



**EuroBrake**<sup>®</sup>

17 – 21 May 2021

Organised by



# EuroBrake 2021 Report

## Summary Report



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The BRAKE Report™



EuroBrake is organised by FISITA.

Delivering collaborative thought leadership and support to the world's mobility systems engineers, helping them to achieve their goals and continue to push the boundaries of technology while maintaining high ethical standards, delivering continuous improvement, and enabling progress that will benefit society.

To find out more about FISITA, please visit [fisita.com](http://fisita.com).

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# Chairman's Welcome

**EuroBrake is the world's largest international braking technology community and event. During EuroBrake 2021 we welcomed delegates, sponsors, and exhibitors not just from Europe, but also from other countries as far apart as India, Australia, South Korea, U.S and Japan, to name but a few!**

Conferences and events are changing – of course because of Covid-19, but also thanks to advances in virtual conference platforms – and as part of EuroBrake's constant evolution, it has been exciting to deliver EuroBrake 2021 on a fantastic online events platform.

The 2021 technical programme featured over 90 technical presentations, two expert panels, two keynote speeches, and unique networking sessions.

EuroBrake 2021 also included a special rail theme, with three technical sessions, one keynote speaker, and a panel session all devoted to hot topics in the global rail industry. We look forward to seeing how different transportation sectors and other users of braking technologies can learn from each other.

I was also delighted to welcome the participants of our EuroBrake Student Opportunities Programme, or ESOP. This initiative offers students from around the world the chance to participate in EuroBrake. ESOP 2021 once again offered students with a passion for mobility the unique chance to network with and learn from international braking experts – and we're sure they will find the EuroBrake event a valuable part of that programme.

I'd like to say a special thank you to our sponsors and exhibitors for helping to make EuroBrake 2021 possible.

And of course, thanks to our delegates, for joining us for a week of fascinating presentations and discussions about the technology of braking.



**Jan Münchhoff**

Chair of the EuroBrake Steering Committee

# Organisation

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*The EuroBrake Advisory Board consists of representatives from **major companies and research institutions** that lead the field in **braking technology** today. The Advisory Board provides **strategic advice** and helps to ensure that EuroBrake continues to meet **the needs of the international braking community**.*

# EuroBrake 2021 opens with Leadership Discussion on CASE and regulation

**EuroBrake is the world's largest braking technology community, and the annual EuroBrake conference provides the opportunity for the braking community to come together for knowledge-sharing, networking and more.**

In that spirit of knowledge-sharing and networking, FISITA invited leadership from AsiaBrake, EuroBrake, and the SAE Brake Colloquium to join a moderated panel discussion at EuroBrake 2021.

*"Braking is about **so much more** than stopping" – brake industry leaders discuss **the evolution of braking**".*

Moderated by FISITA Chief Executive Chris Mason, the panel discussion was titled "From stopping vehicles to regenerative braking – the evolution of brake technology," and featured Dr Seong Rhee, representing AsiaBrake, Roy Link of the SAE Brake Colloquium, and Jan Münchhoff, the Chair of the EuroBrake Steering Committee.

*"Technologies are changing at a fast pace, and **it's essential to keep up** with the latest brake technology developments. And that's what EuroBrake offers".*

The panel discussion kicked off EuroBrake 2021 and addressed a range of topics that included the impact on braking of connectivity, automation, sharing, and electrification (CASE), and the regulation of brake emissions.

## CASE impact on brake technology developments

Evolutions in vehicle technology mean that braking is now about so much more than stopping vehicles, said Chris Mason, opening the discussion. The automotive industry has seen a wave of new technologies in the last 30-40 years, noted Jan Münchhoff, with the pace of change in technology driven first by safety, and then by customer comfort and convenience.

"Right now, we are talking about connectivity, automation, sharing, and electrification as major factors impacting braking technology," he said. "We face some very tough goals for safety, notably reducing fatalities to zero. For braking systems, and for foundation brakes, this is a significant technological challenge."

*"We're working with companies on solutions to **encapsulate the brake** and prevent brake debris from leaving the vehicle".*

"We've evolved into the era of smart brakes," said Roy Link, Chief Executive and Chairman of Link Engineering, and Chair of the Executive Board for the SAE Brake Colloquium. In the past, he noted, if you wanted to stop your vehicle, you'd pull on a lever or put your foot on the brake pedal; now the impulse to stop may come from a vehicle sensor triggered by a dog walking out in front of the vehicle. "We have all sorts of technologies contributing to make smart brakes perform safely and optimally.

"We're seeing all kinds of demands for testing related to smart brakes," said Link, whose company provides testing engineering services. "We see plenty more evolution in smart brakes, and we've not reached the end yet. Technologies are changing at a fast pace, and it's essential to keep up with the latest brake technology developments. And that's what EuroBrake offers. There are so many people, interactions and technologies that are presented during EuroBrake that really make it a worthwhile experience."

CASE technology is making a major impact on brake technology development, but there is still considerable work to do on conventional braking, said Dr Seong Rhee.

"We need to remember that conventional internal combustion engine vehicles and electric vehicles will co-exist for a long time to come, and even in 30 years' time, the majority of vehicles on the US roads alone will be internal combustion engine vehicles. So, it is good to have the excitement of these technological changes, but at the same time we have to remind ourselves that they will co-exist with conventional vehicles using conventional brakes."

*"We face some very tough goals for safety, notably **reducing fatalities to zero**. For braking systems, and for foundation brakes, this is a **significant technological challenge**".*

Secondly, he said, electric vehicle regenerative braking systems give long durability, but they also present numerous technological challenges. "Since we are not going to be doing heavy duty braking at high temperatures, low-temperature braking will give us long durability, which implies the

possibility of smaller, lighter brakes which will result in new materials and new manufacturing processes being used to produce new brake materials," he explained. "And in conjunction with this, electrification leads to the consolidation of electrical devices, such as using single actuation control units and electro-mechanical brakes."

Exciting times lie ahead, he said, adding that these are also challenging times. India and China each have populations of over a billion people, and each country imports enormous quantities of oil. Vehicle electrification offers countries one opportunity to reduce their oil imports, but they need to balance electrification with their eco-nomic strategy. "The future," he said, "will be very much dependent on regulations in each region."

*"The future depends on regulations in each region".*

**Roy Link**  
CEO Link Engineering co. and  
Chair of the SAE Brake Colloquium

**Seong Rhee**  
President, SKR Consulting LLC  
and Executive Advisor, AsiaBrake

**Jan Münchhoff**  
AUDI AG & Chair of EuroBrake 2021

**Chris Mason**  
CEO, FISITA

**EuroBrake**

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*"From stopping vehicles to regenerative braking – the evolution of brake technology" panel moderated by FISITA CEO Chris Mason and featuring Dr Seong Rhee, representing AsiaBrake, Roy Link of the SAE Brake Colloquium, and Jan Münchhoff, the Chair of the EuroBrake Steering Committee*

## Regulation of brake emissions

The imminent regulation of brake emissions has become a priority topic for automakers, suppliers, and others in the brake engineering community.

"The issue of brake emissions is becoming very important, in working groups, in conference topics, and in scientific research," said Münchhoff. "The primary effect of brake emissions regulation will be increased use of regenerative braking for extending mileage and reducing emissions, but a secondary effect of this will be that the braking industry will face a different usage profile for brakes."

An added complexity is the issue of brake noise in electric vehicles, which otherwise operate silently, noted Mason. The industry is progressing with engine emissions reduction and is now looking at brakes and tyres as a major source of harmful pollutants.

"At Link, we're working with companies on solutions to encapsulate the brake and prevent brake debris from leaving the vehicle," said Roy Link. "There is a considerable focus on this, and infrastructure is being built up to test for that problem."

Speaking from the US, Link added that the US Environmental Protection Agency (EPA) and the California Air Resources Board (CARB) both have brake emissions very high on their agenda, and the technologies they use are comparable to the technologies used to investigate engine emissions, so the level

of nanoparticles are similar to engine emissions. "Brake emissions is a very big issue in the US," he noted.

*"These will be **revolutionary changes** – and big challenges present big opportunities".*

Seong Rhee agreed, adding, "Brake emissions is a global issue." And in this regard, he said, there are two issues facing the industry.

With electrification, brake noise is becoming a significant issue. "We have no perfect capability to predict brake noise, such as high-frequency squeal and low-frequency groan. Many people will admit in private but not in public that even with artificial intelligence and advanced computing technologies, we are not capable of predicting brake squeal. This is a major challenge, especially with quiet vehicles such as electric vehicles. When people hear brake noise, they think there is a problem and take the vehicle in for service

The second challenge, he said, involves materials. "By moving from conventional brakes to regenerative brakes, brake emissions will be reduced by up to 80%, but the remaining percentage will depend on brake material wear," he explained. "With this material wear, we will become increasingly concerned by environmentally friendly or unfriendly ingredients, and carcinogenic materials. This will be a future trend on the material side, which will have to be combined with new friction materials, because material ingredients and manufacturing processes will change."

## Challenges – and opportunities

Drawing the discussion to a close, FISITA's Chris Mason noted the magnitude of the challenges facing the braking industry. "These will be revolutionary changes – and big challenges present big opportunities," said Mason. EuroBrake and FISITA, he noted, are perfectly placed to facilitate the necessary pre-competitive discussion.

# EuroBrake 2021: Brake emissions regulation imminent as non-exhaust emissions surge



**Exhaust particulates now pale in comparison to non-exhaust emissions, said Duncan Kay of the UK Department for Transport in his EuroBrake 2021 keynote. The automotive industry has worked hard – and successfully – to cut exhaust emissions. Now that the level of exhaust emissions in particulate matter have been reduced, regulators are turning their focus to so-called non-exhaust emissions (NEE) – that is, other emissions caused by driving, such as particulates from brakes, tyres, and road surfaces.**

Together, brake wear, tyre wear, road surface wear, and resuspended road dust currently comprises about 10% of UK primary particulate emissions, said Duncan Kay, UK Department for Transport in a keynote presentation at EuroBrake 2021. At current rates, he added, the proportion of non-exhaust emissions is expected rise.

## [Exhaust particulates pale in comparison to non-exhaust emissions](#)

According to the United Nations Economic Commission for Europe (UNECE), vehicle exhaust emissions have been the subject of "increasingly stringent" particulate (PM 2.5 and 10) emissions regulations over the last two decades. The result: a significant reduction in volumes of exhaust emissions of particulate matter in several countries, according to the UNECE citing data submitted to its Convention on Long-range Transboundary Air Pollution (CLRTAP).

Emissions regulators are now turning to non-exhaust sources from road traffic, including harmful debris and particulate matter from road, tyre, and brake wear. UNECE notes a significant rise in the contribution of these sources to total particulate matter (PM) emissions from road transport and expects the rise in electric and hybrid vehicles to increase this trend.

The UNECE's Working Party on Pollution and Energy (GRPE) has, through its World Forum for Harmonization of Vehicle Regulations, begun developing "a rigorous test procedure to measure brake particle emissions under standardized conditions."

Thanks to stringent emissions regulation, and the fitment of diesel particulate filters, exhaust particulates have declined in recent years, to the extent that exhaust particulates in total particulate matter (PM) emissions from road transport now pale in comparison to NEEs.

## [NEE reduction: the UK as a case study](#)

The UK is making a major push on shifting road transport away from gasoline and diesel, noted Kay. A new Environment Bill is currently under scrutiny in the UK Parliament; the UK government has passed law committing to achieving net zero greenhouse gas emissions by 2050; the Prime Minister's November 2020 ten-point plan for a green industrial revolution included commitments to accelerate the transition to electric vehicles and invest in zero emissions public transport; and the UK government has brought forward by 15 years to 2035 a target for a 78% cut in carbon emissions, and banned the sale of gasoline and diesel cars and vans by 2030.

On the subject of NEEs, said Kay, a UK Department for Environment (DEFRA) call for evidence in 2018 highlighted a lack of quantitative data on the effectiveness of different approaches, and an accompanying degree of uncertainty surrounding this field.

Emissions from braking systems will be under ever greater scrutiny as tail-pipe emissions continue to decline, said Kay, adding that "any new regulation in this area designed to address non-exhaust emissions must be designed in a way that addresses the future new vehicle market which will be dominated by electric vehicles."

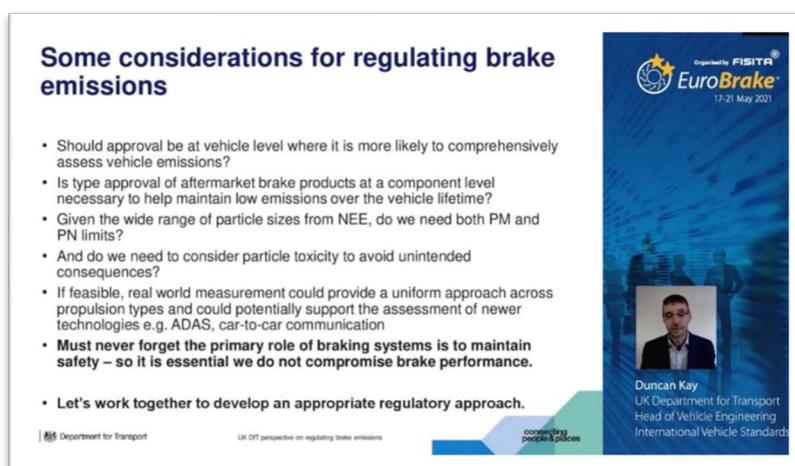
The United Nations Particle Measurement Programme – in which the UK is an active member – is developing a proposed laboratory test procedure to measure brake particulate emissions, based on a similar driving test cycle to the real-world driving database used to develop the WLTP (World harmonized Light-duty vehicles Test Procedure).

And the UK government has recently commissioned a 2.5-year, £1.2m (US\$1.7m) research project led by Ricardo, which focuses on real world measurements of brake and tyre particulate emissions.

## Considerations when introducing NEE regulation

Kay noted specific considerations that need to be taken into account when introducing new regulation on NEEs. These include:

- **Vehicle level approval: Assessing at a vehicle level is more likely to comprehensively assess vehicle emissions, he said, and can consider technologies installed to reduce brake emissions, such as regenerative braking.**
- **Aftermarket type approval: Type approval of aftermarket brake products at a component level may be required to maintain low emissions over the vehicle lifetime.**
- **Different limits for PM and PN? NEE results in a wide range of particle sizes, raising the idea of separate limits for particulate matter (PM) and particulate number (PN).**
- **Future-proof the regulation: Real world measurements could potentially provide a uniform approach across propulsion types and even support the assessment of newer technologies. Kay noted that advanced driver assistance systems (ADAS), vehicle-to-vehicle (V2V) communication, and even self-driving technologies could change the way brakes are used, and thus the emission of NEEs from the braking system.**
- **Safety first! The primary role of braking systems is safety, so regulation cannot compromise brake performance.**



Final slide from Duncan Kay keynote at EuroBrake 2021. Visit [Spotlight](#) for more information.

## Questions for the auto industry

Kay, of course, spoke about the need to regulate NEE from a regulatory perspective. His keynote speech raised some interesting questions for automakers and suppliers.

What are automakers and suppliers doing to get ahead of regulation and reduce NEE? Developing solutions before regulations are imposed is of course more efficient than reacting to regulation, but until the details of proposed regulation are known, automakers and suppliers will be left aiming at a potentially moving target.

Second, how fundamental will the changes need to be in tyre and brake design/technology to reduce vehicle-based NEE? Stakeholders will be concerned that changes may have notable cost implication, while consumers will be hoping that changes are broadly affordable within existing budget parameters.

And third, is there anything that automakers and suppliers can do to mitigate road surface NEE? Kay confirmed at EuroBrake 2021 that road wear particle emissions are estimated to be roughly equal to tyre wear emissions; he also noted that evidence shows considerable variances in road wear emissions in different countries.

## Collaboration required

This is a challenging and complex area, said Kay. "It's important we find a way to address and reduce brake emissions," he said, "and I believe that if regulators and industry work closely together, we can find the most appropriate way of ensuring that any new regulation still allows for innovative solutions to be brought forward."

# Eight things road can learn from rail – and vice versa

*Apart from the physics involved in stopping, what, if anything, do rail and road have in common?*

**EuroBrake 2021 once again featured a focus on rail. The list of differences between the vehicles, driving conditions, and infrastructure for road and rail is of course considerable, but the presence of the rail industry at EuroBrake 2021 raised the question: what can industries such as automotive learn from other sectors, such as rail? And apart from the physics involved in stopping a vehicle, what, if anything, do rail and road have in common?**



This was the subject of a EuroBrake 2021 keynote by Dr. Stefan Doersch, who heads up brakes, couplings, and door-systems at DB Systemtechnik GmbH. In addition to Doersch's keynote, the EuroBrake 2021 agenda

features three technical sessions and a panel session devoted to the global rail industry.

"The more we can learn from other industries, the more we can bring new ideas into the work the automotive industry is doing," said FISITA Chief Executive Chris Mason during the event. "Influence comes in ways you wouldn't have thought previously. We used to talk about the automobile and its constituent parts. Now we learn from people who are bringing in new technologies. They're going to influence mobility in the future. The fact that train-to-infrastructure connectivity is of interest to the automotive industry is a great example."

There are also things the rail industry – and other sectors such as aerospace – can learn from the automotive industry, noted Roy Link, Chairman and Chief Executive of Link Engineering and Chair of the Executive Board for the SAE Brake Colloquium. "The information which you glean out of those interactions is extremely valuable," said Link. "And remember, in between rail and automotive is mass transit. How to handle a massive number of people, and the energies that we see in rail, and the speeds that we see in aircraft all contribute to the technology that's coming in the automotive industry."



"We're working hard in the FISITA community on the technology of mobility, and that's not just automobile based," said Mason.

"Mobility is where traditional automobile-based technology meets

rail, or aerospace technology, or the mass movement of people," he explained. "There are many other industry sectors we can invite to our braking conferences."

Here are eight areas where the automotive industry can learn from rail and other sectors – and vice versa:

## Standardisation

"Rail has been doing standardisation work for many years," said Jan Münchhoff, Chair of EuroBrake. "This is something the automotive industry can learn from rail. There is considerable standardisation in the rail world, and this is also a good opportunity for the development of automation."

## Materials



"There is a realm of material technologies and ways of investigating materials, and looking at better ways of doing things that we see in the rail industry and the aircraft industry," said Roy Link. He noted the

use of carbon fibre, which came out of the aircraft industry and is now being utilised in automotive applications on an increasing basis.

## Communication



"Train-to-train and train-to-infrastructure communication is of real interest to the automotive industry," said Jan Münchhoff.

"Obviously there are different circumstances, but the automotive

world can learn about communication from rail."

## Simulation

Although simulation is being increasingly used in the automotive industry, automakers and suppliers still have much to learn about the use of simulation, said Roy Link, who noted that "Scale testing and utilising samples of materials to project full-scale action is very commonly used in the rail industry, and in the aircraft industry."

## Software

“The use of software to influence brake performance and braking comfort, and also the blending of electrical and frictional braking, is something we can learn from other sectors,” said Münchhoff.

## Comfort

As noted earlier, the physics involved in stopping a vehicle are the same, whether it’s a passenger car or an intercity train – and there is an accompanying need to ensure the comfort of the vehicle occupants during that braking activity, said Dr. Stefan Doersch of DB Systemtechnik, especially when the vehicle is in autonomous mode.

## Safety

The automotive industry always talks about how the use of autonomous systems has the potential for dramatic increases in safety, said Doersch; by contrast, the rail industry talks about “proof of equivalent safety” – that is, proof that high levels of operational safety are not negatively impacted by the replacement of human drivers with autonomous systems.

When it comes to automation, the issue of liability is the same in road and rail when the responsibility for the task of driving is transferred from a human driver to an automated system.

## Daily brake testing

Daily brake testing is a legal requirement for rail operators, said Doersch, who asked, could daily brake testing be introduced in the automotive industry for autonomous cars? “In our daily brake testing, we check if the brake command line is working and active from the driver’s interface to the very end of the train. We have to check if the local brake components in each carriage are switched on and working. And we have to check the pneumatic and electric energy supplies throughout the train.” These checks can be automated, using sensors, or manual, by the driver and staff. And at the end of each brake test, the driver has to manually check the brake lever and the HMI.

**As we move into an era of mobility as a service (MaaS), cars, trains, and all other forms of transportation take on equal importance, and the journey becomes more important than the vehicle. Clearly, there is very little technology overlap between road and rail, but there’s enough to begin seeking out areas of common interest, lessons to learn, and opportunities for knowledge-sharing and collaboration.**



**All EuroBrake 2021 *plus* 2012-20 technical content is available in the FISITA Digital Library – free to browse, registration required to view videos and download papers**

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# Foxconn pitches MIH as “Android of electric vehicles”

**Foxconn’s automotive ambitions have been the subject of increasing speculation in recent years, and in October 2020, to address what it lists as “three major challenges facing the traditional automotive industry,” Foxconn announced MIH, an open electric vehicle (EV) platform. Foxconn MIH CTO William Wei answers some questions about MIH and EVKit.**

Working in partnership with Foxtron Vehicle Technologies, Foxconn developed MIH to address high R&D costs, long lead times, and strained resources. The open platform approach makes MIH “available to all partners and third-party developers to utilize as they develop functional attributes and systems that will support the growth of the whole EV market.” Developed for electrification, MIH’s EVKit is modular and lightweight, and thanks to drive-by-wire technology, autonomous drive-ready.

[We have seen automaker’s modular systems strategies before. How Foxconn’s EVKit skateboard strategy different?](#)

In the six months since MIH was founded, its membership has grown to more than 1,600 companies. MIH continues to bring in strong partners and will be spun off as an independent consortium organization after July 2021.

MIH’s EVKit is an open EV platform like Android is an open smartphone platform. It has a software stack, and a hardware stack in the form of a rolling chassis or skateboard. Being non-profit and open like an open-source community, it will be independently governed by the partners and community members. Technically, MIH is intended as a game-changer, software-defined, and using hardware and software isolation layering to enable all domain experts to come in and innovate in an open way with strong go-to-market synergies.

[EVKit is an open collaborative engineering initiative. How important is pre-competitive collaboration in the development of next generation vehicles and mobility solutions?](#)

MIH will establish technical committees from our member base, including independent international certification and standards bodies. We will ensure all generations of reference design EVs are derived from state-of-the-art technologies with best value propositions for all car manufacturers, and the market will decide the next-generation solutions.

[MIH breaks ground in automotive by ignoring the industry’s traditional dependence on brand heritage. What has been the response to this from the legacy automakers and suppliers?](#)

MIH has attracted tremendous responses from different domain experts and sectors, from global tech giants to EV start-ups. Besides the recent announcement from newcomers such as Fisker, we have had many legacy automakers making

inquiries and wanting to talk with MIH with great outcome – look at our recent MOU with Stellantis to develop future products. Stellantis Chief Executive Carlos Tavares said this will change the way cars are engineered, the pace of engineering, and the frequency at which cars are upgraded. Both Bosch and Continental have also joined MIH, along with others.

[The MIH EVKit looks beyond electrification to prepare for autonomous driving. What has been the greatest interest in EVKit – electrification or autonomous driving?](#)

Both electrification and autonomous driving are very much anticipated. The evolution of EEA architecture designs from decentralized to domain-based and then to zonal and to truly centralized is a hot topic for many partners. Autonomous driving is the immediate must-have application supported by our open drive-by-wire interface and open AD tool kits.

EVKit is much more than electrification or autonomous driving – it also covers open IVI SDK, battery management system interface SDK, smart city adaptor layer, automotive grade kernel and deterministic runtime, sensor fusion framework and SDK, identity and key management. MIH is charting brand-new territories and trying to make all new user experiences possible for future EV development.

[We are seeing considerable evolutions in automotive technology – indeed, we heard at EuroBrake 2021 that “braking is about so much more than stopping.” What other fundamental changes are you seeing or hearing about as you develop an open automotive platform?](#)

At MIH, we describe our approach to EVs in layman’s terms as, “Cars are like smartphones that move with mission-critical characteristics.” In this case, the mission-critical characteristics are real-time, security, and safety, to ensure sensory perception, vehicle control, and protection for safety.

Future EVs will co-exist with our other devices like smartphones, but identity and user context will become more dominant than ever. The seamless user experience transition between devices such as smartphone, EV, smart home and office will be the winning ticket, so EV experiences need to accommodate our user’s smart devices to always ensure smooth continuity.

# Chassis systems – a new approach to OEM-supplier collaboration?

*Foxconn joined Audi, Bosch, ZF, and professors from Braunschweig and Munich to discuss next-gen chassis systems*

**One of the highlights of EuroBrake 2021 was the EuroBrake Strategy Panel, which this year focused on chassis systems. Chaired by Dr Georg-Peter Ostermeyer of TU Braunschweig, and Jan Münchhoff of Audi, the session featured leading industry and academic experts delivering presentations and discussing a range of topics, including the future of OEM-supplier collaboration, the evolution of the supply chain, and the role of open and collaborative platform development.**



## Audi and the importance of automaker DNA

Jan Münchhoff, Director Development Driving Characteristics, Driver Assistance and Autonomous Driving Systems at Audi and Chair of EuroBrake, opened by underlining the importance of automaker DNA, and how Audi develops driving characteristics in its cars. The Audi DNA is like a fingerprint, he said, making it distinctive and unique in the market. “You should recognise if you step into an Audi right away that it is an Audi. If that happens, then we’ve achieved our target.” There are two driving characteristics of particular relevance to the automaker’s braking and chassis teams, he explained – effortless driving and controlled driving. “Effortless means an Audi car should be easy to drive even under very severe conditions, such as winter conditions, or feeling relaxed even after a very long drive. As for controlled driving, this means expecting a predictable car reaction in really high dynamic situations.”

## Chassis systems generate customer experience

Professor Peter Pfeffer, professor of automotive engineering at Munich University of Applied Sciences addressed the question,

can chassis systems generate customer experiences? His conclusion? Yes, they can. “We have so many freedoms to set parameters, to change characteristics, to change tyres, tune steering systems, and brake systems, and therefore we can fulfil customer needs. We need new methods to do that. If we can manage these tools, we can really generate a great customer experience.”

## ZF and chassis integration

Manfred Meyer, Senior Vice President Active Safety division at ZF Group spoke about the potential for chassis integration. Trends in vehicle technology, said Meyer, put software and electrification at the heart of vehicle manufacturing, whether that’s by a legacy automaker, a so-called radical automaker, or a true disrupter who sees the next generation of mobility as “computers on wheels.” The ZF response, said Meyer, was to develop a platform for vehicle hardware and software. “The hardware platform consists of all the actuators needed to drive a vehicle. And all the software which connects these actuators is one software module, which we call Cubix, which controls all the actuators in one app. A vehicle manufacturer can use this

hardware platform or the software platform, giving them a system to plug and play into their central controller. Any of these three categories of vehicle manufacturer can drive their vehicles, their supercomputer on wheels, but they do not need to worry about the integration of hardware.”

#### Bosch's pre-integrated system solution

Automakers need to balance megatrends such as automation, connectivity, and electrification, with shortened time to market and reduced development budgets. “How can we support the OEM as a supplier?” said Ulrich Schulmeister, Vice President Systems Engineering Vehicle at Robert Bosch. “Our answer is the so-called pre-integrated system solution.” With its Advanced Driving Module, or ADM, he explained, “Bosch can enable customers to combine and ensure safety and secure relevant motion control systems – and that way the OEM can retain its own specific DNA for differentiation from their competitors.” This ADM solution, he said, is ready for deployment.

#### Foxconn and the Android of EVs

William Wei, Chief Technology Officer at Foxconn Group presented Foxconn's rapidly developing MIH EVKit open EV platform. “Everybody is building the Nokia of EV,” said Wei, “but MIH is building the Android of EV with an open platform for mainstream and specialized applications.”

The Foxconn MIH approach to future electric vehicles, he said, is that “we think cars are like smartphones that move with mission-critical characteristics. The mission critical characteristics are real-time, security, and safety to take care of their sensory perception, vehicle control, and protection for safety.” The goal, Wei explained, “is for everybody to have free

access to EVKit to develop all user experiences based on different kinds of domain in an EV.”

#### Common platforms and the OEM-supplier relationship

Asked how the role of the OEM might evolve, Wei said, “I believe the future of the OEM will be like today's smartphone players, focusing on branding and differentiating themselves by user experiences.”

Pursuing the importance of brand differentiation, Meyer of ZF said, “It's extremely important that we're not developing a plug-and-play system where the OEM customer has no tuning ability. Any OEM needs to differentiate their platforms and their strategies from low to high-end vehicles, and from brand A to brand B.”

An open platform would enable more players in different domains to enter this space and speed up innovation, said Wei. Modularisation would require standards, and the speed of innovation runs differently to the speed of developing standards, cautioned Schulmeister of Bosch: “It's a question of speed – when will we have these standards?”

Schulmeister also noted the need to find the right balance when cooperating with a pool of suppliers. “We have to work together with our suppliers in the network, that's clear, but the question is, what is the right number of partners so that you can reduce complexity, and not increase complexity?”

#### Time to focus on the systems around the brake

Drawing the session to a close, Ostermeyer noted, “In addition to the technical input, I took away one thought in particular from this EuroBrake Strategy Panel discussion, and that is that we need to focus more and more on the systems around the brake.” That, he said, is a new challenge for EuroBrake.

# FISITA's ESOP initiative supports 50 students at EuroBrake 2021

**As part of its commitment to supporting the next generation of mobility engineers and lifelong learning for all, FISITA delivers a Student Opportunities Programme at each of its events throughout the year, and EuroBrake is no exception.**

The EuroBrake Student Opportunities Programme ("ESOP") invites 50 students worldwide from a range of disciplines, from over 35 universities this year, to join dedicated student sessions throughout the week of the EuroBrake conference. As well as Introductory and Q&A Sessions, Round Table and Surgery Sessions, the invited students receive CV and career advice, and more.

ESOP 2021 once again offered students with a passion for mobility the unique chance to network with and learn from international braking experts in industry and academia, as well as their peers. Along with the ESOP sessions, students were given full delegate access to EuroBrake 2021.

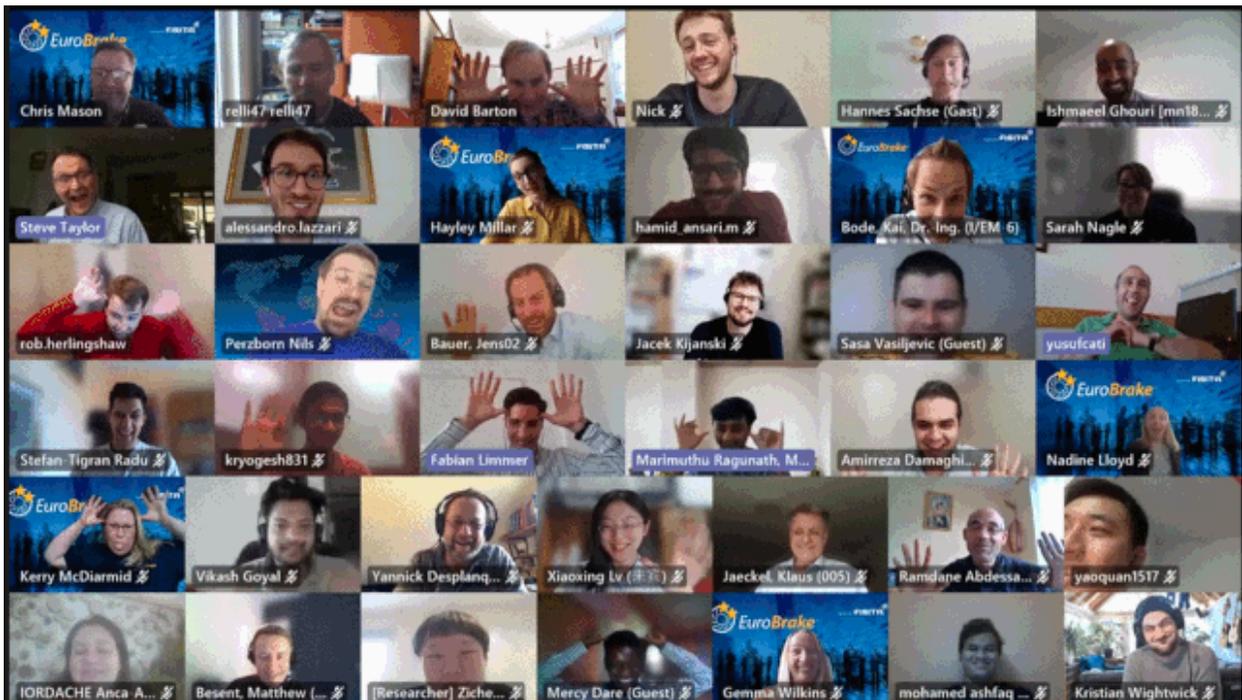
FISITA is grateful to the ESOP Working Group members from Audi, ZF, Continental, Volkswagen, Applus IDIADA, University of Leeds, TU Braunschweig, and the EuroBrake Steering Committee for their support with the ESOP initiative.

In addition, we thank braking experts from Brembo, Bosch Chassis Systems Control, Link Engineering, Altair, Applus IDIADA, TMD Friction, and Wabtec, along with Dr Martin Haigh from Latitude7, who joined and led ESOP sessions.

Students who were not selected for ESOP this year were still welcomed and encouraged to attend EuroBrake 2021; for just £25 students had the opportunity to join all the technical sessions throughout the week of EuroBrake as well as access to the 425 technical papers.

[Support the EuroBrake Student Opportunities Programme](#)

For more information on how your company can support the next generation of mobility engineers through the EuroBrake Student Opportunities Programme, please contact [Hayley Millar](#).



# Why EuroBrake is a community, not just an event

*EuroBrake has the potential to become an all-year-round international connected community – and FISITA is ideally placed to facilitate this*

**As EuroBrake 2021 draws to a close, it seems pertinent to reflect on the value of this global technical forum – and why EuroBrake is so much more than a single event: EuroBrake is a community.**

EuroBrake is traditionally acknowledged as the world's largest annual braking conference, and provides the opportunity for the braking community to come together for knowledge-sharing, networking, and more.

"Braking is about so much more than stopping," said FISITA Chief Executive Chris Mason, at EuroBrake 2021. New technologies are shaping and changing brake technology – braking is evolving, and so too is EuroBrake, with the annual EuroBrake conference held online for the first time in 2021.

*EuroBrake has the potential to become an all-year-round international connected community – and as its organiser and host, FISITA is ideally placed to help make this happen*

In delivering a week-long event online, EuroBrake may not have provided the in-person experience of pre-Covid times, but it certainly demonstrated the benefits and efficiency of online engagement and sowed the seeds of a community that can collaborate all around the world, all year long.

More and more, there is evidence that cooperation is the fastest and most efficient way to develop and deliver new mobility solutions. According to Chris Mason, FISITA is seeing growing interest from companies keen to invest in a pre-competitive arena as they seek the value of peer group collaboration in the advancement of new technologies and solutions.

Consider the impact of connected, automated, shared, and electrified (CASE) technologies on braking – and the role of braking in the delivery of CASE technologies; consider, also, the impact on braking of non-exhaust emissions (NEE) regulations.

Although they may require local solutions, these are global challenges facing global companies, and because the early work required for any solution to these challenges is common to all stakeholders, it makes sense to collaborate in the pre-competitive space.

"The automotive industry takes its responsibilities very seriously," said Mason, "and the brake emissions challenge is one issue where I have seen a massive focus, and considerable contribution and effort from FISITA membership and the EuroBrake community. Once again, our industry will meet and overcome the challenge in solution mode and deliver its contribution to a cleaner and better world."

*EuroBrake 2021 demonstrated the benefits and efficiency of online engagement, and sowed the seeds of a community that can collaborate all around the world, all year long*

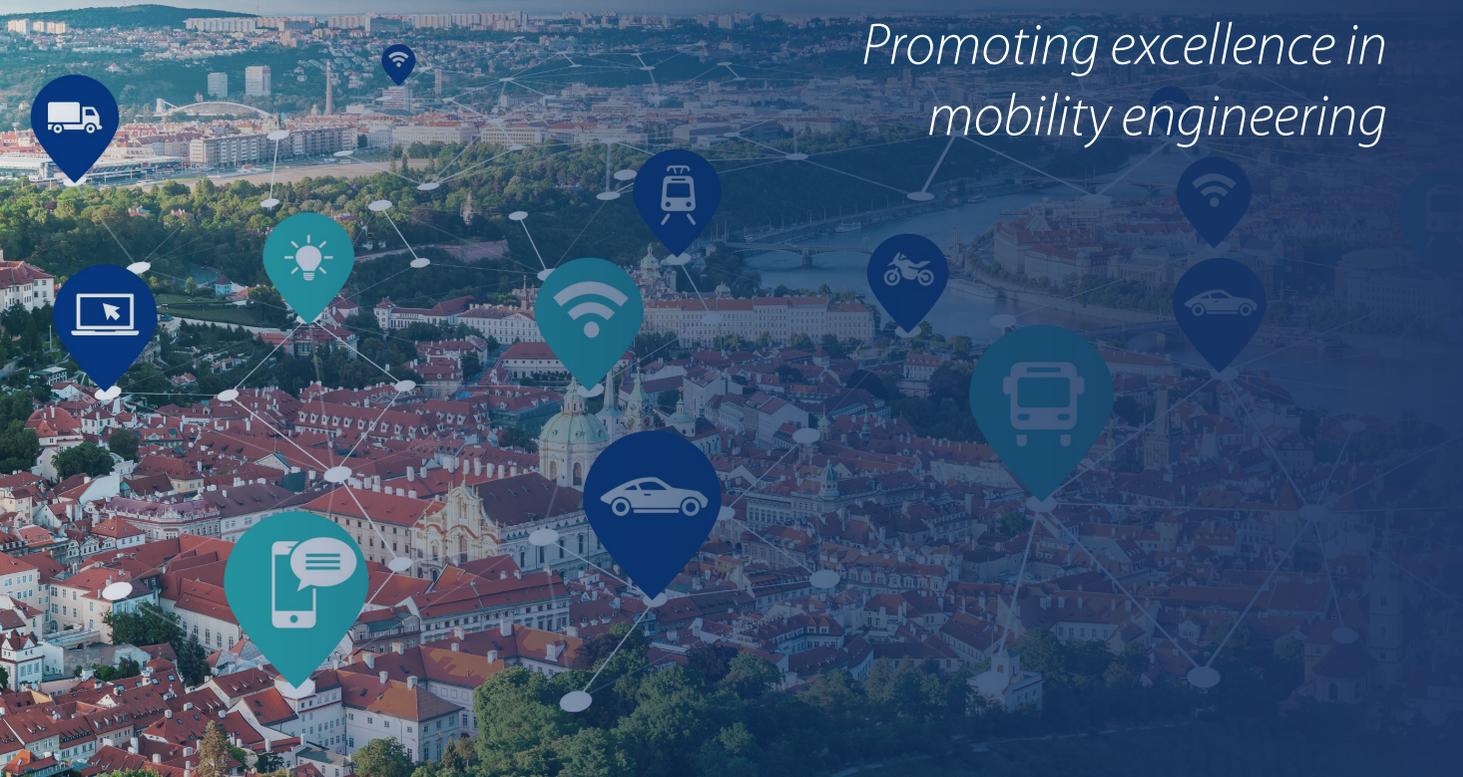
As evidenced by the EuroBrake Leadership Discussion that opened the conference this year, EuroBrake enjoys close collaboration with AsiaBrake and the SAE Brake Colloquium – and that's just one of the many ways that EuroBrake's network extends to engineers all around the world. Foxconn CTO William Wei's presentation on MIH, the open EV platform that already has over 1,600 members, underlined the evolution in the automaker-supplier relationship, and the need for brake industry stakeholders to widen their focus to the many other systems around the brake.

Having begun as an online conference, EuroBrake now has the potential to become an all-year-round international connected community – and as the organiser and host of EuroBrake, FISITA is ideally placed to help make this happen.



# FISITA

*Promoting excellence in  
mobility engineering*



Become part of the FISITA International Connected Community of mobility industry experts, engineers and executives, and contribute to the knowledge share and thought leadership that drives mobility forward.

Join us and your peers focussing on member-led priorities such as carbon neutral mobility, digitalisation agenda, intelligent safety, workplace evolution, EDI and more as we work together in delivering the technology and methodology of mobility.

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