

# Vehicle Dynamics and NVH

Joint EDAG - Michelin SIMIX

Methodologies for Smart Vehicle Simulation



# Agenda

Efficient Virtual Chassis Development relies on a reliable Model Creation

## Vehicle Model Creation

Vehicle Dynamics by **MICHELIN**  
SIMIX

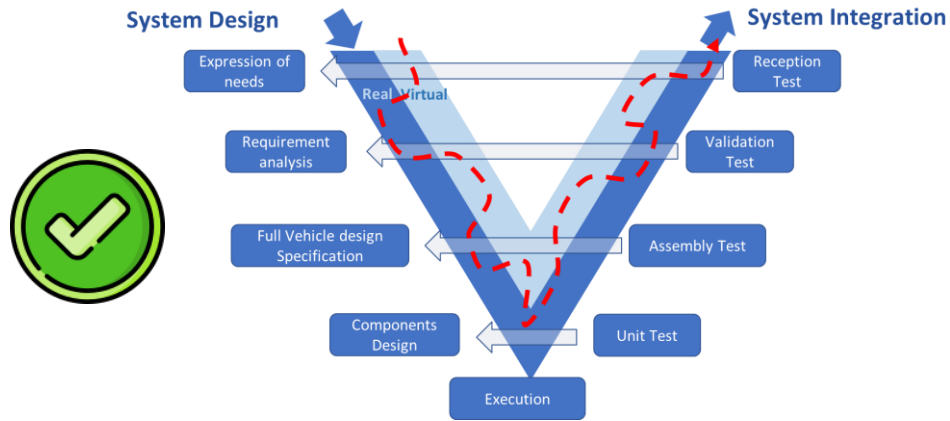
Vehicle NVH by **EDAG**

FSS use case Coupled Noise + Handling (Bushings & Structure) optimization

Conclusion Benefits of the common approach

# Virtual Chassis Development needs on a Reliable Model Creation

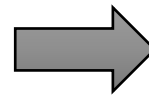
Navigate real and virtual domains



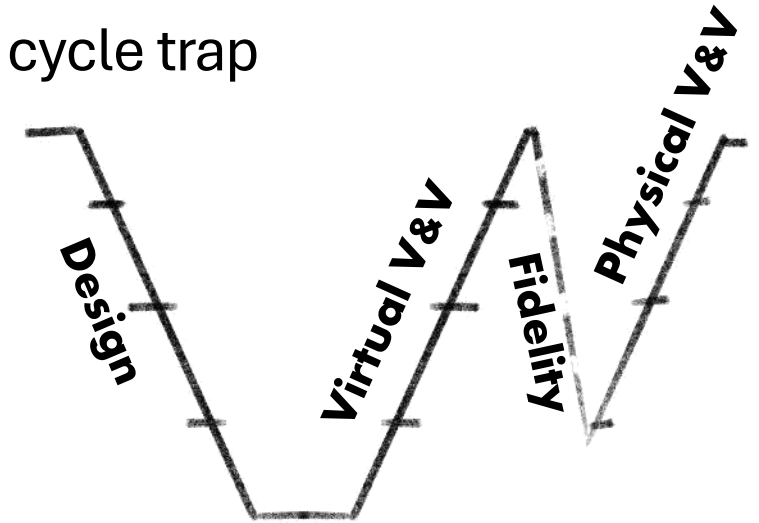
Faster and cheaper R&D

Make better products

Make the right decisions



... "W" cycle trap



**Need for Fidelity (Relevancy)**

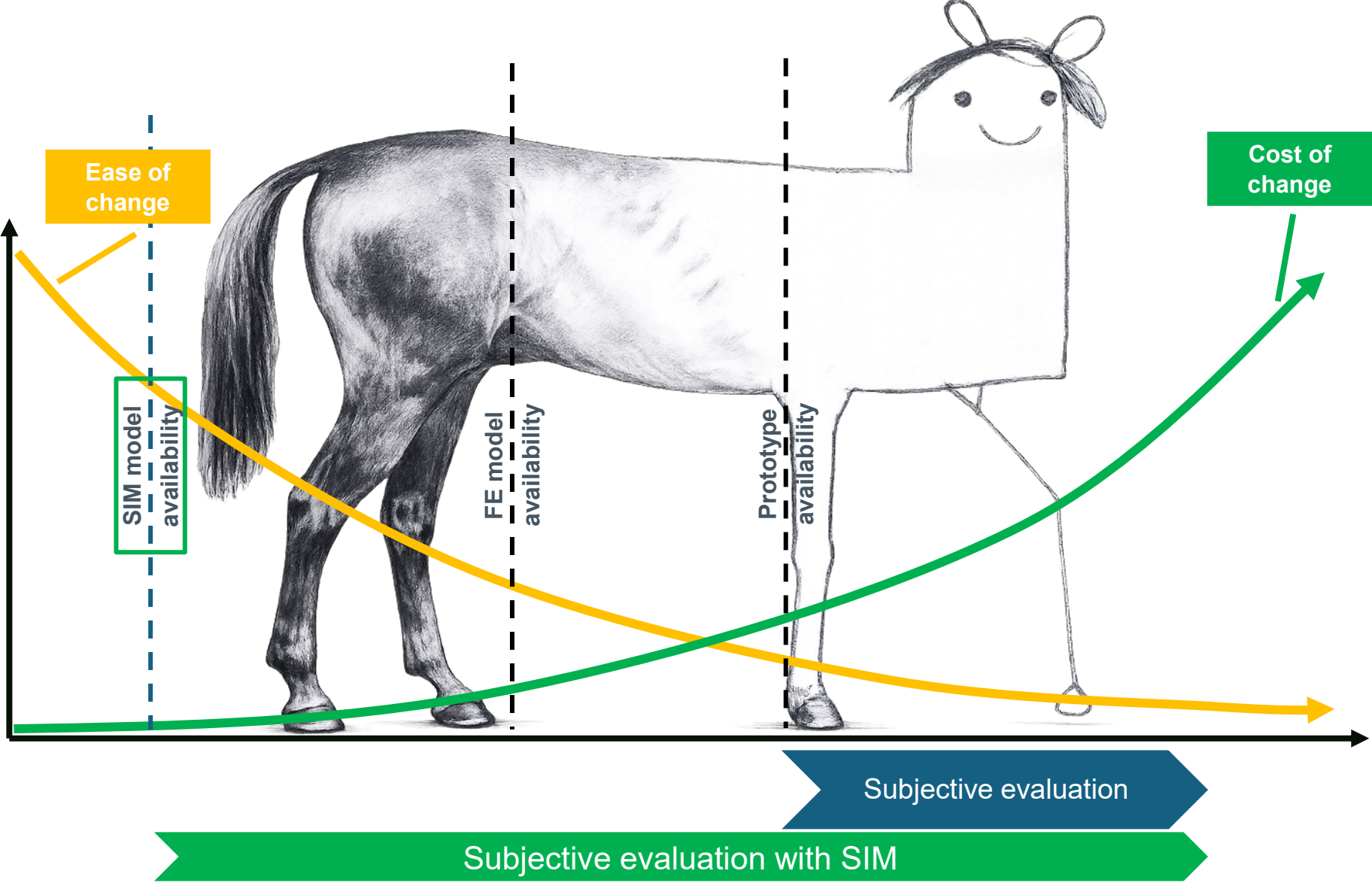
**Tools are great**

**BUT...**



**... Good quality input datasets are hard to get**

# Simulator / Zero Prototype Lab Advantage



# Vehicle Dynamics Model Creation by **MICHELIN** SIMIX

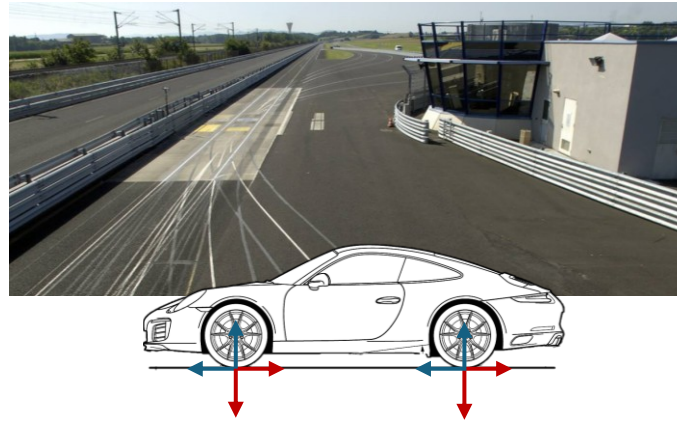
## Static Characterization

KnC, CoG, Inertia, Torsional Stiffness, Steering, Dampers



## Dynamic

Instrumented, Aero, Loads



## Dynamic

On Track + Subjective



## Virtual KnC + Offline Simulation



# Vehicle Dynamics Model Creation by

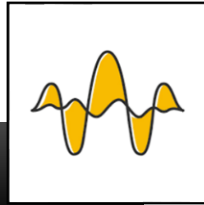
# **MICHELIN** **SIMIX**

## Turnkey Vehicle Model

Different levels of details accessible

... + NVH need

→ How to ?



### Braking

Approximated  
/ communicated by customer

### Aerodynamics

Measured  
/ estimated  
/ communicated by customer

### Suspensions

- Static alignment (toe, camber, ...)
- Full KnC maps (stiffness, induced toe, Induced camber, ...)
- Spring
- Damper (+bumps)

### Steering

- Force feedback
- Friction
- Power steering
- Column stiffness

### Chassis

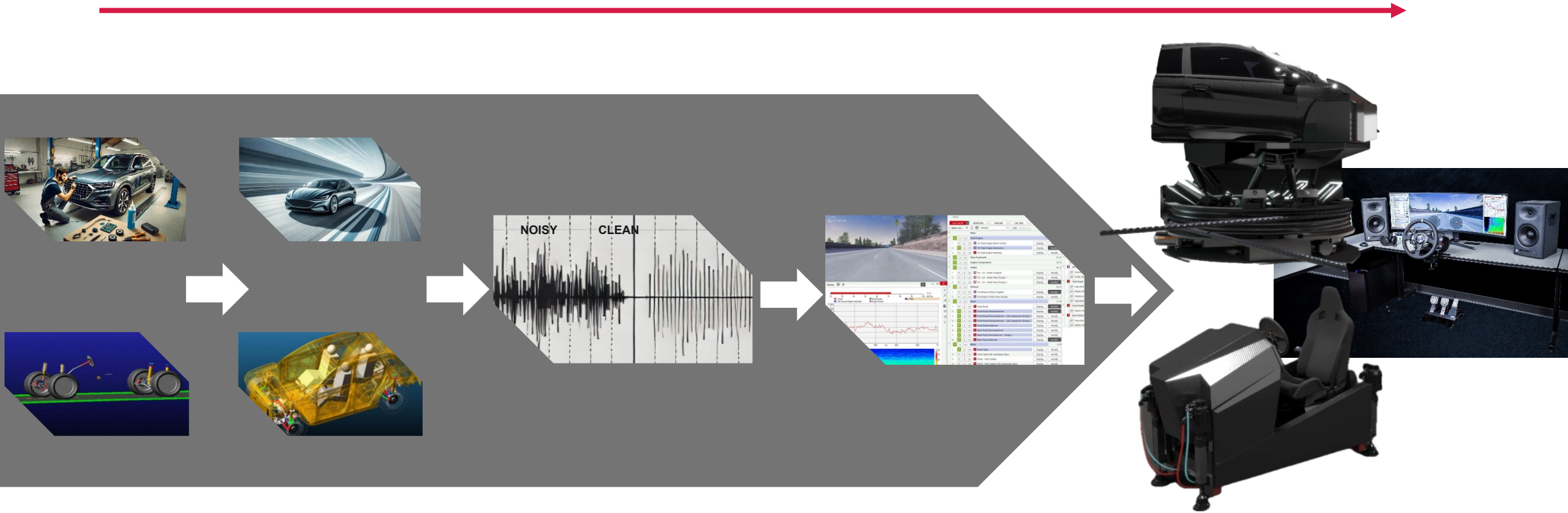
- Mass
- Inertias
- CoG Position
- Chassis stiffness

### Powertrain

Approximated  
/ communicated by customer

# Vehicle NVH Model Creation by

## Workflow



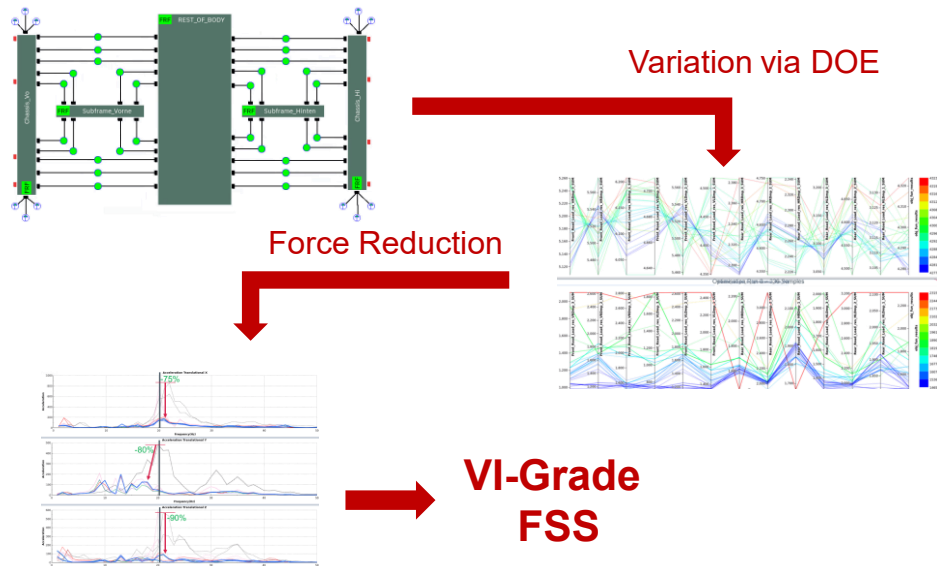
# FSS use case

Coupled Noise + Handling (Bushings & Structure) optimization

## Optimization Process

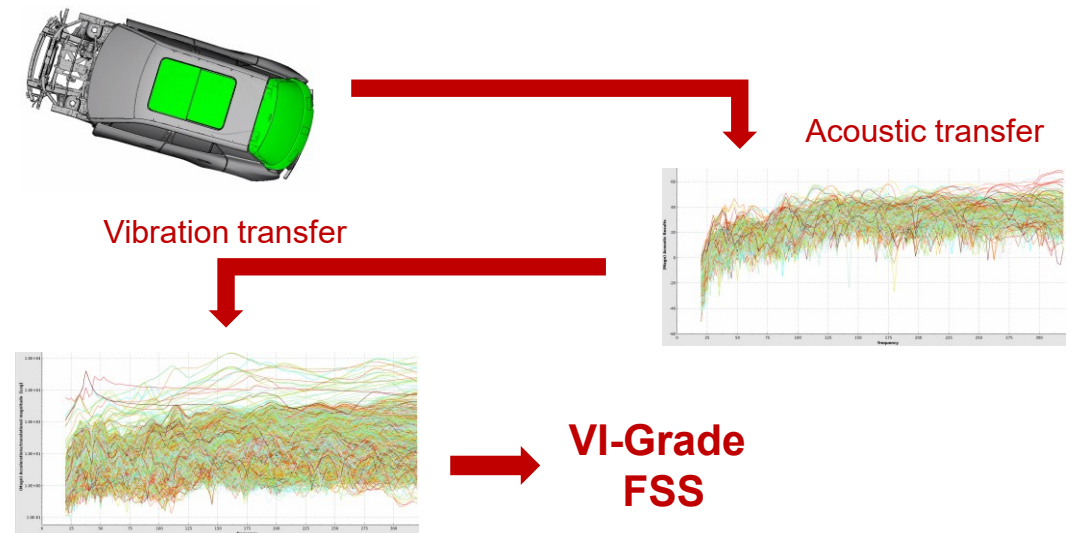
### Sensitivity chassis bushings

Using submodel assembly with variation of key-point stiffness to reduce road load into TB



### Structural modifications

Modification of Body structure and assess real world feedback with modified transfer paths



**MICHELIN**

Frederic Spetler

2026 May 20th – VI-Grade Smart Prototype Summit

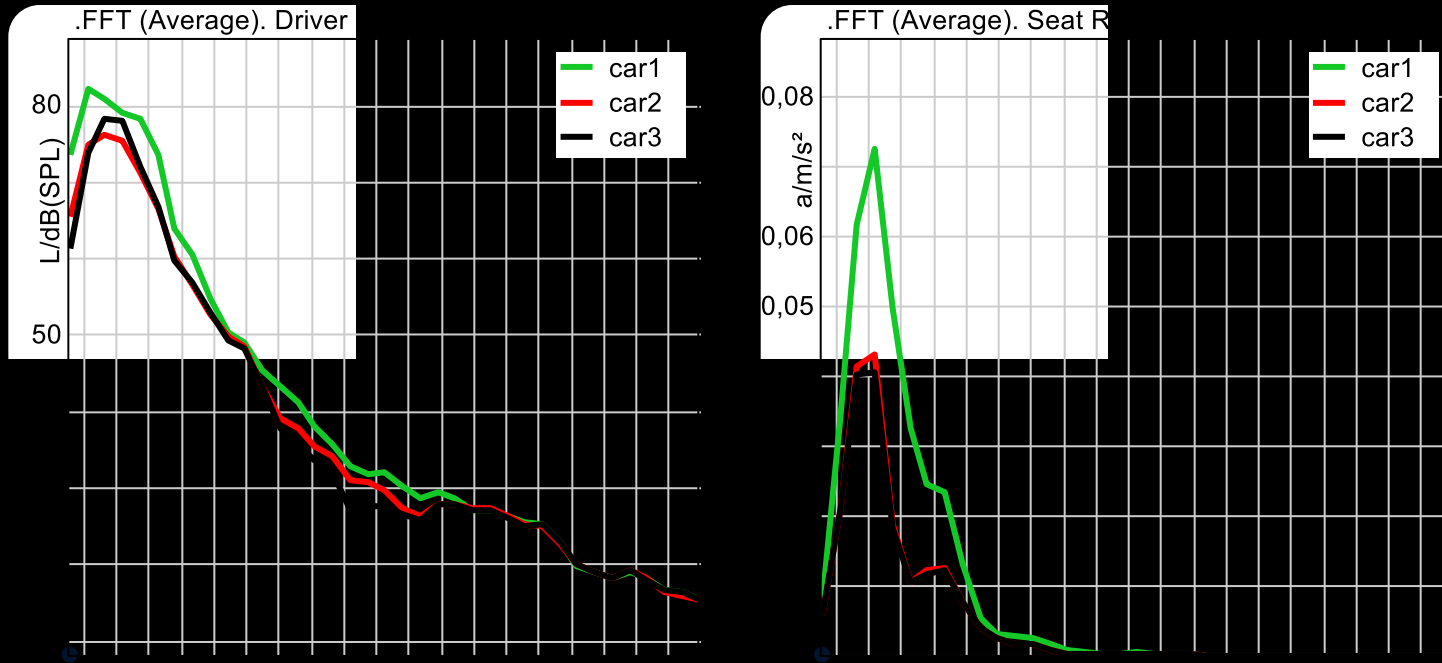


Tobias Krebs

# FSS use case

Coupled Noise + Handling (Bushings & Structure) optimization

## Optimization Results



- Car 1: Baseline Configuration
- Car 2: MBS Bushing Optimization
- Car 3: Combined MBS Bushing and FEA Body Optimization

The vehicle models shown are implemented as displayed and can be driven and perceived subjectively in the Full Spectrum Simulator (FSS) demo.



Together, the Michelin SIMIX platform and the EDAG with its Zero Prototype Lab create a seamless path from simulation and X-in-the-Loop to real driving and test tracks, enabling explainable, high-fidelity validation of tire, vehicle, NVH, and handling performance.

- Accessibility of readily available tire and vehicle models online
- Physics-based models with full transparency (no black boxes)
- Closed-loop capability from virtual design to real object
- Hi-Fi realism and immersion with physical explainability
- Capturing NVH-handling interactions through joint force representation
- End-to-end process mastering from simulation and Driver-in-the-Loop to physical testing

# Thanks for your attention !

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