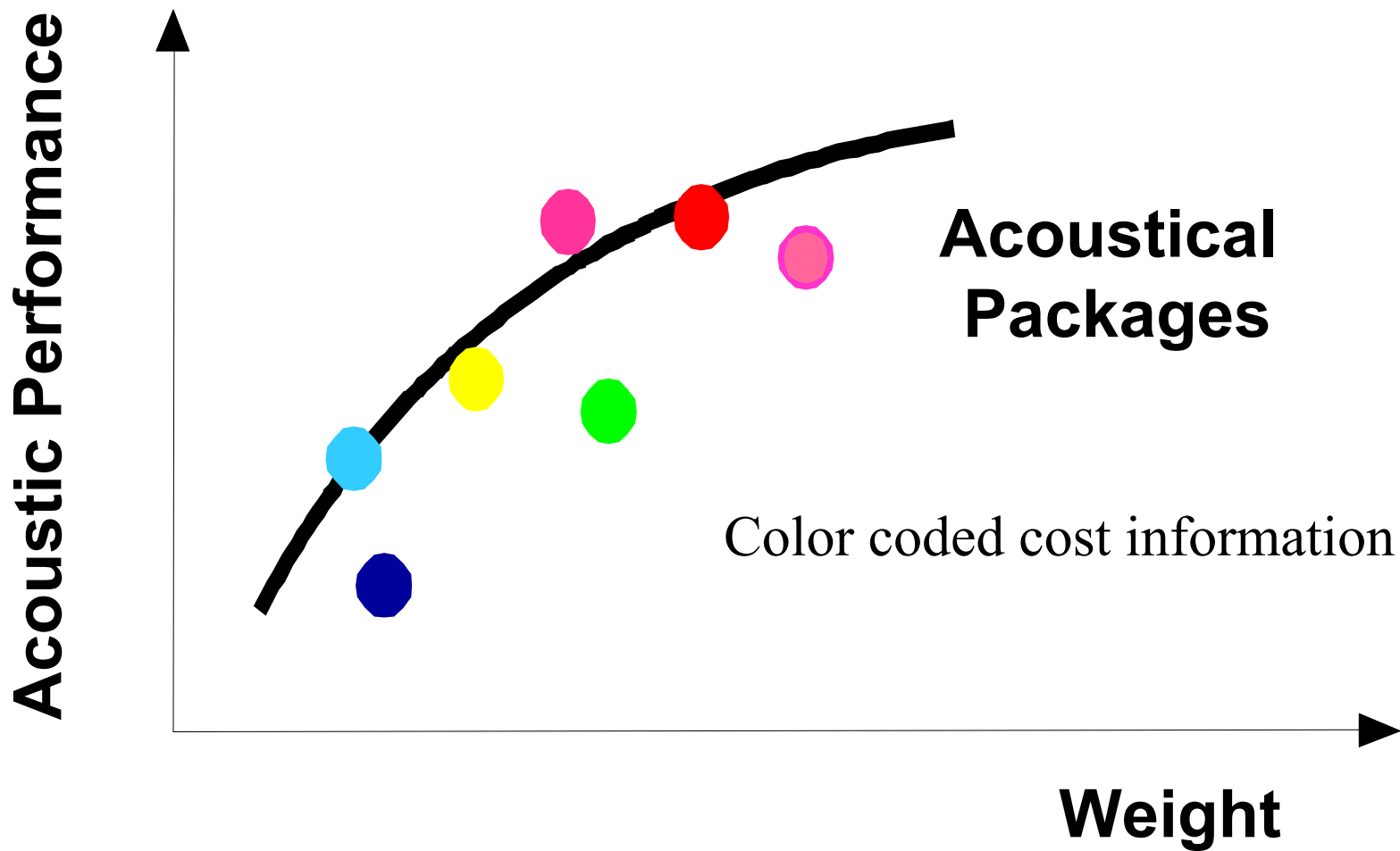
Improvements from design changes  
(relative to baseline configuration)

Problem 1: performance optimization

$$\text{Minimize } f = \sum_i \alpha_i \left( SPL_i - SPL_i^0 \right)$$

Problem 2: weight or cost optimization

$$\text{Minimize } f = \sum_{k=1}^7 \omega_k A_k$$



# SEA Optimization

