

PERMAS

Optimizing Frequency Response

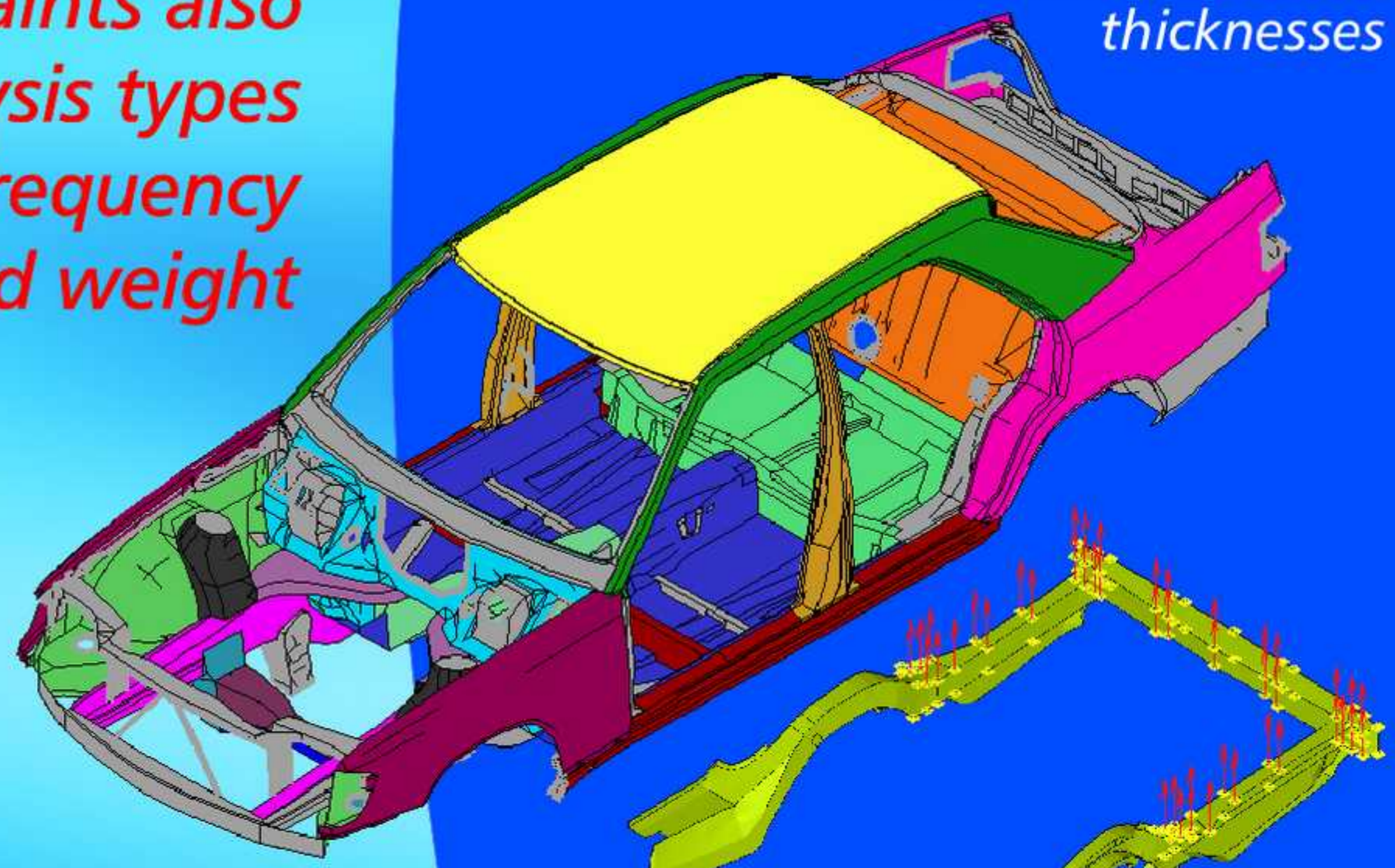


for a modal frequency response analysis:

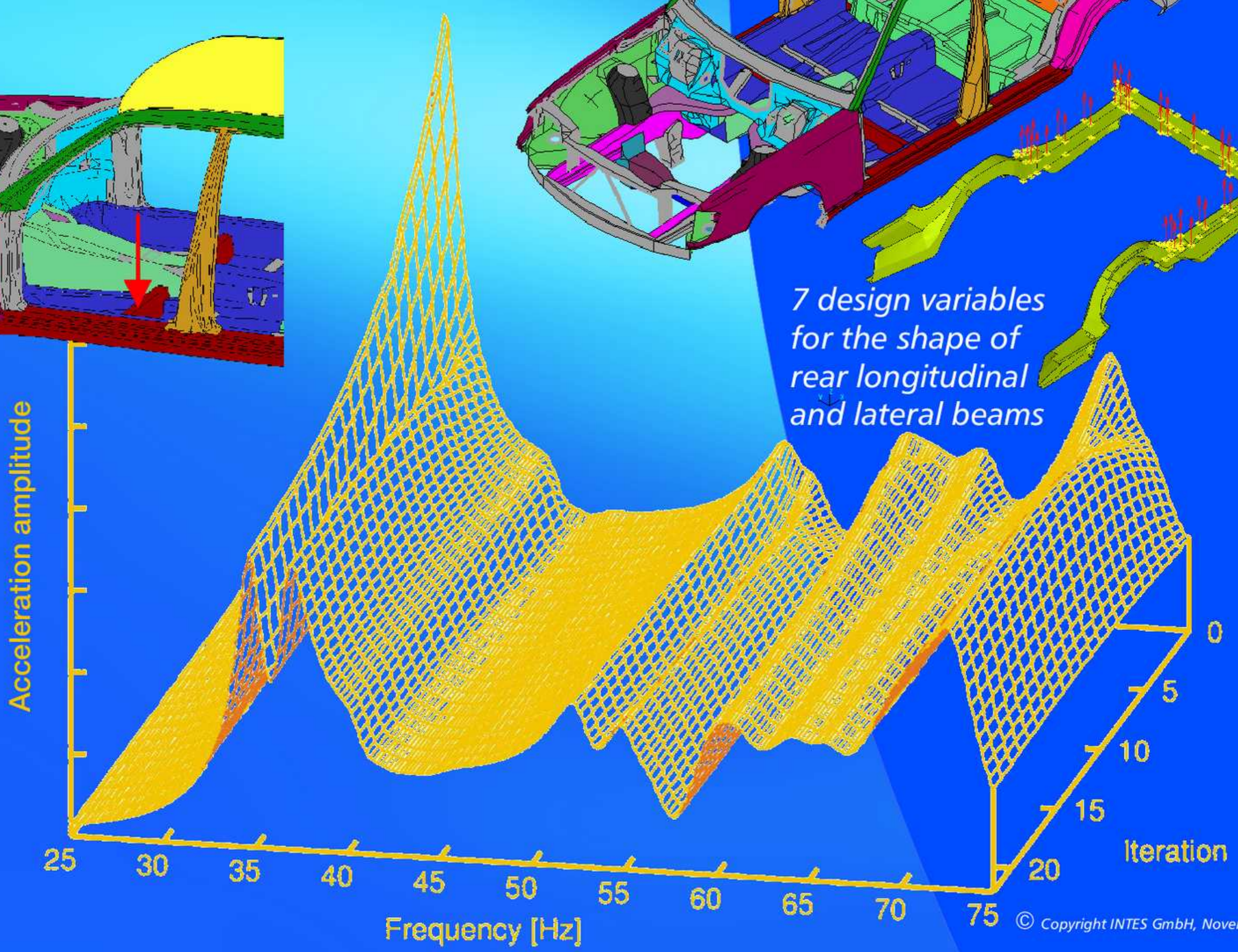
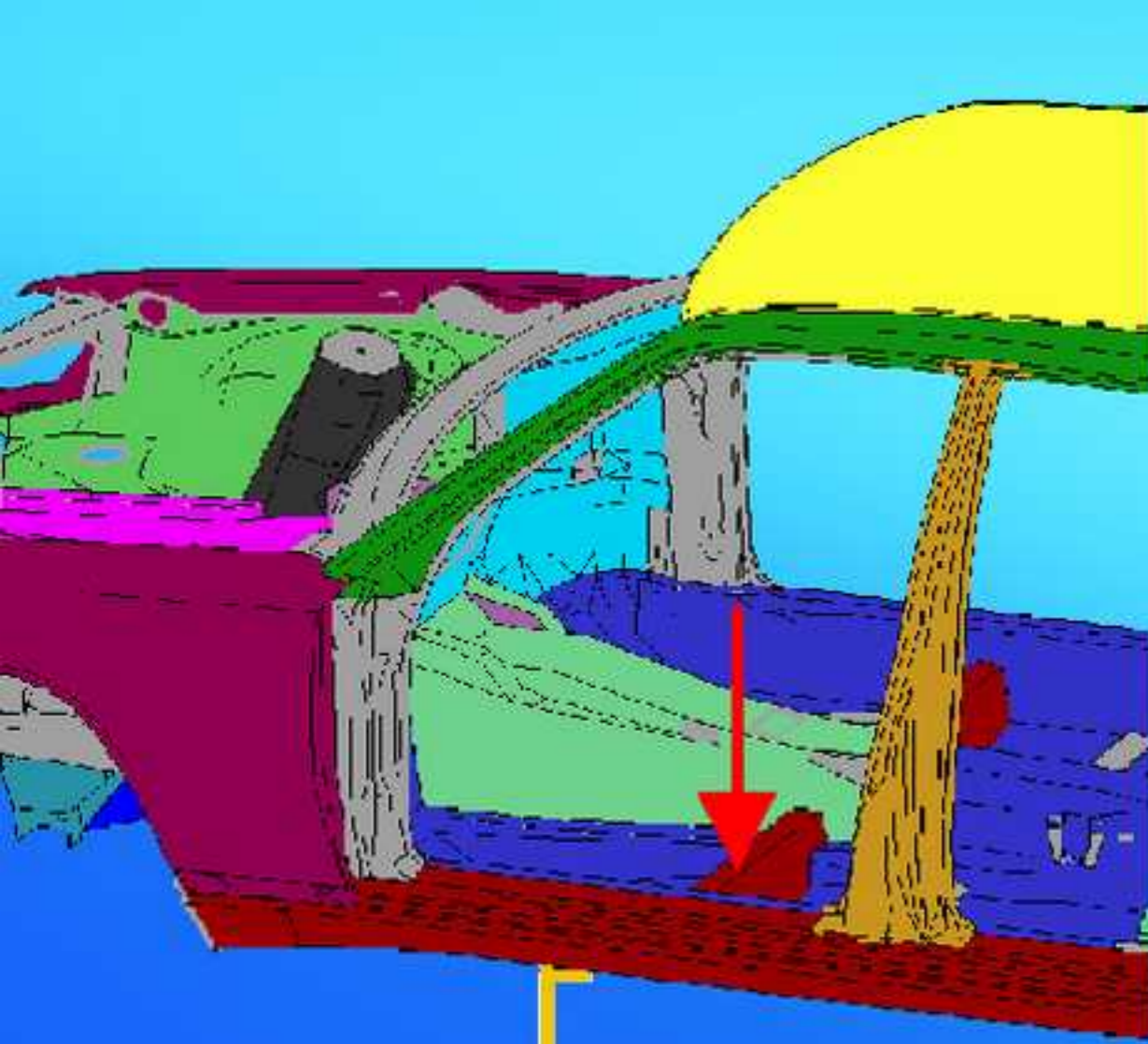
- Amplitudes of displacements, velocities, accelerations, reaction forces, element stresses, and element forces
- Combined use of shape and sizing design variables
- Substructuring supported using static and dynamic condensation
- With design constraints also from other analysis types like statics, eigenfrequency and weight

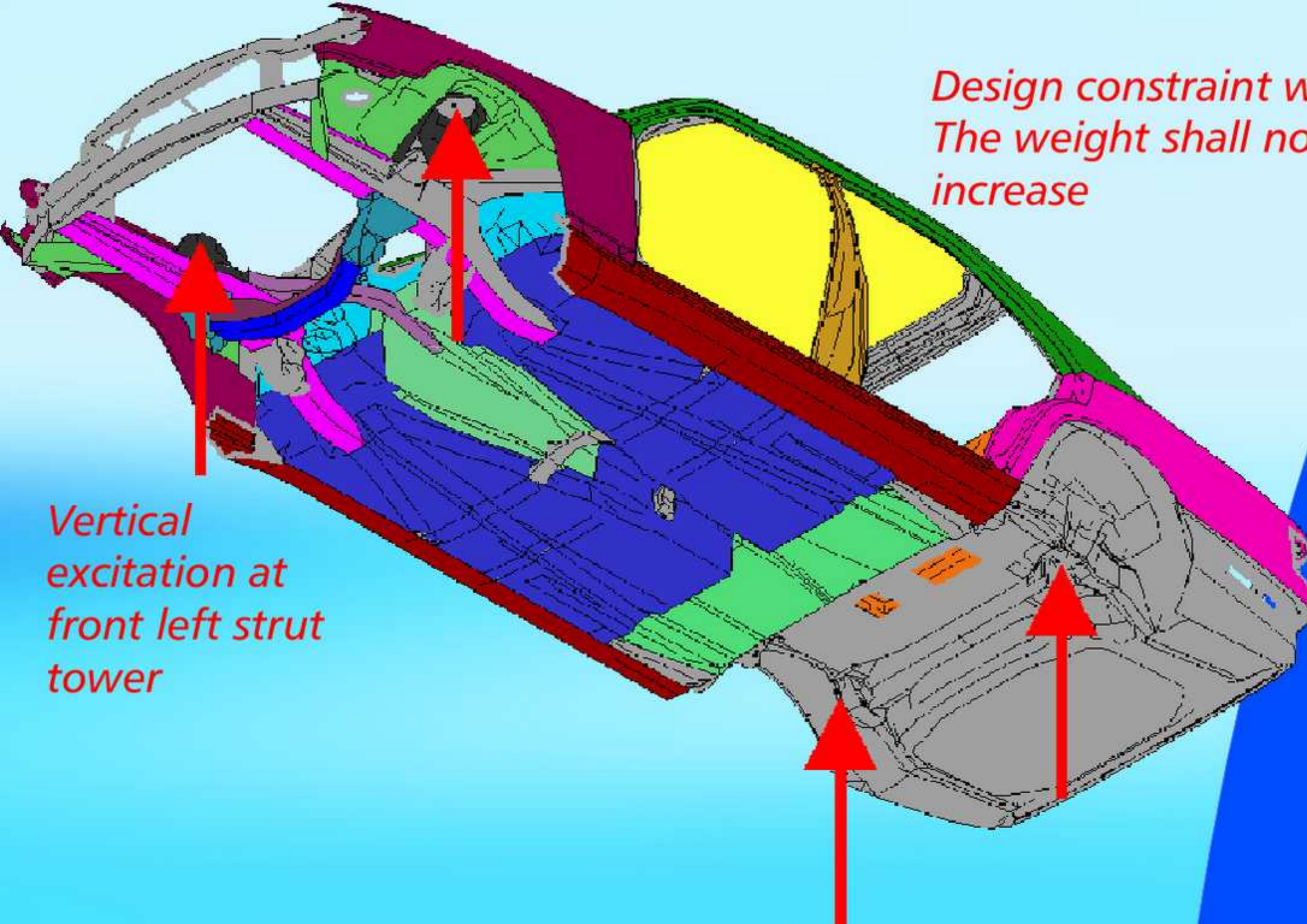
Example:
Minimizing vertical acceleration amplitude of a car at driver's seat position

19 design variables for sheet thicknesses



7 design variables for the shape of rear longitudinal and lateral beams





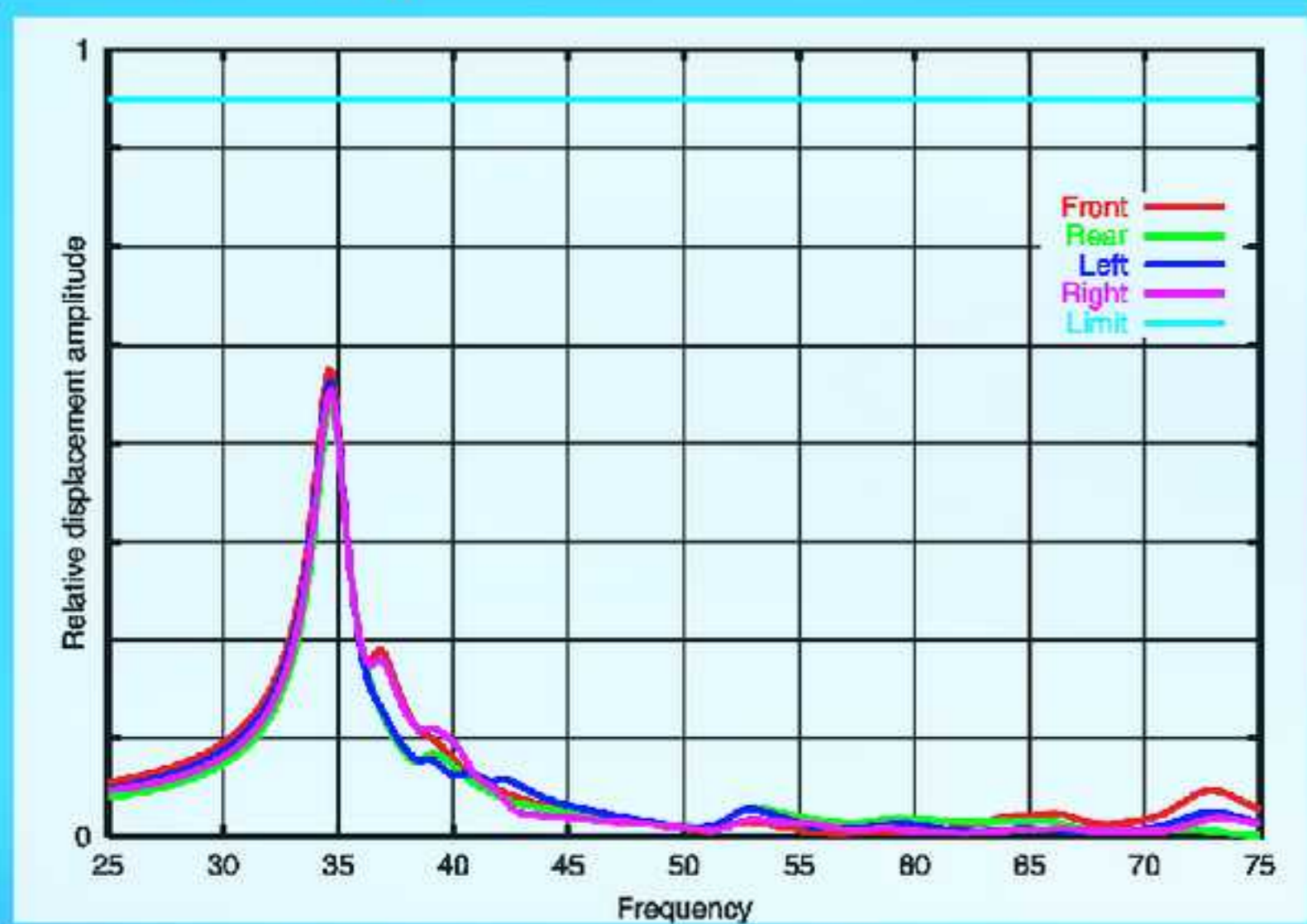
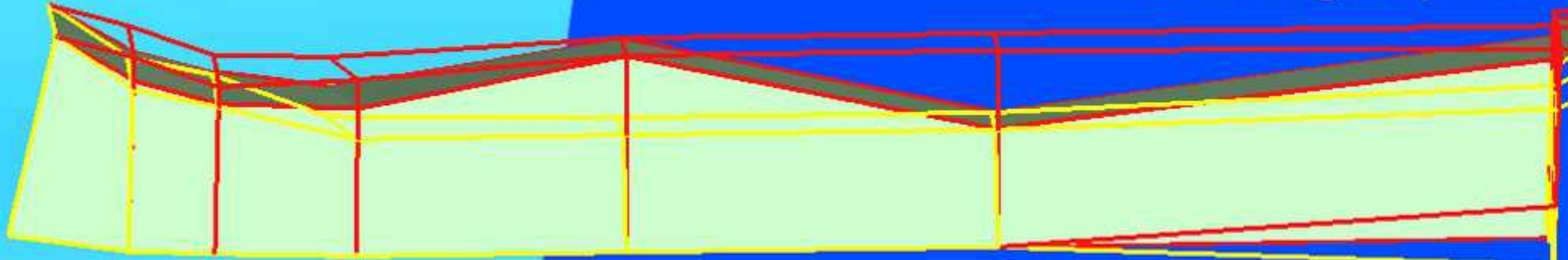
*Design constraint weight:
The weight shall not increase*

*Design constraint torsional stiffness:
Relative displacements at strut towers shall not be beyond a certain limit*

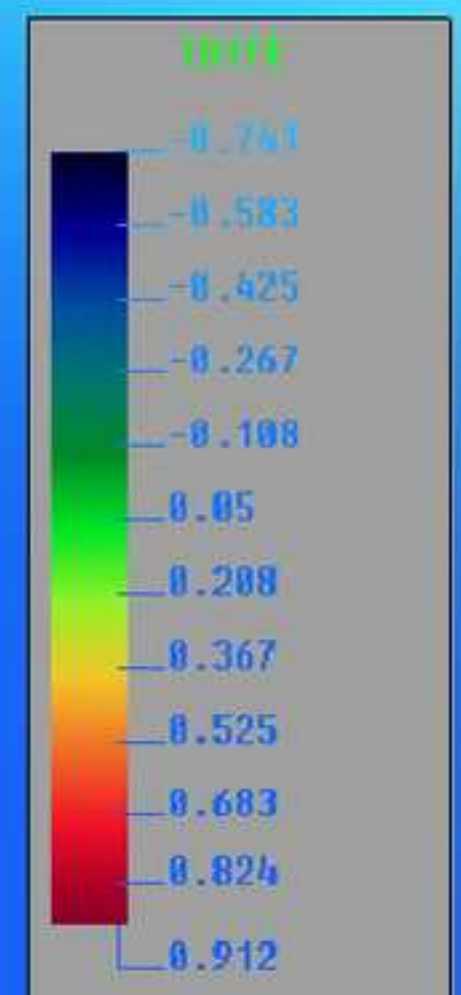
Vertical excitation at front left strut tower

Optimized beam shape between lower limit (yellow) and upper limit (red) of design space

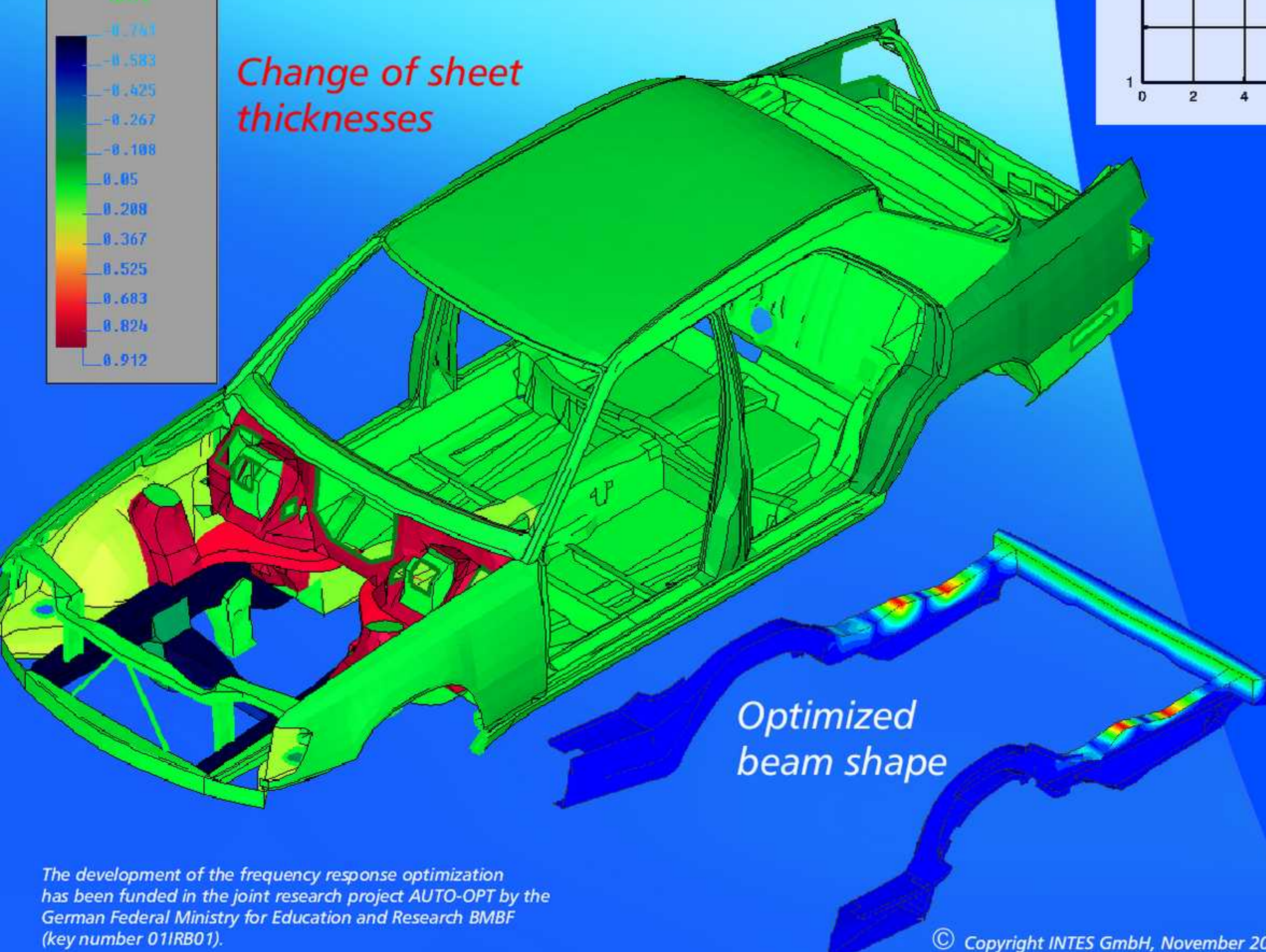
Relative displacements between the supports of the body-in-white



Objective function history (max. acceleration at driver's seat)



Change of sheet thicknesses



Optimized beam shape

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