

THE LARGEST OEM REPRESENTATION IN A UNIQUE INTERACTIVE GLOBAL AUTOMOTIVE ACOUSTICS & VIBRATION CONFERENCE

Automotive ACOUSTICS & VIBRATION



International Forum

25-26 September 2018, Birmingham, UK

EXCLUSIVE GUIDED TOUR
OF THE JAGUAR LAND ROVER ENGINEERING
& PRODUCT DEVELOPMENT SITE IN GAYDON!

ORGANIZED BY



IN CO-OPERATION WITH



VENUE: National Conference Centre, Birmingham

With featured experts, among others, from:



SPONSORS:



Testimonials from our Forums in 2015 - 2016 - 2017:

"One of the best events we have ever seen on automotive NVH"

Diego Copiello, Free Field Technologies

"I've met many of the key players in the industry and understand their issues now so that we can look for solutions that suit their needs"

Phil Bownds, Brüel & Kjær

"Based on the way that it has been organized and the high level of delegates that were here, including a lot of decision makers, we've met all the right people and I developed more leads than from most other exhibitions"

Matt Lucas, HBM Prensica

"One of the best Forums I have been to with respect to networking opportunities. Very well organised"

Tony Shepperson, Head Acoustics UK, Ltd.

"The presence and contribution of this conference makes it unique in the UK"

Clive Sutton, Ricardo UK

"The best you can get about NVH from people that are dealing with the real automotive challenges"

Simon Vipavec, Akrapovic

"Great networking opportunity and chance to see high quality presentations"

Marco Tarabra, Ferrari S.p.A

Scientific Committee & Keynote Speakers:



Aaron Hankinson
Chief Engineer, Driven Attributes,
Product Engineering
Jaguar Land Rover, UK



Jonathan Layfield
Head of Vehicle Physics
Bentley Motors Limited, UK



Marco Tarabra
Head of Acoustics
Ferrari S.p.A., Italy



Per-Olof Sturesson
Senior Director Driving Dynamics
and Noise & Vibration Centre
Volvo Car Group, Sweden

Over 150 companies from over 20 countries were represented in 2015-2017, including: Jaguar Land Rover - Bentley Motors Limited - Honda R&D - Porsche AG - McLaren Automotive - Audi AG - Bugatti - VolvoCars - Ferrari S.p.A. - Ford - Nissan Technical Centre - Nissan Motor Manufacturing (UK) Ltd. - Daimler AG - Scania - PSA PeugeotCitroen - Aston Martin Lagonda - Honda R&D Americas - Renault SportCars - Ford Otosan - Volkswagen Group UK Ltd. - Volkswagen Osnabrück GmbH - Mercedes-BenzTürk - NIO - NextEV (UK) Limited - PorscheEngineering GmbH - Hyundai MotorCo - Hyundai MotorEuropeTechnicalCentre - TATA Motors - Toyota Motor Corporation - Head Acoustics - Exa - WSB - Mueller-BBM - MSC Software - Siemens Industry Software NV - Brüel & Kjær - ANSYS - Visiconics - Silenium - AltairEngineering - Treileborg - Campbell Associates - Continental - Automotive GmbH - DTR VMS Ltd - ESI UK Ltd - FEV GmbH - G.R.A.S sound & Vibration UK Ltd. - ISVR University of Southampton - Acsoft - Konzept-X GmbH - MagnaPowertrain ECS - Mecaplast Group - MTSystems Ltd - Polytec Ltd - Pritech Ltd - Prodrive - Recticel - Ricardo MTC - Saint-Gobain PerformancePlastics - Ricardo UK Ltd - Vibracore - AVLlist - Sri Lanka Institute of Technology - GBIE Inc - Huntsman Europe - FSUE "NAMI" - Prosig Ltd - ASDEC University of Leicester - of Leicester - Horiba-Mira Ltd - Foamotive - MillbrookProving Group - AphonePlus - Tenneco GmbH - Siemens STS - BRP Inc - Valeo Air Management UK - CD-adapco - The Autins Group Plc - Liebherr Machines Bulle - Corning Inc - Idida Automotive Technology - Mafflow BRSSRL - TectonicElements - Optis Genesis - HBM Prensica - Acrapovic d.d. - Automotive Insulation Ltd - Autonom Management AG - AWTC-EUR - Ansol - Apollo Tyres Global R&D B.V. - AZL-Technology Center GmbH - Beond S.r.l. - CKAUTO S. Coop - Coatek International Ltd. - Engineering Center Steyr GmbH & Co KG - Fontaineware Tech - Frazer-Nash Consulting Ltd. - IG Watterweir Ch s.r.o. - Italdesign Giugiaro S.p.A. - IIT Italia s.r.l. - Kistler Instrumente AG - HV Solutions - Optis-Genesis - Schlegel and Partner GmbH - Sensing Precision Limited - Shiloh Industries Inc. - STS Acoustics S.p.A. - Tecman Speciality Materials Ltd. - Treileborg Sealing Solutions Kaimar AB - University of Leicester - Vibes Technology BV - Vibracoustic GmbH & Co. KG - Dyson Technology Limited - Le Mans Acoustique - AWTC-EUR

Hear about the latest case studies on:

- ▶ NVH in chassis, powertrain and body engineering
- ▶ Active and adaptive exhaust systems and motor sound enhancement
- ▶ Design of advanced pedestrian alert systems and minimization of environmental noise pollution

Discover innovative concepts in:

- ▶ Psychoacoustics, Sound branding and balance between refinement and acoustic character
- ▶ Acoustic requirements and sound quality for EVs and HEVs and fully autonomous vehicles
- ▶ Full NVH simulation, testing and validation, acoustic integration and attribute balancing

Learn about advanced technologies in:

- ▶ Structural dynamics and materials science, solutions with lightweight passive NVH tools
- ▶ Aero-acoustics technologies, duct acoustics and combination of acoustic and thermal performance optimization

Join our interactive sessions and discuss with leading experts about:

- ▶ Cost efficiency and effective co-operation between OEMs and suppliers
- ▶ Passive NVH solutions versus active sound technologies
- ▶ Sound branding and marketing aspect of NVH
- ▶ Reconciliation of vehicle performance with legal requirements for pass-by noise regulation



To Register: T +44 1618 841 208, +44 161 768 0059 | E info@internect.co.uk

<https://www.internect.co.uk/content/3/international-forum-automotive-acousticsvibration-nvh>

AGENDA | SEPTEMBER 2018

Welcome to the 4th International Forum

Automotive Acoustics & Vibration - NVH 2018

Dear members of the Automotive Acoustics & Vibration - NVH Community,

The Auto Industry is facing the greatest challenge it has seen for nearly 50 years. The move to a future of Autonomy, Connectivity and Electrification, along with unprecedented market changes, cost pressures and complexity, means that the world of Automotive Acoustics has never been more exciting and challenging. The need to be more efficient, more complex, lighter, cheaper, better, faster, having a larger range, better emissions and economy, presents challenges to us as engineers that we haven't faced before. The need to share learning, develop technologies and approaches has never been more important.

Over the last three series of our **International Forum on Automotive Acoustics & Vibration - NVH**, representatives from more than **150 international companies**, from **20 different countries**, have experienced a **special, networking intensive conference**.

This year, in co-operation with one of the world's leading manufacturer of luxury automobiles, **Jaguar Land Rover**, Internect Ltd. is hosting the **4th Automotive Acoustics & Vibration - NVH Forum**, on **25th and 26th of September 2018**, at the **National Conference Centre, Birmingham, UK**.

Our **selective participant field**, with **decision makers, heads of departments, senior experts** from **international companies, NVH suppliers, prestigious research institutions** and the **largest representation of OEMs** will bring together the latest acoustics 'State of the Art' through a variety of **interactive sessions, panel discussions, workshops, industry case studies** and a **selection of high quality presentations**.

An **exclusive visit** to the **Jaguar Land Rover Engineering Centre** in **Gaydon** with a **guided tour** of the **Full Vehicle NVH Simulator, Jaguar Land Rover Test Laboratories** and **JLR Driving Dynamics Simulator**, followed by our **networking evening get-together** and **dinner** will round up this unique conference experience.

Don't miss the opportunity to join the premier Automotive NVH Conference, the event with largest OEM representation, the **NVH meeting venue for automotive manufacturers and suppliers!**

Gain insight into **powertrain, chassis and body NVH engineering, active and passive NVH technologies, sound design for high performance EV-HEVs & autonomous vehicles, NVH simulation, testing & validation, aero-acoustics, sound branding and psycho-acoustics** as well as **lightweight materials for noise control**, among many other topics.

We look forward to welcoming you in Birmingham to make this event another great success in the global automotive engineering calendar!

Best regards



Aaron Hankinson
Chief Engineer
Driven Attributes
Product Engineering
Jaguar Land Rover, UK



Maria Nikolopoulou
Managing Director
Internect Limited, UK



Conference Location:



**National Conference Centre
in Birmingham, UK**

Coventry Road Bickenhill Solihull West Midlands B92 0EJ
Based at the National Motorcycle Museum





Sponsorship and Exhibition Opportunities:

Are successful marketing strategies and fruitful networking opportunities among your biggest challenges? Are you looking for an effective means to:

- Raise the profile of your business
- Enhance the perception of your brand
- Interact with a targeted international participant field of your prospective and existing clientele?

With our strategic marketing campaign ahead of the event we contribute to your **company's recognition**, positioning you as a leading supplier through verbal and online means. At the conference we offer you an excellent platform to **display your solutions, services and products, network with your target audience and influence other companies' budgeting.**

How?

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and test" process that has traditionally been used in product design.

MSC Software develops simulation software technology that enables engineers to validate and optimize their designs using virtual prototypes. Customers in almost every part of manufacturing use our software to complement, and in some cases even replace the physical prototype "build and test" process that has traditionally been used in product design. <http://www.mscsoftware.com/>

Free Field Technologies (FFT), an MSC Software Company, is a leading global company focused on **acoustic simulation** and engineering services. Actran, FFT's software suite, leads numerous technology trends of vibro and aero-acoustic modelling. Used by key actors of the Automotive, Aerospace, Home Appliance and Heavy Equipment industries, Actran helps engineers **reduce noise and improve the sound quality** of their products. Actran is chosen for both its powerful general purpose simulation features and its unique capabilities to **address specific industrial needs.** www.fft.be



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we provide shorten development time, ensure component quality and optimize vehicle performance. We offer advanced NVH solutions like the NVH Simulator and DISCOM NVH Analysis systems. <http://www.bksv.com>

Brüel & Kjær has led the Sound & Vibration field for over 75 years, and that is not about to change. Brüel & Kjær's Automotive division helps customers solve NVH challenges by developing advanced technology for measuring and managing sound and vibration. The solutions and technology we provide shorten development time, ensure component quality and optimize vehicle performance. We offer advanced NVH solutions like the NVH Simulator and DISCOM NVH Analysis systems. <http://www.bksv.com>



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and international level. We aim to create synergies between research, education and innovation (industrial companies) and to foster collaborative projects in the field of acoustics. Le Mans Acoustique has over 300 players working in the field of acoustics, making the city of Le Mans the European Capital of Acoustics. www.lemans-acoustique.fr

Le Mans Acoustique brings together the acoustics players of Le Mans, France to spread around the world its unique concentration of expertise in acoustics. It is a new institute founded to further the interests of acoustics-based projects in research, innovation and education on a national and international level. We aim to create synergies between research, education and innovation (industrial companies) and to foster collaborative projects in the field of acoustics. Le Mans Acoustique has over 300 players working in the field of acoustics, making the city of Le Mans the European Capital of Acoustics. www.lemans-acoustique.fr



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test and pre-certify their future products. Coupled with the latest technologies, Virtual Prototyping is now anchored in the wider concept of the Product Performance Lifecycle™, which addresses the operational performance of a product during its entire lifecycle, from launch to disposal. The creation of a Hybrid Twin™, leveraging simulation, physics and data analytics, enables manufacturers to deliver smarter and connected products, to predict product performance and to anticipate maintenance needs. <http://www.esi-group.com/>

ESI Group is a leading innovator in Virtual Prototyping software and services. As a specialist in material physics, ESI has developed a unique proficiency in helping industrial manufacturers replace physical prototypes by virtual prototypes, allowing them to virtually manufacture, assemble, test and pre-certify their future products. Coupled with the latest technologies, Virtual Prototyping is now anchored in the wider concept of the Product Performance Lifecycle™, which addresses the operational performance of a product during its entire lifecycle, from launch to disposal. The creation of a Hybrid Twin™, leveraging simulation, physics and data analytics, enables manufacturers to deliver smarter and connected products, to predict product performance and to anticipate maintenance needs. <http://www.esi-group.com/>

FEATURED EXPERTS:



Aaron Hankinson

Chief Engineer, Driven Attributes
Product Engineering
Jaguar Land Rover, UK



Ashley Gillibrand

Technical Specialist - NVH
Jaguar Land Rover, UK



Thomas Englund

Technical Leader Trimmed Body Acoustics
Volvo Car Corporation, Sweden



Steven Eich

Senior NVH Engineer
Honda R&D Americas Inc., USA



Marco Ballatore

Functional Manager Chassis NVH
Bentley Motors Limited, UK



Mostapha Choukri

Business Development Manager
Automotive Industries
Siemens Industry Software, Belgium



Per-Olof Sturesson

Senior Director Driving Dynamics and
Noise & Vibration Centre
Volvo Car Corporation, Sweden



Jared Cox

Principal NVH Engineer
Honda R&D Americas, Inc., USA



Ben West

Engineer - Acoustics
Bentley Motors Limited, UK



Paul Speed-Andrews

Manager - NVH, Aerodynamics
& Aeroacoustics
Nissan Technical Centre Europe Ltd., UK



Paul Kennings

Attribute Leader – Ride Comfort,
Powertrain Mounting and Active Systems
Bentley Motors Limited, UK



Richard Henry Cornish

Senior Lecturer
Birmingham City University, UK



Jonathan Layfield

Head of Vehicle Physics
Bentley Motors Limited, UK



Marco Tarabra

Head of Acoustics
Ferrari S.p.A., Italy



Hakki Can Koman

Senior Interior Quietness Engineer
Ford OTOSAN, Turkey



Alexandre Nunes

Associated Director, Vehicle Attributes
NIO, China



Dr. Jordan Cheer

Lecturer, ISVR
University of Southampton, UK



Frank Syred

Principal Consulting Engineer
Brüel & Kjær Global Engineering Services, UK

CONFERENCE PROGRAMME

Forum Day One / Tuesday, 25 September 2018

8:00-9:00 Registration with Coffee & Tea

Internét on Facebook

Ready for a picture?

Discover who else is participating in the Forum and be discovered on our facebook.

Don't forget your business cards!



9:00-9:10 Welcome & Opening Speech by the Organiser



Maria Nikolopoulou
Managing Director
Internét Limited, UK

9:10-9:20 Keynote Speech

[Chaired by Aaron Hankinson]



Aaron Hankinson
Chief Engineer, Driven Attributes, Product Engineering
Jaguar Land Rover, UK

9:20-9:50 Driving Simulators for NVH – A New Approach to NVH CAE



Ashley Gillibrand
Technical Specialist – NVH
Jaguar Land Rover, UK

- ▶ Application of NVH driving simulators in automotive business
- ▶ Data requirements for simulator model creation
- ▶ Approaches to create and manage data to deliver simulation
- ▶ Impact of full vehicle simulator demonstrations

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9:50-10:00 MSC/FFT presentation



10:00-10:40 Interactive Session: Internét at Speed

Introduce yourself to the other participants with this series of brief one to one meetings.

Get to know the other delegates and "break the ice".

10:40-11:10 Refreshment & Networking Break - Exhibition

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11:10-11:40 Using a Transmissibility Matrix Approach to Predict Tactile Seat Vibration from Seat Rail Vibration



Frank Syred
Principal Consulting Engineer
Brüel & Kjær Global Engineering Services, UK

- ▶ Transmissibility matrix method
- ▶ Prediction of tactile seat responses from seat rail vibration
- ▶ Tactile seat response predictions with different occupant masses and road surfaces
- ▶ Comparison of transmissibility matrix and FRF matrix methods
- ▶ Use of method for FVS subjective evaluations using CAE predictions

11:40-12:10 NVH in Concept Phase Platform Development



Thomas Englund
Technical Leader Trimmed Body Acoustics
Volvo Car Corporation, Sweden

- ▶ NVH development at Volvo Cars
- ▶ Challenges and opportunities using CAE in early phases
- ▶ Cross attribute optimization and securing enough platform

12:10-12:40 NVH Challenges and the Development of the 2nd Generation Nissan Leaf



Paul Speed-Andrews
Manager - NVH, Aerodynamics & Aeroacoustics
Nissan Technical Centre Europe Ltd., UK

- ▶ Introduction to the 2nd Generation Nissan Leaf
- ▶ Expectations of Leaf customers for NVH
- ▶ Overview of some of the technical challenges and improvements made on 2nd Generation Leaf including: Motor Whine, Road Noise, Wind Noise
- ▶ Feedback from the market and journalists

12:40-13:50 Networking Lunch - Exhibition



13:50-14:20 Interactive session - panel discussion:
Drive Mode Selectable Sound:
What can we do vs. what should we do?



Steven Eich
Senior NVH Engineer
Honda R&D Americas Inc., USA



Co-moderator:
Jared Cox
Principal NVH Engineer
Honda R&D Americas, Inc., USA

- ▶ How to integrate Quietness vs. Acceleration sound emotion? For example, is it OK to have completely silent cruising but loud acceleration? It depends on the vehicle concept, but where does each compare on the sound spectrum?
- ▶ How large of a sound difference is reasonable between drive modes? [e.g. Comfort vs. Sport]
- ▶ With respect to active devices, do you let your customer easily determine that you are altering their experience? Or do you hide it from them?
- ▶ Should the same general character be kept between dynamic modes, or is it OK to change them completely?
- ▶ E.g.: An L4 engine vehicle uses active sound to make V6 sound character: in the most quiet mode, do you cut active sound completely and reveal the L4 character in the name of quietness? Or does that sacrifice the concept of the vehicle?
- ▶ How to account for contribution of Other Vehicle Systems, i.e. Transmission control logic change = more sound
- ▶ The total accumulated sound has changed, even though the active sound systems have not.
- ▶ How often do customers drive in alternate Dynamic Modes? Must this be considered in the 'normal mode' design?

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14:20-14:30 BETA CAE Systems presentation

14:30-15:00 Practical Seat Development Technique Linking With Virtual Solutions In The Full Vehicle NVH Simulator



Paul Kennings

Attribute Leader - Ride Comfort, Powertrain Mounting and Active Systems
Bentley Motors Limited, UK

- ▶ Making practical measurements linked to virtual world
- ▶ Improving the existing Bentley Full Vehicle Simulator process
- ▶ Understanding how occupants affect their own Comfort
- ▶ Developing our products around our customers

15:00-15:30 Active and Adaptive Sound Control for Automotive Applications



Dr. Jordan Cheer

Lecturer
ISVR, University of Southampton, UK

- ▶ Active engine and road noise control
- ▶ Local active noise control with head-tracking
- ▶ Personal sound zones and privacy enhancement
- ▶ Binaural audio reproduction

15:30-16:00 Refreshment & Networking Break - Exhibition

16:00-17:30 Afternoon Workshops (only for registered participants!):

Led by the Workshop leader, the aim of this session is to offer you the chance to interact with your peers, raise questions, share views and opinions in a targeted participant field

Workshop A: Solidity Feel & Squeaks & Rattles, Design Factors in an Increasingly Electric Car Environment



Aaron Hankinson
Chief Engineer, Driven Attributes, Product Engineering
Jaguar Land Rover, UK

Workshop B: A World without NVH Physical Development (How would we engineer the full system performance of a vehicle, facing the reality that there are fewer prototypes to work with)



Per-Olof Sturesson
Senior Director Driving Dynamics and Noise & Vibration Centre
Volvo Car Group, Sweden



17:30-18:00 Transfer to the JLR Engineering Center in Gaydon
(Shuttle busses will be provided at the NCC)

18:00-20:00 Guided Tour of the Jaguar Land Rover Engineering Center

Hands-on experience and guided tour of the JLR Engineering Centre in Gaydon! You will have the unique opportunity to view one of Jaguar Land Rover's Test Laboratories, experience a demonstration of the VIC Crudens Simulator, experience a sound recording demo at a full size Semi Anechoic Chamber, experience a demonstration of a Full Vehicle Simulator and the latest sound quality technology.



20:00-20:30 Transfer back to the NCC
(Shuttle busses will be provided)

20:30

Dinner and Evening Event



Enjoy our evening get-together with your colleagues in a relaxed atmosphere with live music entertainment, dinner and drinks.

The Exclusive Visit to the JLR Engineering & Product Development Site in Gaydon

It's a great pleasure to offer in this year's Automotive NVH Forum a special hands-on experience and guided tour of the JLR Engineering Centre in Gaydon! All delegates will have the unique opportunity to view one of Jaguar Land Rover's Test Laboratories, experience a demonstration of the VIC Crudens Simulator, experience a sound recording demo at a full size Semi Anechoic Chamber, experience a demonstration of a Full Vehicle Simulator and the latest sound quality technology.



We are also excited to have some of the latest JLR vehicles on display at our conference venue! Based on availability, you will have the chance to see the i Pace, F PACE, E PACE, Range Rover



e Pace



f Pace



i Pace



F Type



Range Rover Velar



Range Rover SV0

Forum Day Two/ Wednesday, 26 September 2018

08:00 - 08:30 Registration with Coffee & Tea

8:30-8:40 Keynote speech

[Morning Session Chaired by Jonathan Layfield]



Jonathan Layfield
Head of Vehicle Physics
Bentley Motors Limited, UK

8:40-09:10 Automotive Aeroacoustic Sound Quality



Ben West
Engineer - Acoustics
Bentley Motors Limited, UK

- ▶ Background to automotive aeroacoustics & motivation for research project
- ▶ Focus group interviews to understand the consumer perception of aeroacoustics
- ▶ Semantic differential listening studies to identify the principal components of aeroacoustic subjective performance
- ▶ Conclusions on automotive aeroacoustic sound quality and potential further work

09:10-09:20 Blackberry QNX presentation



09:20-10:00 Interactive Session: Internect at Speed
Introduce yourself to the other participants with this series of brief one to one meetings.
Get to know the other delegates and "break the ice".

10:00-10:30 Refreshment & Networking Break - Exhibition

10:30-11:00 Ford OTOSAN's Efforts on Using Computational Methods for Prediction of Shape Generated Aero-Acoustic Noise of Vehicles and Acoustic Optimization of Vehicle Shape



Hakki Can Koman
Senior Interior Quietness Engineer
Ford OTOSAN, Turkey

- ▶ Prediction of aero-acoustic shape noise and acoustic optimization of vehicle shape by conventional experimental methods in the wind tunnel
- ▶ Steady State CFD methods applied to aero-acoustic noise prediction and shape optimization
- ▶ Transient CFD methods applied to aero-acoustic noise prediction and shape optimization
- ▶ Correlation of CFD methods and wind tunnel test results
- ▶ Correlation of CFD methods and on-road test results

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11:00-11:10 ESI Group presentation

Sponsor

11:10-11:40 Impact of Electric Vehicles on NVH Engineering



Mostapha Choukri
Business Development Manager Automotive Industries
Siemens Industry Software, Belgium

- ▶ Comparison of NVH between classical ICE vehicles and EV
- ▶ How to address the sound quality of electric vehicles
- ▶ Technology update on new methods to address wind noise, road noise & other new noise sources
- ▶ How to address the noise from the AVAS system

11:40-12:10 Refreshment & Networking Break - Exhibition

12:10-12:40 NVH and Human Factors: NVH Design in an ACE Product Development (Autonomous-Connected-Electric)



Aaron Hankinson
Chief Engineer, Driven Attributes, Product Engineering
Jaguar Land Rover, UK



Alexandre Nunes
Associated Director, Vehicle Attributes
NIO, China

- ▶ Impact of autonomous driving, electrification and digital connectivity
- ▶ Development and inclusion of new NVH engineering approaches, tools and methods
- ▶ Cost and weight compensation implication
- ▶ Changes on human interface and process of information
- ▶ Cost/delivery challenges

12:40-13:10 Balancing Attributes in an Electrical Vehicle World



Alexandre Nunes
Associated Director, Vehicle Attributes
NIO, China

- ▶ User expectations
- ▶ Attributes engineering fundamentals
- ▶ Cross-attributes development as strategy
- ▶ Trade-offs and learnings

13:10-14:20 Networking Lunch - Exhibition

14:20-14:30 Keynote Speech

[Afternoon Session Chaired by Per-Olof Sturesson]



Per-Olof Sturesson
Senior Director Driving Dynamics and Noise & Vibration Centre
Volvo Car Group, Sweden

14:30-15:00 Interactive Session- Team Debate with Q&As
Find your teammates from different companies among the other delegates and share your views in a lively debate while solving a technical question.

15:00-15:30 NVH Problem Solving Techniques in a Lightweight World



Richard Henry Cornish
Senior Lecturer
Birmingham City University, UK

- ▶ Problem classification techniques
- ▶ Problem avoidance at the design stage
- ▶ Design trends
- ▶ Enabling technologies

15:30-15:40 Voting for the Best Automotive NVH Supplier Award & Award Ceremony



15:40-15:50 Voting for the Best Speaker Award & Award Ceremony



15:50-16:00 Closing Remarks by the Organiser



Maria Nikolopoulou
Managing Director
Internect Limited, UK

16:00-16:30 Refreshment & Networking Break - Exhibition

16:30-18:00 Afternoon Workshops: Led by the Workshop leader, the aim of this session is to offer you the chance to interact with your peers, raise questions, share views and opinions in a targeted participant field.

Workshop C: NVH for Electric, Hybrid & Autonomous Vehicles



Alexandre Nunes
Associated Director, Vehicle Attributes
NIO, China

Workshop D: Human Factors Design in NVH



Jonathan Layfield
Head of Vehicle Physics
Bentley Motors Limited, UK



Marco Ballatore
Functional Manager
Chassis NVH
Bentley Motors Limited, UK

Visit our website for more information:

<https://www.internect.co.uk/content/3/international-forum-automotive-acousticsvibration-nvh-2018>



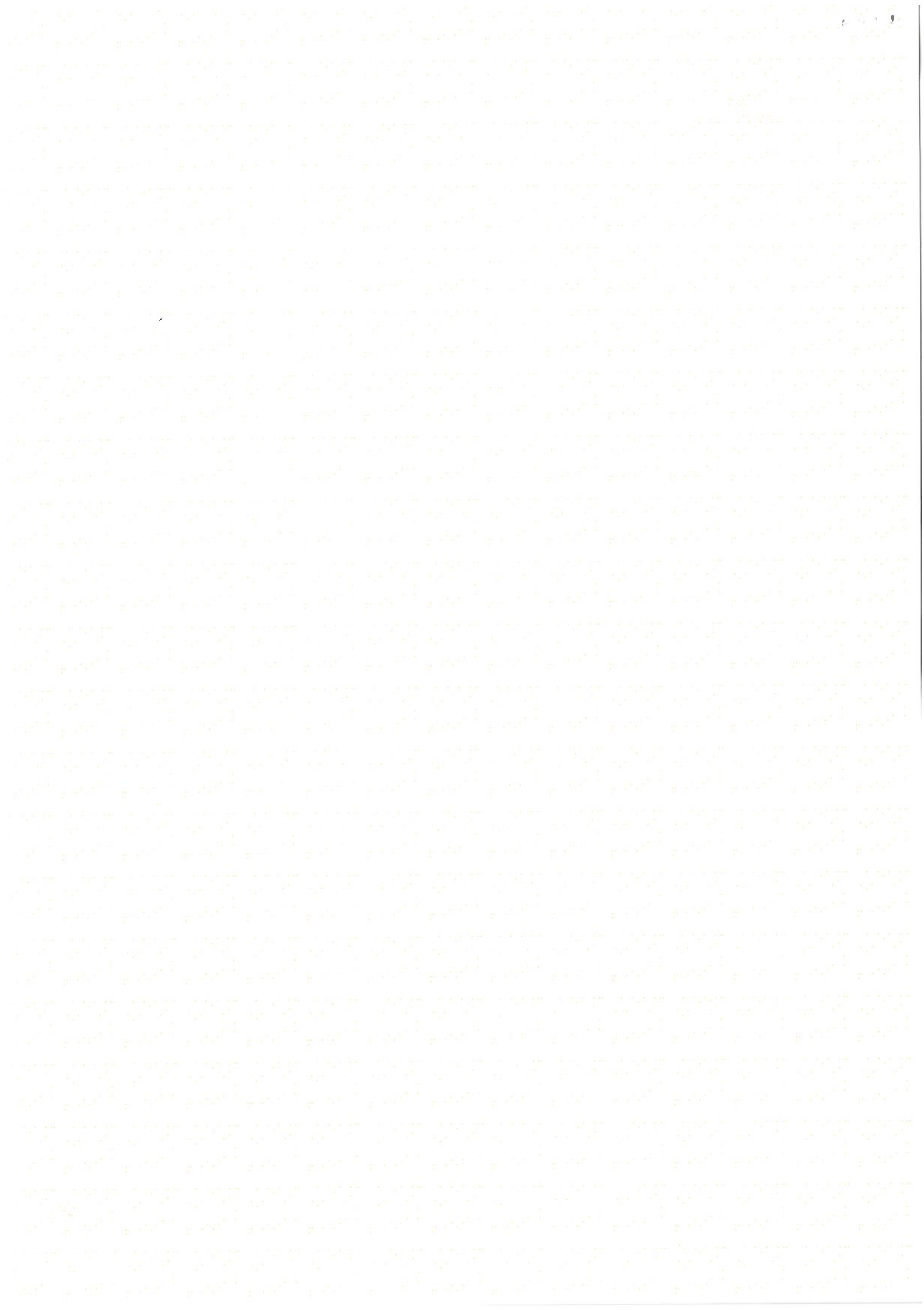
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Aaron Hankinson had a very diverse career having had his senior management career developed in the German car industry. Aaron started his career in the electrical mechatronics industry for Balfour Beatty Industrial and Construction Group in their Electrical and Mechatronics Business Division in the early 1980's. A brief stint followed working for Philips Electronics in their Magnetic Products Division in Research & Production Deployment. Then Leyland Commercial Vehicles/Leyland DAF, then the Leyland Technical Centre Consultancy before working at MIRA, in their UK & overseas Consulting Team, mostly in Asia. A brief stint followed at Rover Group, before 14 years working for VW Group at Bentley Motors. Finally as a business development Director, for a Growing Automotive Consultancy, Akustikzentrum GmbH, near Munich. He is currently (Senior Manager) spearheading the re-development of the Vibro-Acoustic & Sound Design Team at JLR. This is to support the aggressive JLR business growth plan and the premium repositioning of the brand. Aaron is also leading the plus hundred million pound project at JLR to build the largest Acoustics R&D Centre in the UK, to allow the company to compete with the best in the world.



Ashley Gillibrand graduated with a Masters of Engineering from the ISVR in 1996. He has worked in Automotive NVH since then as part of the Rover Group, Land Rover and Jaguar Land Rover. Ashley specialises in Powertrain NVH Sound Quality and methods for cascading and managing noise paths to deliver to customer expectation and also to delight.



Frank Syred is a Principal Consultant Engineer working for Brüel & Kjær Global Engineering Services who supply advanced NVH consulting services to the automotive and other industries. He has a Bachelor's (Hons) degree in Mechanical Engineering and over 30 years' working within the NVH field. As well as experience in many areas of measurement, data analysis and product improvement within automotive NVH, he has been involved in the design and development of the (B&K) Full Vehicle NVH Simulator (FVS) from its beginning. Subsequently, he has been involved with further method developments to enhance the FVS capabilities. He has focussed on techniques which enable the physical subjective assessment of NVH CAE analysis results, in combination with appropriate test data, with the aim of evaluating the noise and vibration performance of new designs options early in a product design cycle before physical hardware exists.



Thomas Englund has an MSc (2000) and Licentiate of Technology (2003) in Mechanical Engineering. He has a broad NVH knowledge profile and 15 years of experience within the field including CAE, testing and leadership positions. Thomas has been working with a broad spectrum of product development, method development and advanced engineering projects involving cars, trucks, buses, construction equipment and chainsaws.



Paul Speed-Andrews received a BEng in Mechanical Engineering from Birmingham University in 1996 and subsequently started his career as a Noise and Vibration engineer with Jaguar Cars. Moving to Nissan in 2005, Paul is currently Manager of NVH, Aerodynamics and Aeroacoustics at Nissan Technical Centre Europe Ltd.



Steve Eich hails from the United States, specifically the state of Ohio, where he graduated with a Mechanical Engineering degree from The Ohio State University in 2002. He began working at Honda shortly thereafter, gaining experience in both Manufacturing and Quality, before moving to Honda R&D in 2010. There he worked on primarily Acura products, beginning with the Acura TLX sedan, and eventually the Acura NSX development, beginning in 2012. Steve has raced sports cars with Honda's factory racing team for many years, and spent countless weekends at the race track. This is where his appreciation of sports car sound began, enveloped by the authentic sound of racing engines, he took this passion and applied it to the Acura NSX, which he will speak to you about today



Paul Kennings is the attribute leader of Ride Comfort, Powertrain Mounting and Active Systems at Bentley Motors and has been working in the field for 20 years. He has a Bachelor's (Hons) degree in Mechanical Engineering. His main experience is in the development of Powertrain Mounting Systems but he also has experience in chassis mounting system development and modal analysis of body structures. All have been part of his extensive experience in Ride Comfort development of motor vehicles. More recently, he's become responsible for the Full Vehicle Simulator. This entails the physical reproduction of CAE simulations, or measured data, to compare the subjective performance effects of specification changes on different attributes. This technique has been used over a number of product lifecycles to develop the performance of Bentley's products. He has also taken on the additional responsibility of function owner for Calibration of Active Engine Mounts which has become more widely used in the Bentley portfolio and now in all model lines.



Dr Jordan Cheer is a Lecturer at the [Institute of Sound and Vibration Research](#) (ISVR). His research covers both active control of noise and vibration and sound field control for audio reproduction. He has worked across a variety of industries, including the automotive, maritime, telecommunications and defence sectors. Jordan graduated from the University of Surrey in 2008 with a BMus (Tonmeister) in Music and Sound Recording. In 2009 he received the MSc in Sound and Vibration from the ISVR at the University of Southampton, with a thesis on the design of directional loudspeakers for mobile devices. Following this he carried out his doctoral research in the Signal Processing and Control group of the ISVR, working on the active control of the acoustic environment in automobile cabins. Having received the PhD in 2012, he was then appointed as a Research Fellow in Active Control at the ISVR. He was promoted to Senior Research Fellow at the beginning of 2015 and appointed as a lecturer in 2017. He is also currently assistant editor for the [Journal of Sound and Vibration](#).



Jonathan Layfield's engineering career spans automotive component and system design & development at tier 1 suppliers and vehicle manufacturers, ranging from small passenger cars to heavy trucks and construction equipment. He joined Bentley Motors in 1998 to manage the Chassis Engineering department, and since 2014 has taken responsibility for vehicle attribute performance, including NVH, as head of Whole Vehicle Physics. Jonathan has a higher diploma in Mechanical Engineering, a Master of Science degree in Materials Engineering, and is a Fellow of the Institution of Mechanical Engineers.



During a four year Higher Apprenticeship programme within the Whole Vehicle Physics department of Bentley Motors Limited, **Ben West** gained a BEng (Hons) in Mechanical Engineering, and a broad range of both Acoustic and Aerodynamic engineering experience. Since 2015 Ben has been an Acoustic Engineer within the Body & Cabin NVH function of Whole Vehicle Physics. In 2017 Ben graduated from the University of Salford as a Master of Science in Acoustics with Audio Applications. Predominantly focused on the

aeroacoustic development of Bentley vehicles, Ben has an in-depth understanding of the technical challenges of ensuring class leading acoustic performance, from simulation through to physical development and validation testing.



Hakki Can Koman has 8 years of experience in Ford OTOSAN, mainly on interior quietness design and verification of light and heavy commercial vehicles of Ford product line. He has been involved in wind noise, sound package, air leakage, climate control NVH and operational sound quality testing & development of vehicle programs. He has worked with design, plant and quality engineers to incorporate best practices for better NVH performance in vehicles as well as identifying and

solving issues that cause customer dissatisfaction. He was the member of the vehicle engineering team that developed 2014 Transit Connect, elected as 2014 International Van of the Year.



Mostapha Choukri graduated at the Katholic University of Leuven in Belgium as a Mechatronic Engineer. Started in 1996 in product development with a focus on testing solutions. Later moved to providing professional services for the automotive industries. Currently he is working for several years as NVH testing expert contributing to advanced NVH seminars and consulting services.



Alexandre Nunes has a Bachelor's Degree in Physics and Master's Degree in Acoustics. Has been working in vehicle development for 22 years, which 18 fully dedicated to NVH and as recently to complete vehicle attributes. He worked the majority of his career at General Motors and developed over 22 projects to different car users in various countries such as China, Thailand, Indonesia, South Africa, Germany, North America and others. Since 2014, he moved to China to work on New Energy Vehicles.

Currently, he's the Associate Director of Vehicle Attributes at NIO, responsible for NVH, Vehicle Dynamics, Durability, Thermal, Aero and mass. Beyond the Acoustics, his motivation is pursuing elegant engineering solution that makes people's life better.



Per-Olof Sturesson is Senior Director of Noise & Vibration Centre, Volvo Car Group. Sturesson received his M. Sc., and Ph.D. from Lund University, Sweden in the 1990's. After more than 15 years of experience at different positions, varying from CAE engineer to department manager inside GM/Saab Automobile Engineering, he joined Volvo Car Group in 2012. He is responsible for the development of NVH and Sound Quality in Volvo products,

methods and competence development with respect to NVH for the corporation. He has in co-operation with others submitted several papers with respect to automotive NVH.



Richard Henry Cornish is an Automotive Engineer with wide experience of Automotive R&D, especially developing test methods and models to capture new practical knowledge and theoretical insights. His expertise in Simulation, Test, Measurement, and Product Perception has been used in Cars, Trains, Buildings and Factories in the UK and abroad. Richard came to Birmingham to study Physics and then joined the car industry, working at Lucas Group Research and Leyland DAF. He worked on mathematical models of fuel injection, headlamps and signal lamps, tyres and active

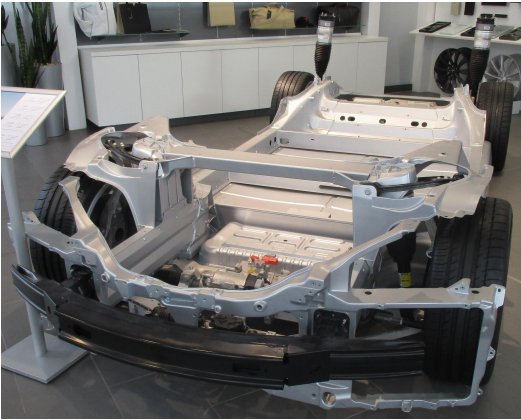
suspension. Richard completed a PhD in vehicle noise, vibration and harshness (NVH) and taught part time at the University. He has taught Birmingham City University for 20 years and worked on consultancy and research projects.

Evidence based lightweight car body responses

Dr Richard Cornish

Birmingham City University





Electric vehicles are 50% heavier.

Tyre noise increases with load = + 3 dB.

Tyre noise increases with pressure = + 3dB.

Size of the problem = + 6 dB

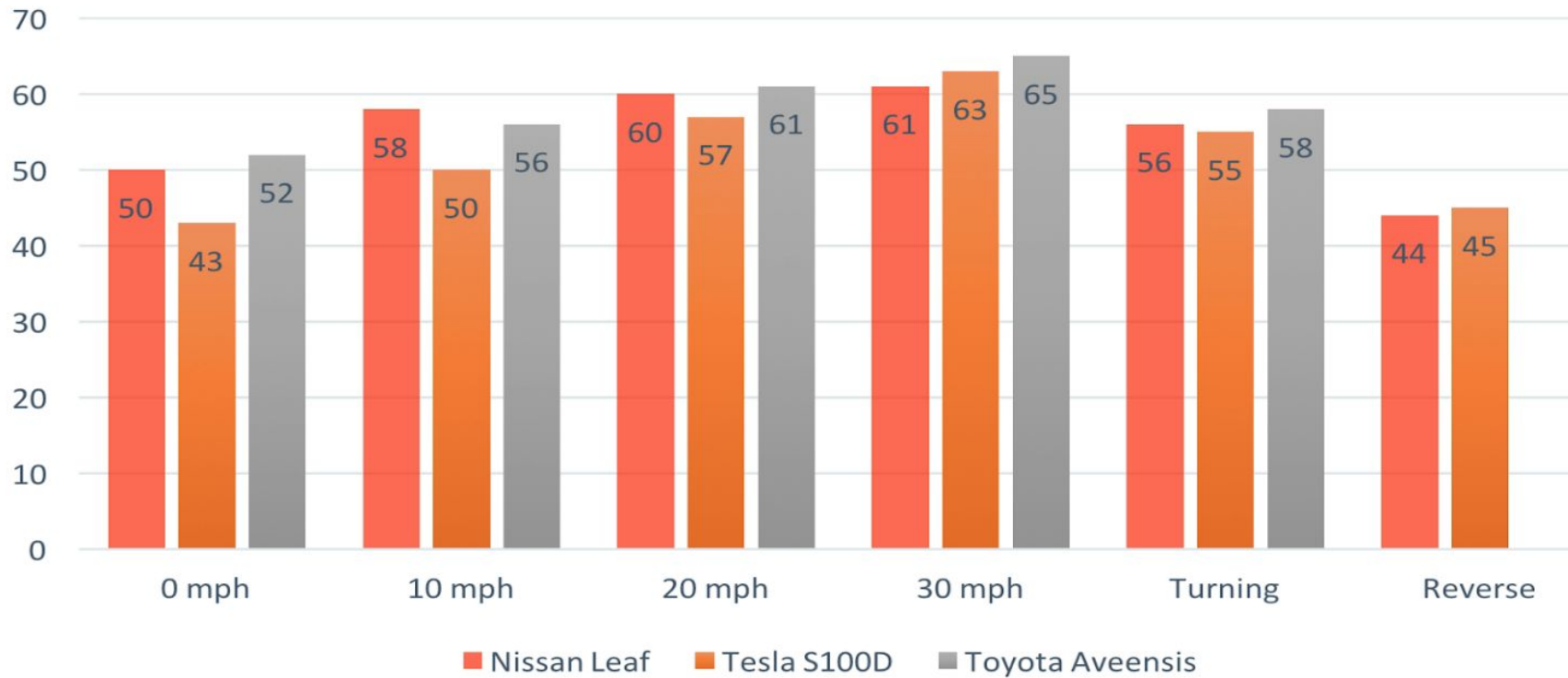
Can road impact response be used as a measure?

BCU activity was directed at understanding Body Noise Paths and responses in a Global sense, looking at opportunities for lightweighting and integration.

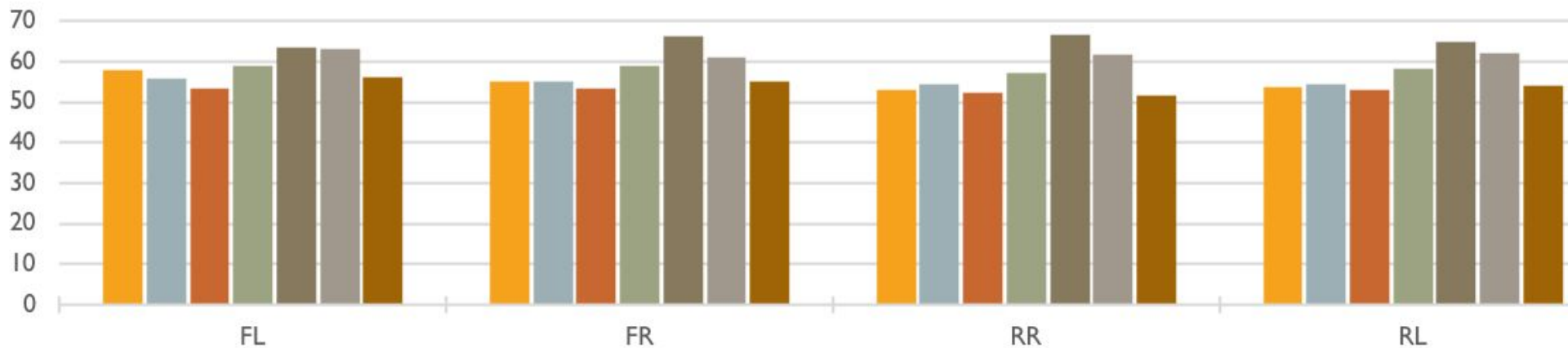
Can road impact response be used as a measure?



Noise Levels on Urban roads

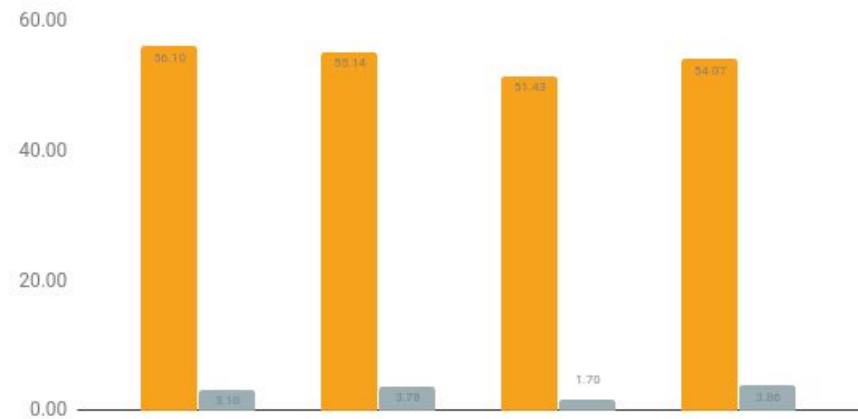


Mean Comparison



Compare 7 cars ^

Average of 7 cars ->



Can road impact response be used as a measure?

There is some variability in excitation, about 2 dB.

The response as an A-weighted response is very consistent.

The response shows expected relationships to each wheel.

The response matches steady state road tests.

The test is suitable for very large scale surveys.

An opportunity for evidence based design?

Research questions:

The concentration of battery mass - does it raise or lower low frequency response?

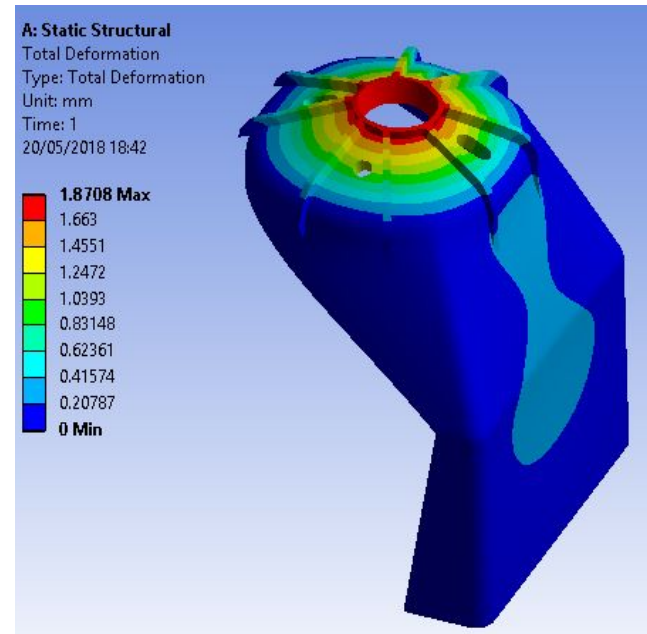
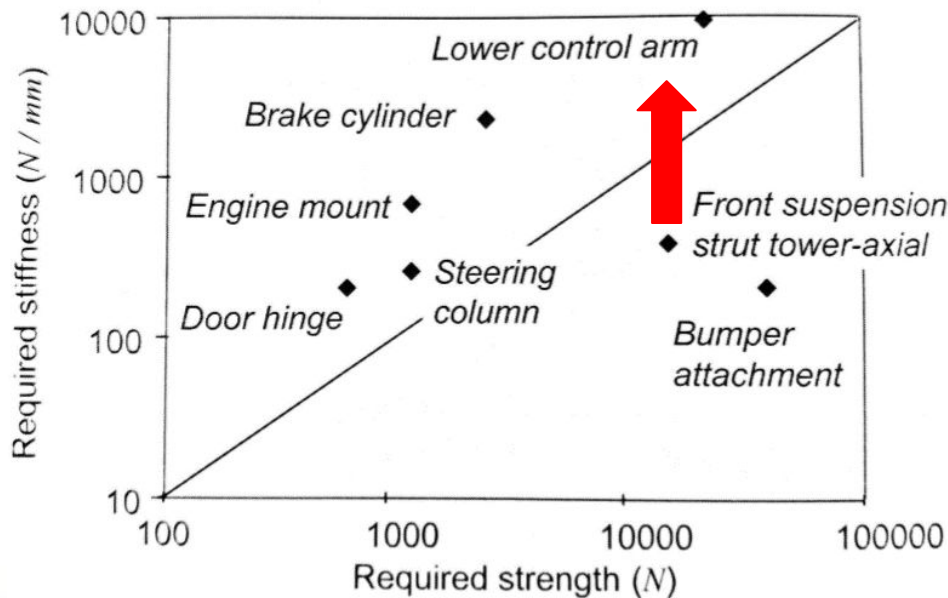
Integration of parts - is that helpful or unhelpful?

Casting in alloy - is that helpful or unhelpful?



Example 1: Strut top mounting

Casting in alloy to adjust stiffness - is that helpful or unhelpful?



Example 2: Cross car beam

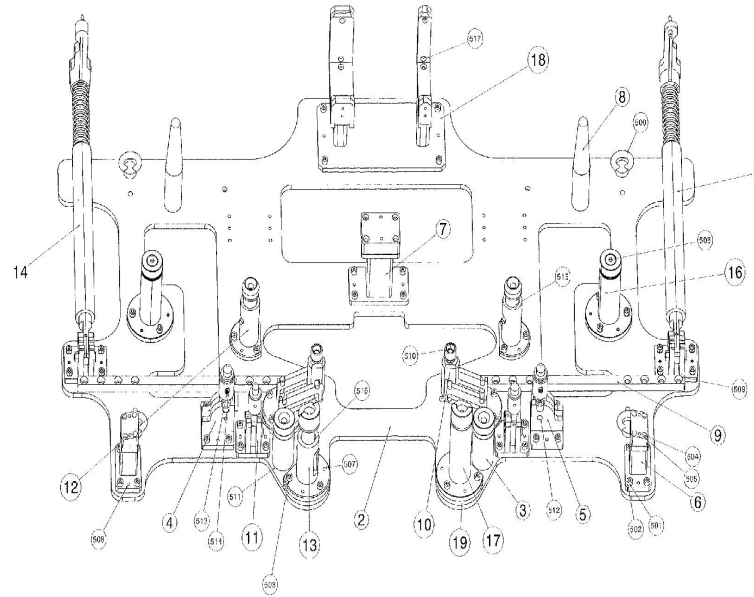
Casting in alloy - is that helpful or unhelpful?



Squeak and rattle testing - IAC

Example 3: Assembly techniques

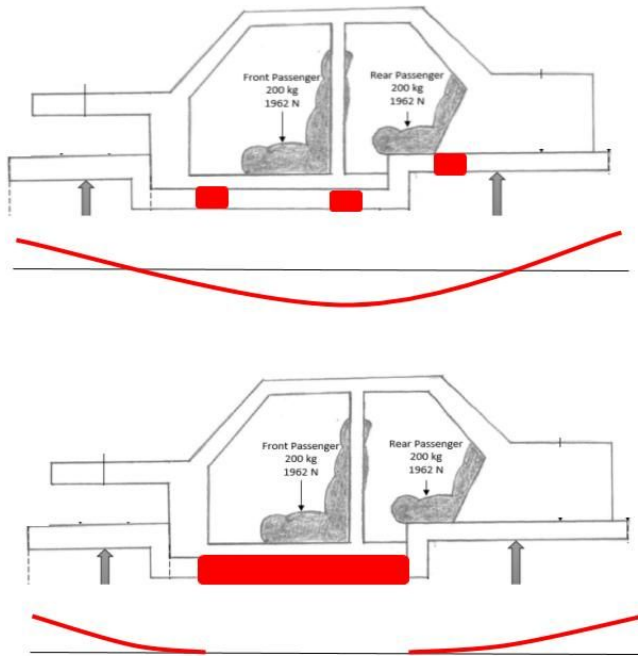
Assembly techniques - is that helpful or unhelpful?



Placement year student - production tooling Nissan

Example 4: Structural battery strategy

Structural strategy for added mass - is that helpful or unhelpful?



Conclusions

Electric vehicles are competing with premium vehicles and owners expect very low noise levels and negligible servicing needs.

The best electric vehicles have unique air spring chassis and tyre technology to produce a 'quiet ride'. The target is 'Quiet Ride'.

Constant speed testing is appropriate. You can always find a bad road surface.

The battery compartment modifies the modal response of the steel car body to low frequency vibration and noise paths.

The mainstream electric vehicle is a steel bodied SUV with high pressure tyres.

Noise path quality and consistency being monitored at BCU.

Electric vehicles are competing with premium vehicles and owners expect very low noise levels and negligible servicing needs.

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The mainstream electric vehicle is a steel bodied SUV with high pressure tyres.

Subframe isolation is the main barrier to interior road noise. Noise path quality and consistency is built by robotic assembly by BCU student at NMUK. Noise path quality is being monitored at BCU.

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Rashid R, Langley R S, Cornish R H, 'Modelling and analysis of in-vehicle boom noise', Proceedings of the Institute of Acoustics, Vol. 26. Pt.2 2004

PhD Thesis: 'An Investigation of the Role of Vehicle Body Variability in Interior Noise Variability of Light Commercial Vehicles', University of Central England 1998.

A small group investigated tyre noise inside electric and IC vehicles on inner city roads and some major A roads.

The methodology focussed on comparing interior noise levels over road surfaces ranging from cobblestones to good and pitted tarmac. Vehicles were also compared qualitatively.

In common with other workers we found that the noise levels varied strongly with the road type. Electric vehicles were about 50% heavier than the IC vehicles, with tyre pressures about 50% higher.

Except for the most expensive battery electric vehicles, we found instances of much higher interior road noise. Our conclusion is that mainstream budget EVs risk becoming unpopular in cities due to poor levels of refinement.