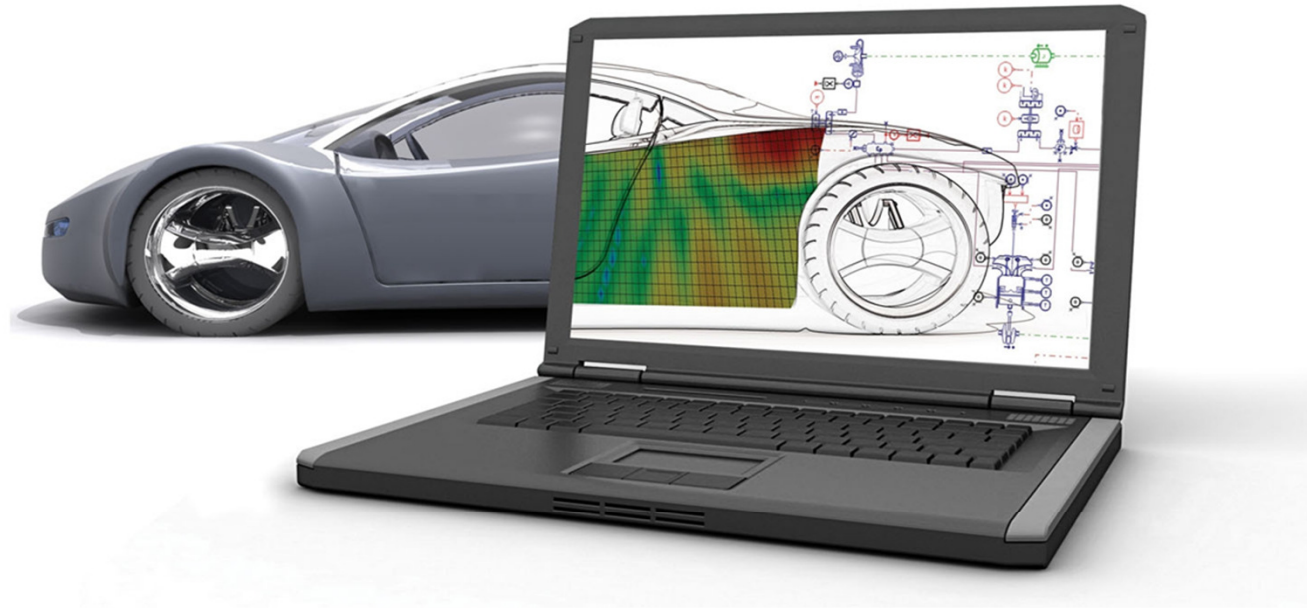


Leading partner in
Test & Mechatronic Simulation



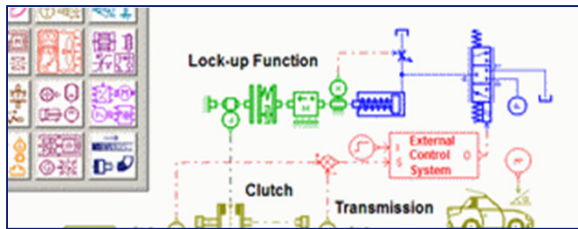
Building out traditional NVH-tools for ECO-engineering

Meeting the NVH-engineer's needs

Engine Expo 2012
Wilfried Claes – Product Line Manager NVH Testing



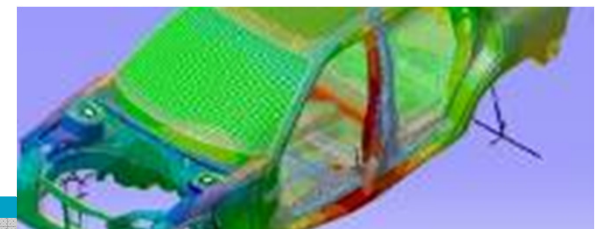
LMS, a unique portfolio of engineering innovation solutions



LMS Imagine.Lab
1D simulation solution



Engineering Collaboration
Simulation Integration in PLM



LMS Virtual.Lab
3D simulation solutions



LMS Test.Lab
Test-based engineering solutions

LMS SCADAS
Mobile – Recorder – Lab

LMS Engineering and Deployment Services



LMS Tec.Manager
Test data management

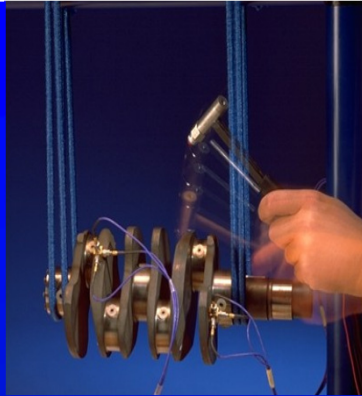


LMS Samtech
SAMCEF

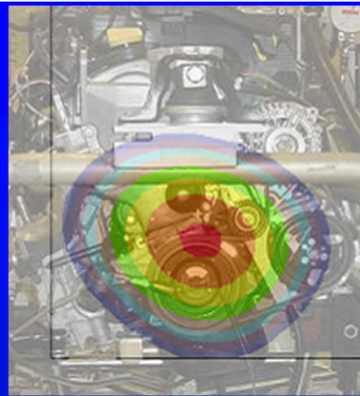
Test - Overview



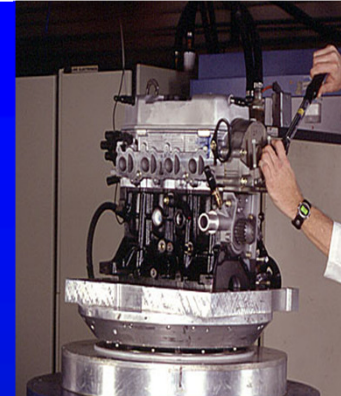
**Rotating
Machinery**



**Structural
Testing**



**Acoustic
Testing**



**Environmental
Testing**



**Durability
Testing**

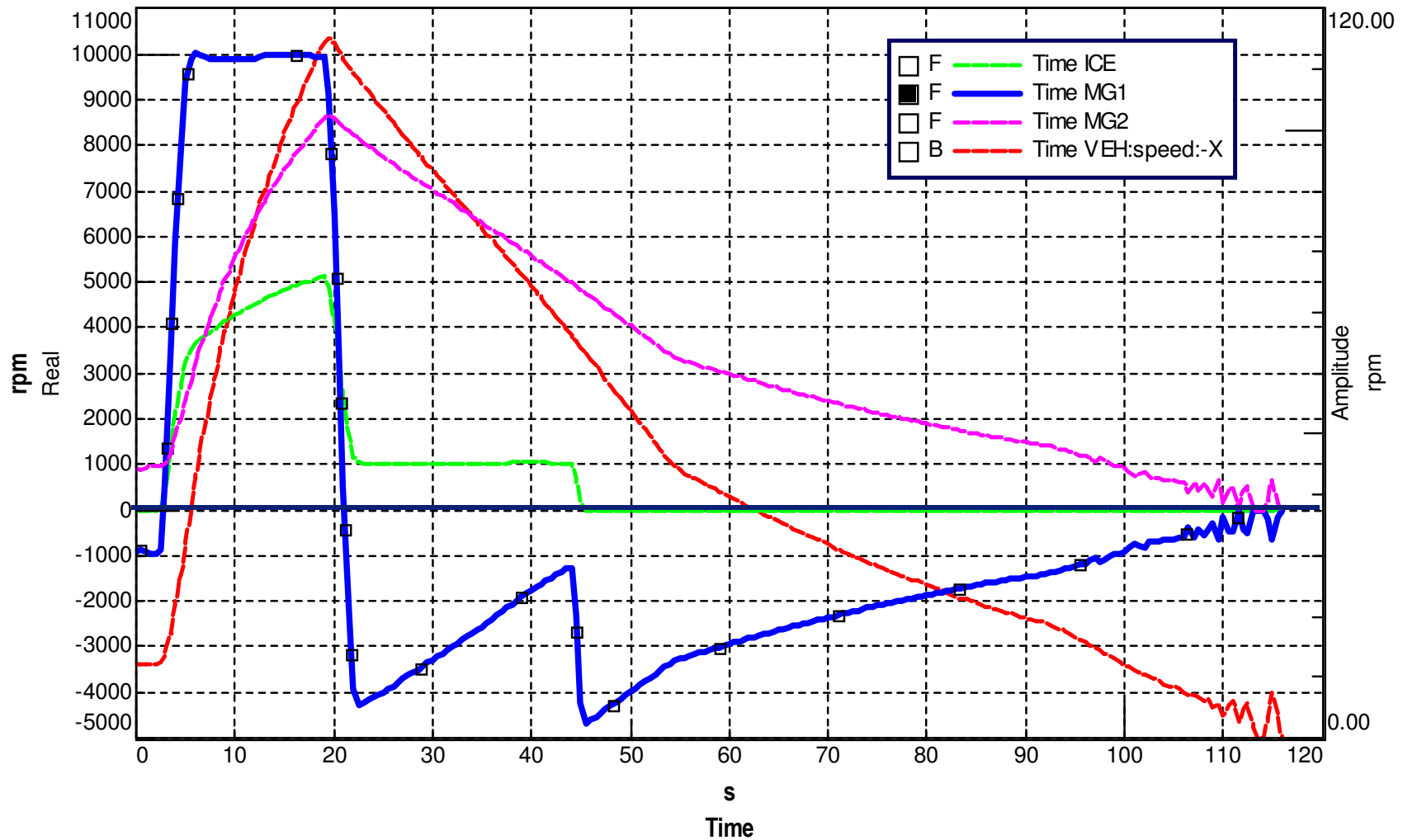


**Reporting
Data sharing**



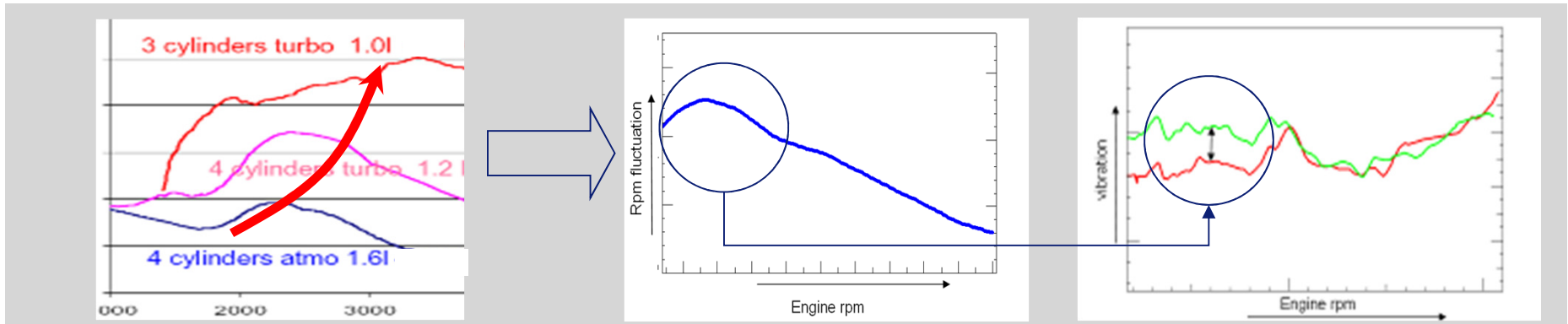
Rotational dynamics

Positive and Negative sense of rotation



Rotational Dynamics Torsional Vibration

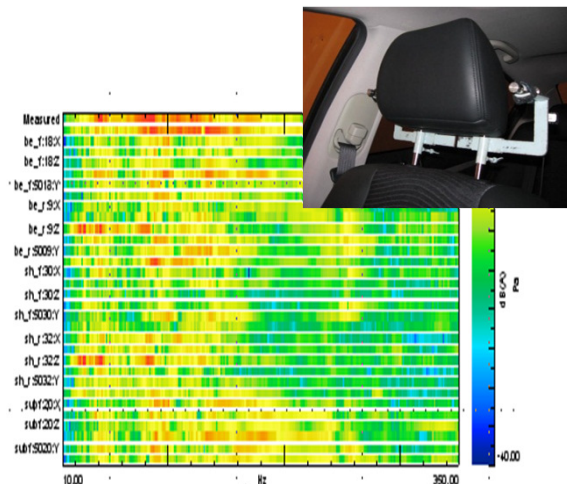
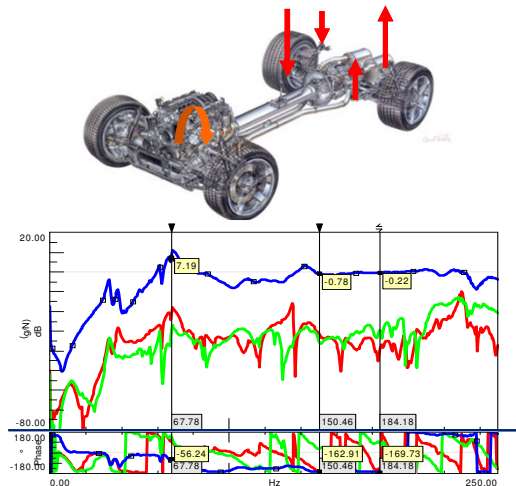
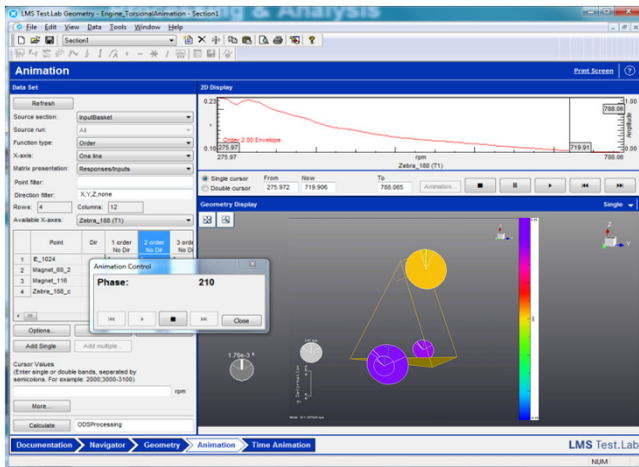
Increased torque fluctuations - Higher body excitation - Booming noise



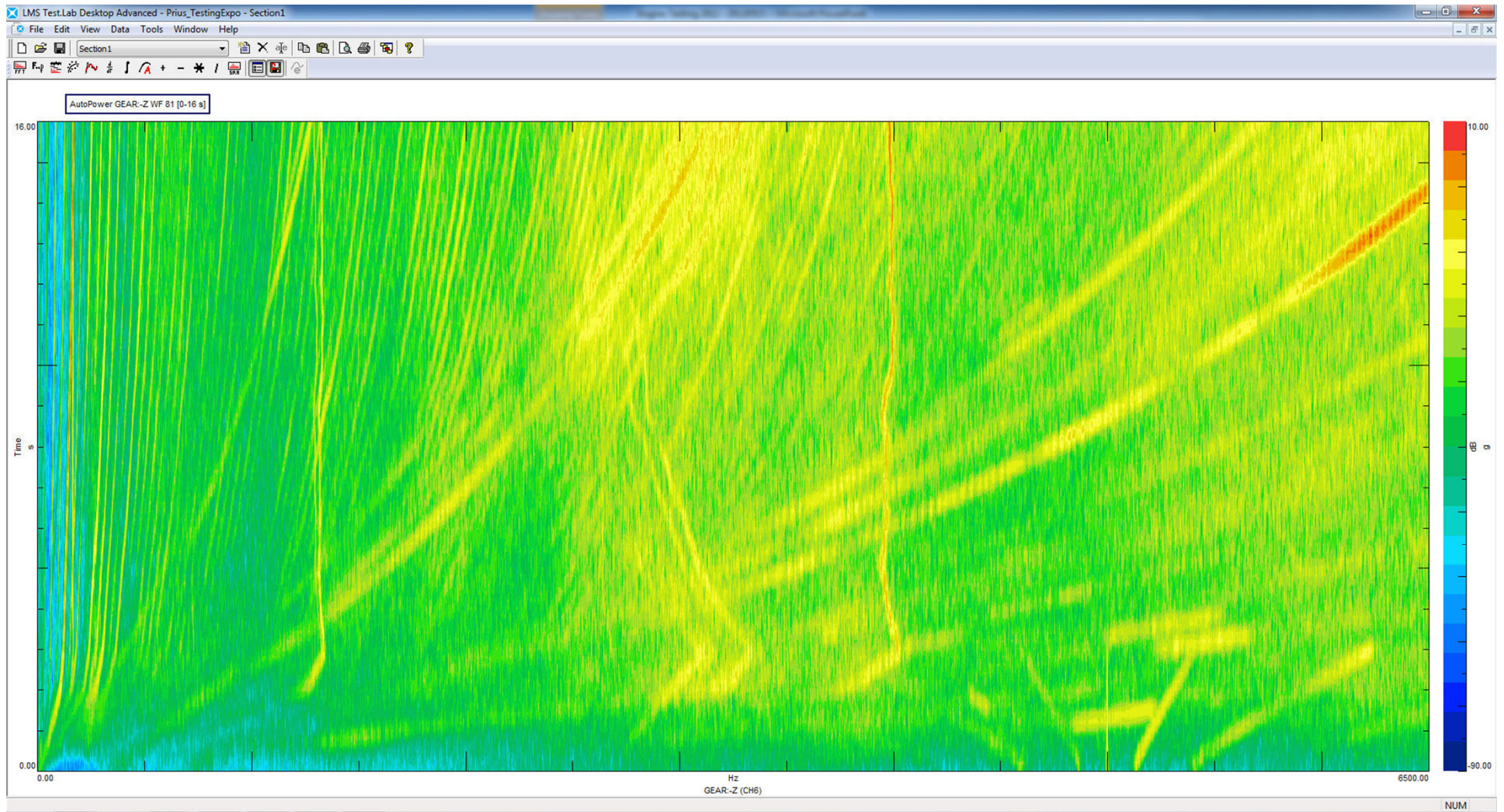
Torsional Vibration Testing/Analysis
Multi-channel, using analog
and digital tacho sensors...

...in “full NVH Context”
To link Torque Fluctuations
to Dynamic Interface Forces...

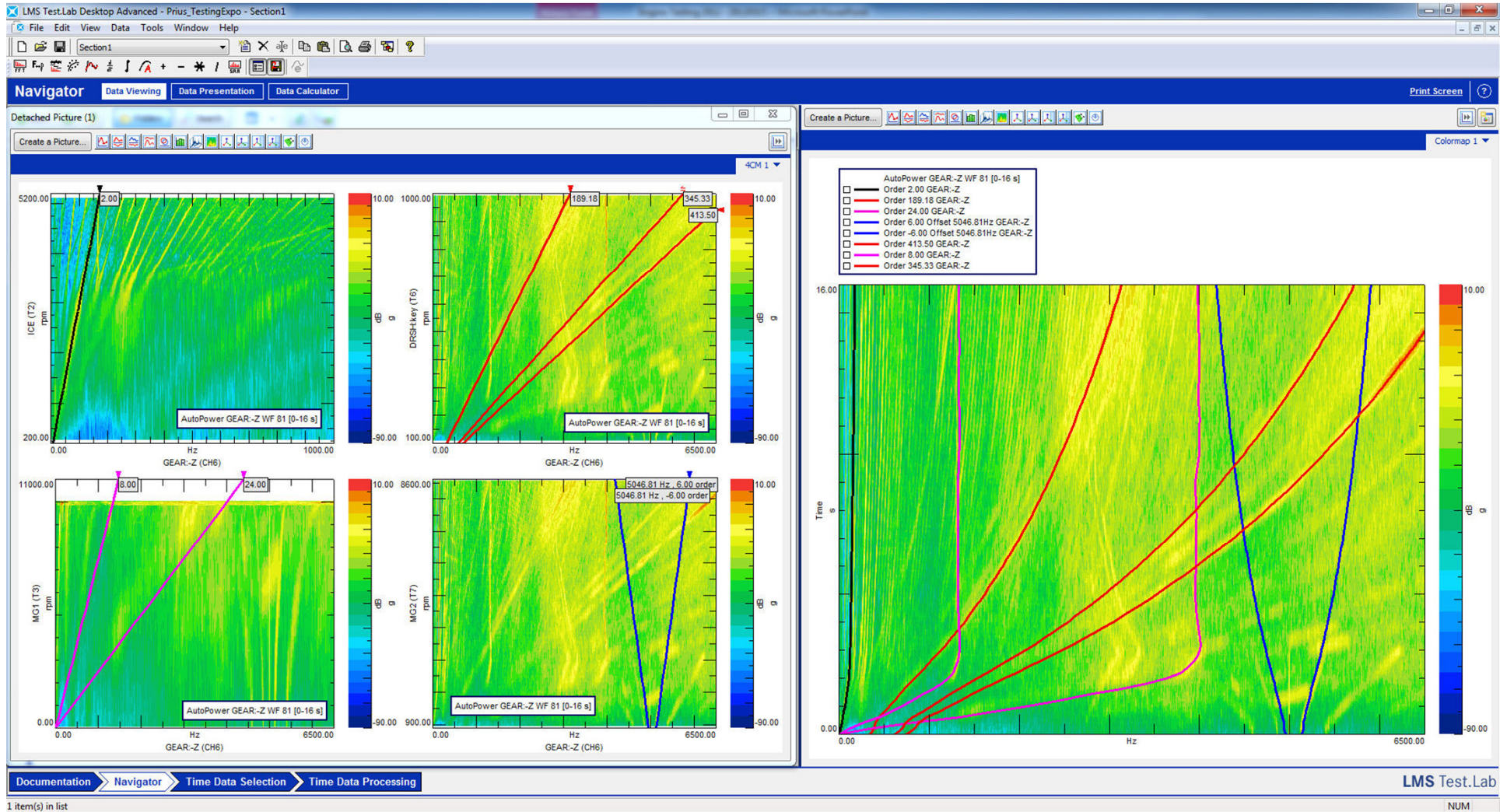
...Transfer Path Analysis (TPA)
Insights in contribution
to NVH Comfort



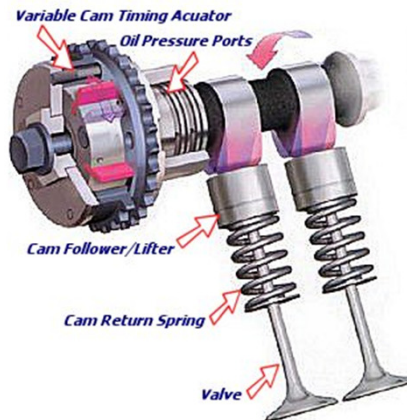
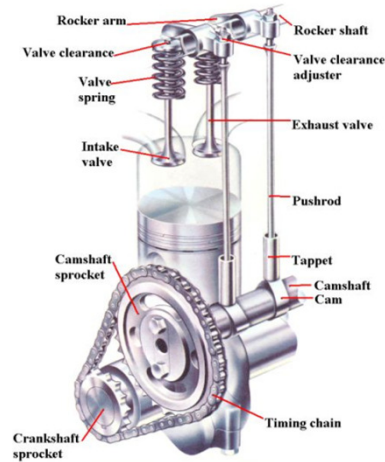
Rotational Dynamics Contribution diagnostics



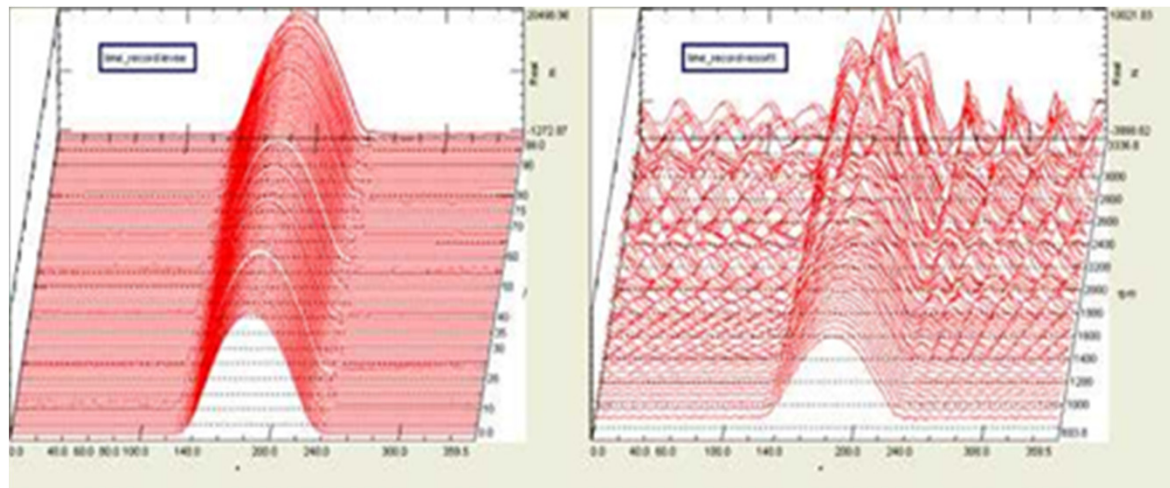
Rotational Dynamics Contribution diagnostics



Rotational Dynamics (Variable) Valvetrain Testing

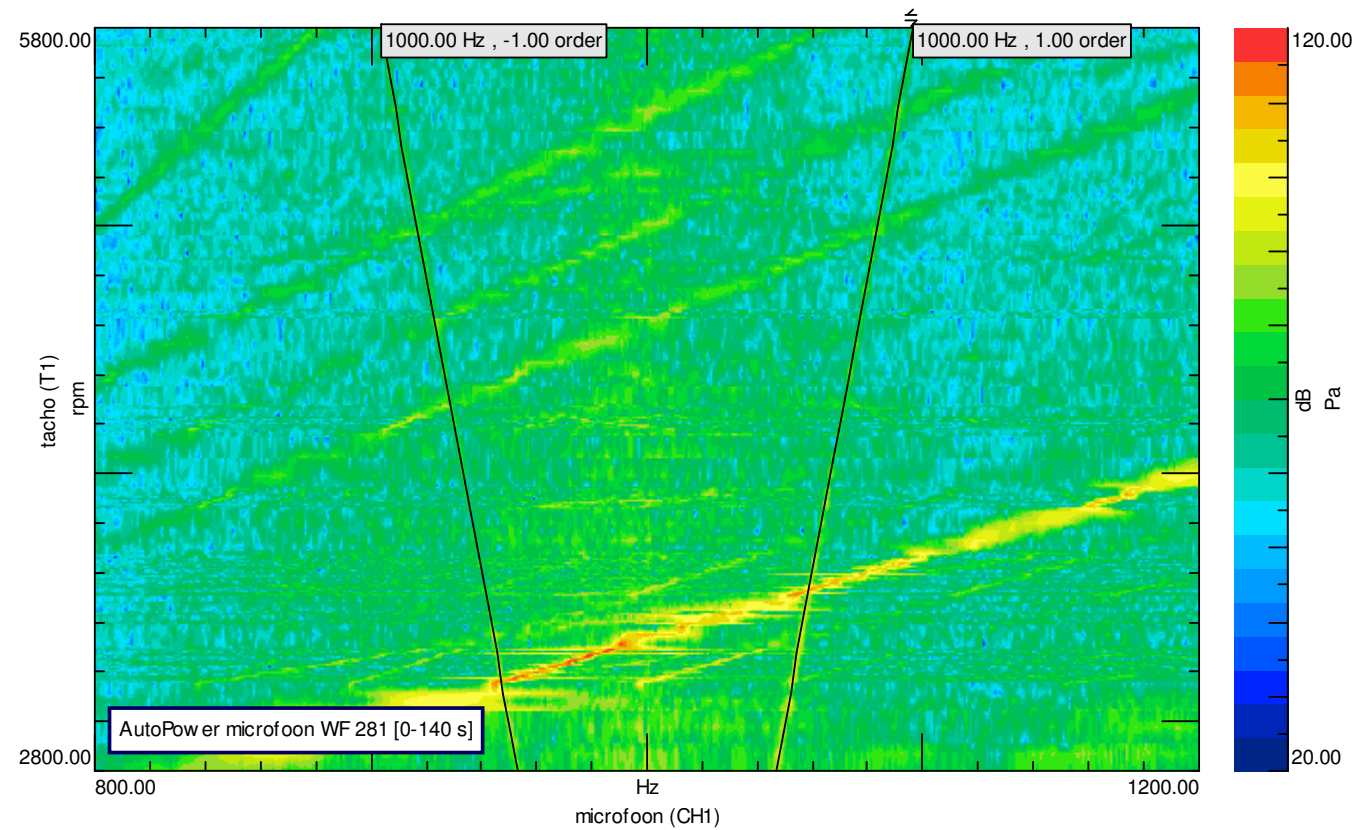
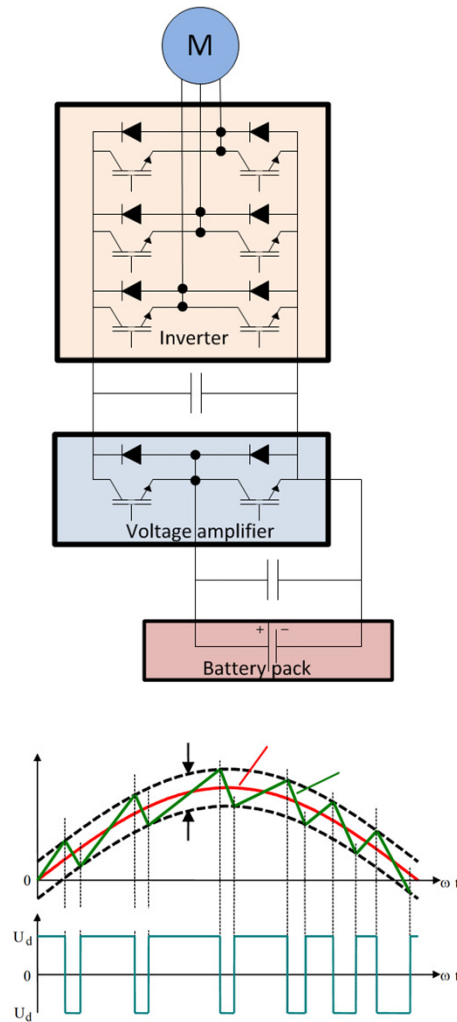


**Time Domain Acquisition & Analysis – Spectral Analysis –
Order Analysis – Torsional Vibration Analysis – Angle Domain
Analysis**



Electrification of Drivetrain

Invertor noise

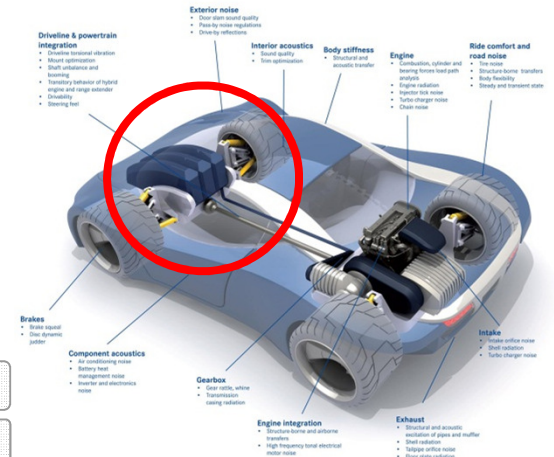
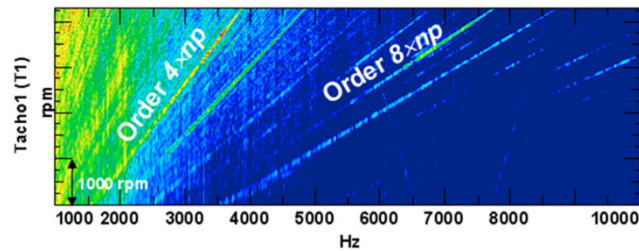


Electrification of Drivetrain Transfer Path Analysis

Engine & Powertrain

Auxiliaries

Vehicle Integration



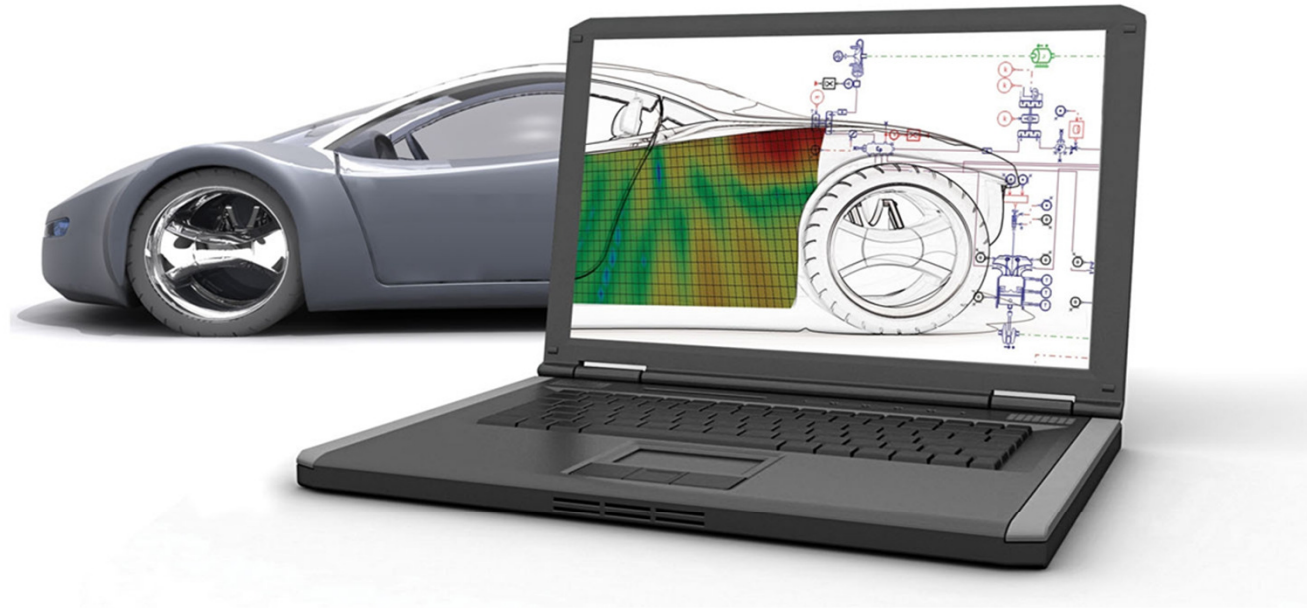
Physical <u>Source-Transfer-Receiver</u> model			Statistical model
Transfer Path Analysis (TPA)	LMS OPAX		Operational Path Analysis (OPA – OTPA)
Classical method for <u>detailed</u> analysis	From <u>fast</u> but still <u>accurate</u> to <u>detailed</u> analysis		Extremely fast Warning: <u>high risk of false identification</u>
✓ Panel Contribution ✓ Sound Power & Intensity ✓ Single Path Inversion ✓ Matrix Inversion	- Parametric model for Airborne Source Quantification (ASQ) - Parametric models for Structural Source Quantification ✓ Soft mounts ✓ Rigid connections		Transmissibility
✓ Direct load measurement ✓ Mount Stiffness ✓ Single Path Inversion ✓ Matrix Inversion	- Interface loads - Component sensitivity - Noise Transfer Function - Single & Multi Reference Principal Component Analysis - Frequency/Order & Time Domain results - High frequency analysis (Energetic methods) - What-if engineering - Component Editing	- Yes - Yes - Yes - Yes - Yes - Yes - Yes	Transmissibility No No Yes – High risk of false identification Yes – High risk of false identification Yes – High risk of false identification No (No force identification / Statistical model limitation)

Electrification of Drivetrain

Virtual Car Sound



Leading partner in
Test & Mechatronic Simulation



Thank you

Engine Expo 2012
Wilfried Claes – Product Line Manager NVH Testing

