13 October 2020 **07:30**

Opening of the platform

13 October 2020 **08:15**

Welcome Address by CTI and the Chairman

PLENARY SPEECHES

13 October 2020 **08:25**

| PLENARY SPEECH

The next generation of electric vehicle buyers

- Comparison vs. buyers from 2009 – 2019
- Research findings on next gen EV buyers

Mike Dovorany
Vice President – Automotive & Mobility,
Escalent, USA

13 October 2020 **08:45**

Q&A

13 October 2020 **08:50**

| PLENARY SPEECH

The Automatic and Electrified Transmission Portfolio for Ford Motor Company Passenger Vehicles

- All new 8 and 10 speed ATs for conventional powertrains

- Powersplit and modular hybrid transmissions
- BEV single speed gearbox

Ramasunder Krishnaswami
Director Transmission and Driveline
Engineering,
Ford Motor Company, USA

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13 October 2020 **09:10**

Q&A

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13 October 2020 **09:15**

PLENARY SPEECH

The Ultium Propulsion System

- GM's vision for EV propulsion
- Our journey to an all-electric lineup
- GM's battery strategy
- GM's architecture and drive unit strategy

Adam Kwiatkowski
Executive Chief Engineer – Global
Electric Propulsion Systems,
General Motors LLC, USA

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13 October 2020 **09:35**

Q&A

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13 October 2020 **09:40**

Challenges of automotive electric drive design due to high power density

Prof. Dr Markus Henke
Institute Director, Institute for Electrical Machines, Traction and Drives (IMAB), Technische Universität Braunschweig

13 October 2020 **10:00**

Q&A

13 October 2020 **10:05**

Announcments & Transition to coffee break

13 October 2020 **10:10**

Coffee Break and Visit to the Digital Exhibition

EXPERT PANEL

13 October 2020 **10:40**

| EXPERT PANEL

Combustion vs. electrification in view of legislation and consumer demand

Moderator:

Tom Rucker
President,
Magna Powertrain, USA

Paul Eichenberg
Managing Director,
Paul Eichenberg Strategic Consulting, USA

Greg Gardner
TDE Chief Engineer,
Ford Motor Company, USA
Further panelists tbd

Sandy Stojkovski
CEONorth America
Vitesco Technologies USA, LLC

13 October 2020 **11:20**

Lunch Break and Visit to the Digital Exhibition

TECHNICAL SESSIONS

13 October 2020 **12:00**

TECHNICAL SESSIONS

All session pres. incl. 5 min Q&A

E-DRIVE UNIT I

12:00

What's the role of the electrification going forward?

Greg Pannone, Executive Director, Powertrain Analysis, IHS Markit, USA

12:30

E-drive with 2 e-motors and 2-speed-gearbox with dog clutches

- Shiftable speed overlay system, e-synchronisation

Prof. Dr Peter Johannes Tenberge, Director, Institute for Industrial and Automotive Drivetrains, Ruhr-University Bochum, Germany

01:00

Hummingbird – Next Generation High Speed Electric Drive Unit

- Testing activities of the 30,000 RPM Electric Drive Unit

Wayne Petzke, Chief Engineer – Transmission, Driveline & Electrification, AVL Powertrain Engineering, Inc.

01:30

Coffee Break and Visit to the Digital Exhibition

02:00

Electric drives of tomorrow – innovative 2-speed concepts

- 2-speed concepts
- 800V
- SiC

Dr Stephan Demmerer, Head of Advanced Engineering E-Mobility, ZF Friedrichshafen AG, Germany

02:30

Optimized for the fleet, customizable for every model – an innovative e-axle modular system

- Powertrain platform's modularity
- 2 speeds, optional non-power-shiftable or power-shiftable
- A-class up to D-class performance SUV
- Detailed look inside the transmission design

René Kockisch, Team Manager, IAV GmbH, Germany

POWERTRAIN CONTROLS, MODELING & ANALYSIS

12:00

Clutch thermal and sensor modelling by using machine-learning algorithms

- Virtual sensor model
- Clutch thermal model
- Machine learning algorithm

Markus Schödder, Project Engineer Function Development Transmission Systems, FEV Europe GmbH, Germany

12:30

Functional safety emphasis in qualifying AUTOSAR based software components

- Qualifying AUTOSAR based SW components – overview
- Industry challenges in qualifying AUTOSAR based SW components
- Special considerations to adjudicate the challenges of software component qualification

Dhanabal Arunachalam, Functional Safety Architect, Robert Bosch Engineering and Business Solutions Private Limited (RBEI), India

01:00

Predicting lubrication, power losses and heat transfer with Smoothed Particle Hydrodynamics (SPH)

- Low gear FZG examples and application example
- FZG higher rotation speed and application example
- E-Motor Cooling

Markus Ihmsen, CEO, FIFTY2 Technology GmbH

01:30

Coffee Break and Visit to the Digital Exhibition

02:00

Model-based angular position sensorless drives of main electric oil pump for transmission

- Low cost practical method for sensorless drives
- Robust position estimator with electrical parameter adaptation
- Measurement error compensation for phase voltages
- Experimental results with various types of electric oil pumps for DCT, AT and e-axle

Dr Chinchul Choi, Team Lead, Myunghwa Ind. Co., Ltd, South Korea

TRANSMISSION COMPONENTS - I

12:00

Replacing hydraulic actuation in electrified drivelines

- Introduction and hydraulic benefits and liabilities
- Electro-magnetic actuation (EMA)
- Multiplexing electric actuator

Alex Haldane, Senior Engineer, DANA Incorporated, UK

12:30

Customized powertrain actuation systems for passenger cars and commercial vehicles

- Systematic development process
- Electromechanical actuation solutions
- Clutch and gear actuation for EV and HEV

Erik Schreiterer, Team Manager Advanced System Development, IAV GmbH, Germany

01:00

High performance polymer gears – a viable solution for future drives?

- Automotive megatrends and their impact
- Perception of high performance polymer gears
- Durability proof under real test conditions
- Application references

Ralf Weidig, Global Program Manager Gears, Victrex Europa GmbH, Germany

01:30

Coffee Break and Visit to the Digital Exhibition

02:00

Park by wire system for current electric drive units

- Functional safety and diagnostic concepts
- Mechanical park lock concept
- Park by wire concept

Brian Campbell, Chief Engineer, FEV North America Inc., USA

02:30

A technique to maintain compliance of the floating member of in a high speed complex planetary gear train

- Virtual development of high speed transmission
- Dynamic load sharing model
- Mathematical model of complex planetary

Scott Sweet, Technical Leader, Ricardo Inc., USA

| ADDITIONAL PRESENTATION ONDEMAND

Full range isolation devices for future HEV

- Future dampers need to respond to NV issues as P2HEV expands.
- High performance damper is applicable to various vehicles
- Isolation system can be simplified with electric motor usage

Yusuke Tomita, Manager, EXEDY Corporation, Japan

CALIBRATION, TEST AND DEVELOPMENT METHODS

12:00

A virtual calibration toolchain with objective assessment

- Virtual development enviroment for transmission calibration
- Automate calibration process with objective assessment tool
- Real words ‚vs' virtual calibration

Christopher Burbidge, Global Technical Expert – Transmission Control Software, Ricardo UK Ltd., UK

12:30

Advanced validation strategy for electrified drivelines

- Validation strategies to support short time to marked
- Improved product maturity at early development stage
- Component failure-based validation program optimization

Wilhelm Vallant, Product Manager Passenger Car Transmission, AVL List GmbH, Austria

01:00

Test catalog for validation of Electrive Drive Unit (EDU) transmissions

- Electric drive unit validation
- Test procedure development for EDU's

Thomas Wellmann, Department Manager, FEV North America, Inc., USA

01:30

Coffee Break and Visit to the Digital Exhibition

02:00

Simulation of skidding behaviour in electric-vehicle bearings

- Description of the mathematical model used to predict skidding

- Underlying skidding mechanisms in high-speed bearings
- Skidding behaviour of electric vehicle bearings – case study

Sanket Joshi, Application Engineer, Romax Technology

02:00

RDE PLUS – A ROAD TO RIG DEVELOPMENT METHODOLOGY FOR WHOLE VEHICLE DEVELOPMENT, CALIBRATION AND VERIFICATION

- Frontloading via Road to Rig
- Engine-in-the-Loop
- Decoupling the effects of driving style and traffic density on engine performance and emissions using a virtual toolset

Philip Roberts, HORIBA Automotive Test Systems

TRANSMISSIONS, AWD

12:00

Pushbelt variator module to improve perfor-mance of electrified powertrains

- Best power conditions, improved acceleration, top speed and gradeability
- Range of applications and driving modes with flexible CVT4EV system
- Compact and efficient CVT4EV with few components

Gert-Jan Van Spijk, Director Engineering Transmissions, Bosch Transmission Technology, The Netherlands

12:30

Power to the Wheels – Hybrid AWD Challenges and Benefits

- CO2 benefits of all-wheel drive electrification
- Improvement of longitudinal and lateral dynamics
- Cost benefits through adaptable hardware and software modules

Simon Kaimer, Global Product Manager AWD 4WD Attributes and Function, Magna Powertrain, Austria

01:00

TREMEC TR-9070 DCT and TR-9080 DCT dual-clutch transmissions

- High performance DCT brothers with tremec DNA

Mathew Memmer, Program Director, TREMEC Corporation, USA

01:30

Coffee Break and Visit to the Digital Exhibition

02:00

Development of GM Allison 10-speed heavy duty transmission

- Heavy duty 10-speed automatic transmission

Chi Teck Lee, Transmission and Drive Unit Technical Specialist, General Motors LLC, USA

02:30

Light-weighted Orbis Wheels present multiple novel opportunities for OEM

- First in-wheel motor to sidestep the un-sprung weight penalty
- Technology bridging today & tomorrow
- Retrofitting ICE to clean-sheet EV designs

Marcus Hays, CEO, Orbis, USA

02:30

PIA 4.0: Our roadmap to automation in a digitalized future

- PIA's automation competence
- Digital and Analog service portfolio
- Live Demonstration

Claude Eisenmann, Chief Digital Officer, PIA Automation Holding GmbH

| ADDITIONAL PRESENTATION ONDEMAND

Vehicle performance improvement with eLSD System for EV AWD platform

- FR based eLSD system introductions
- Performance improvement of ICE vehicle with eLSD
- Simulation of EV AWD with eLSD.

Heon Kang, Senior Research Engineer, Hyundai WIA, Republic of Korea

LUBRICATION

12:00

Innovative foil-sensor revolutionizes fluid monitoring in electrified drivetrains

Mario Theissl, University Assistant, Institute of Machine Components and Methods of Development, Graz University of Technology, Austria

12:30

NextGen extended range fluids for multi-speed e-drives

Armin Schenk, Global OEM Manager Driveline, Castrol Driveline Technology Centre, Germany

01:00

E-Mobility: How new thermal fluids can enhance battery performance

- CFD modelling comparing indirect with direct cooling using thermal fluids
- Experimental data new battery demonstrator to validate CFD modelling
- Abuse test results confirming successful fire safety through engineering
- Rethink system integration, combine cooling of battery with other components

Dr Volker Null, Technology Manager Thermal Fluids, Shell Global Solutions GmbH, Germany

01:30

Coffee Break and Visit to the Digital Exhibition

02:00

Mobil EV hydrocarbon based thermal management fluids for battery electric vehicles

- Mobil EV dedicated fluid solutions for electric vehicles
- Products to manage heat more effectively than water-glycol
- Improves safety by reducing risk of thermal runaway
- Promotes extended battery range and durability

Abby Van Wassen, Senior Researcher Electric Vehicle and Driveline Lubricants, ExxonMobil Research & Engineering, USA

02:30

Assessing proper lubricant corrosion protection for next generation electrified powertrains

- Using new copper wire and conductive deposit test methodologies
- Evaluating performance within head, immersed and restricted spaces
- Stablishing guidance for performance criteria

Christopher Prengaman, Research Engineer, The Lubrizol Corporation, USA

13 October 2020 **03:00**

End of program day one

14 October 2020 **08:00**

Welcome Address by CTI and the Chairman

PLENARY SPEECHES

14 October 2020 **08:10**

| PLENARY SPEECH

Impact on electrification on international lessons learned

Don Hillebrand
Director, Energy System Division,
Argonne National Laboratory (ANL),
USA

14 October 2020 **08:30**

Q&A

14 October 2020 **08:35**

| PLENARY SPEECH

Innovative electrified transmissions for next generation mobility

- Modular design to achieve economies of scale and flexibility
- Integration of mor functions to reduce cost and space requirements
- PHEV technology to overcome range anxiety

Dr Jörg Trampler
Director, Engineering Center,
ZF Group North America, USA

14 October 2020 **08:55**

Q&A

14 October 2020 **09:00**

| PLENARY SPEECH

Electric drive transmissions for passenger cars and light commercial vehicles

- Battery electric drive
- Market tendencies
- Single speed and multi speed transmissions
- Simulation results and transmission designs

Dr Ingo Steinberg
Group Vice President,
FEV Europe GmbH, Germany

14 October 2020 **09:20**

Q&A

14 October 2020 **09:25**

| PLENARY SPEECH

A market segment approach for optimizing hybrid propulsion systems

- Architecture comparison of DHTs and parallel hybrid transmissions for different market segments
- Different hybrid topologies required to deliver balance across the vehicle fleet
- Optimization considerations and methods to meet the demands of the regulations and end users

Paul Diemer
Director of New Product Management –
PowerDrive Systems,
BorgWarner, USA

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14 October 2020 **09:45**

Q&A

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14 October 2020 **09:50**

| PLENARY SPEECH

Mobility for tomorrow - Change within the automotive industry is inevitable

- The cessation of the automotive industry as we know it today
- Getting ready as an industry for disruptive changes in consumer behavior
- New product technology and legislation around the world

Patrick Lindemann
President Transmission Systems & E-
Mobility,
Schaeffler Group

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14 October 2020 **10:10**

Q&A

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14 October 2020 **10:15**

| PLENARY SPEECH

BP energy outlook 2020 and solutions for advanced mobility

Dr David Hall
Distinguished Advisory,
BP International Ltd, UK

14 October 2020 **10:25**

Q&A

14 October 2020 **10:30**

Coffee Break and Visit to the Digital Exhibition

EXPERT PANEL

14 October 2020 **11:00**

| EXPERT PANEL

System engineering in the age of no compromises

Moderator:

Jeff Lux
Head of Global Propulsion Systems Quality,
FCA FIAT Chrysler Automobiles LLC, USA

Jamie Arnold
Director of Engineering,
AVL Powertrain Engineering Inc.

Jim Downs
Executive Director – Innovation,
American Axle Manufacturing (AAM),
USA

Marques McCammon
President,
Ricardo Inc., USA

Christophe Dominiak
Senior Vice President and Chief Technology Officer,
Dana Inc., USA

14 October 2020 **11:40**

Lunch Break and Visit to the Digital Exhibition

14 October 2020 **12:10**

Announcements & Transition to parallel sessions

TECHNICAL SESSIONS

14 October 2020 **12:15**

TECHNICAL SESSIONS

All session pres. incl. 5 min Q&A

E-DRIVE UNIT II

12:15

Formula E-race transmission 2.0

- EV high speed transmission
- Layouts and architectures
- High efficiency

Steve Blevins, Project Manager, Ricardo UK Ltd, UK

12:45

A next generation tightly integrated electric axle

Dr Karel Vergote, Manager Advanced Development, Punch Powertrain N.V., Belgium

01:15

Multi-speed electric drive unit for commercial vehicle applications

- Powertrain of heavy duty commercial vehicle
- Electric drive system
- Concept and design details

Cao Zheng, eKontrol GmbH, Austria
Dr Gereon Hellenbroich, FEV Europe GmbH, Germany

01:45

Coffee Break and Visit to the Digital Exhibition

02:15

What is next for electric axles

- 2-speed axles
- Power shift
- Torque vectoring

Markus Steinberger, Director R&D E-Mobility, Schaeffler Group

02:45

An innovative approach to a coaxial planetary P4 e-axle

- Thermal management
- eAWD propulsion systems
- P4 e-axle

Joe Palazzolo, eDrive Director, GKN Automotive, USA

HYBRID POWERTRAIN

12:15

Benchmarking of hybrid powertrains

- Comparison of hybrid powertrains with different mechanical complexity
- Assessment of electrical and mechanical complexity in different vehicle segments
- Evaluation of efficiency and driving performance
- Application of benchmark parameters to assess powertrain concepts

Christian Sieg, Research Associate, Electric and Hybrid Drives, Institute of Automotive Engineering, Technische Universität Braunschweig, Germany

12:45

A systematic approach to find the ultimate hybridized powertrain

- Investigation of hybridized powertrain configurations
- Powertrain topology and component size optimization
- Attributes development with co-simulation detailing

Dr Stephen Jones, Principal Product Manager Systems, AVL List GmbH, Austria

01:15

Modular and scalable 48 V platform e-drive solutions for CO2 reduction and traction assist

- 48V P2.5-, P3- and P4-hybrid solutions
- High speed concepts from 20.000 up to 35.000 rpm
- Efficiency-, thermal-, NVH- and EMC-optimization

Dr Gernot Steinmair, Senior Manager eMotor Engineering, Magna Powertrain, Austria

01:45

Coffee Break and Visit to the Digital Exhibition

02:15

Future sustainable powertrain platforms

- From future mobility demands to concrete powertrains
- Trade-off between CO2 TtW, CO2 WtW, CO2 CtG and costs
- Rightsizing and objective comparison of powertrain systems
- Systematical generation of DHT- and EV-platform systems

Dr Christoph Danzer, Manager Powertrain Concepts and Sustainability, IAV GmbH, Germany

02:45

Scalability goes Live – Modular Hybrid Transmission Family for High-Volume Applications

- Modular scalable hybrid transmissions up to 300 Nm
- Flexibility for reducing complexity by electrification
- Robust technology through scalable building blocks

Dr Carsten Buender, Director Global Product Management, Transmission Systems, Magna Powertrain, Germany

03:15

Modular and highly functional hybrid platform for subcompact cars up to full-size SUV

- Modular transversal hybrid platform for subcompact cars up to SUV
- Dedicated hybrid transmission (DHT) platform
- Optimal ICE-layout and technologies for hybridized powertrains
- Electrochemical simulation of Li-Ion movements in active material

Erik Schneider, Senior Vice President Transmission & Hybrid Driveline & Electrification, IAV GmbH, Germany

TRANSMISSION COMPONENTS - II

12:15

High Efficiency Oil-Pump – Transmission Hydraulic Efficiency Increase through Hybridization

- TDP – twin drive pump
- Hybrid transmission oil pump
- Significant improvement of hydraulic supply efficiency

Oscar Sarmiento, Head of Advanced Development & Innovation Management, Vitesco Technologies Germany GmbH, Germany

12:45

Dry Multi-Plate Clutch – Efficient Active Torque Control in Electrified and Conventional Drivetrains

- Requirement trends for active torque control devices
- Report about dedicated PCC dry friction technology
- Analysis of traditional wet versus new dry multi-plate

Falk Nickel, Head R&D, Miba Friction GmbH, Austria

01:15

New semi-dry friction solution for highly integrated active torque controlled drives

- Material development – From fiber to friction disc
- Requirements of semi-dry friction solutions
- Test methods to evaluate NVH and friction performance
- MC650 carbon composite material as enabler for less drag torque

Volker Föge, Manager – R&D Wet Friciton Division, Miba Frictec GmbH, Austria

01:45

Coffee Break and Visit to the Digital Exhibition

02:15

Gear Baffle Optimization - A Novel Experimental Study

- Measurements of gear churning losses
- Additive manufacturing use for baffle optimizationsStudy
- Use of gear baffle for lubrication purposes

Mohammad Hotait, Senior Project Engineer, General Motors LLC, USA

02:45

Second Generation Linear Activation System for Mechanical Clutches

- New electro-mechanical device for mechanical clutches
- Mechanical clutch control
- Electric transmission components for BEV/HEV

John Kimes, President, Sigma Powertrain Inc., USA

03:15

Low friction bearings for e-drives

- Sources of Friction in rolling element bearings
- Cage Design for reduced oil agitation and friction
- Ball Bearings, Tandem Ball Bearings, and Tapered Roller Bearings

Mike Johns, Advanced Engineering Consultant, JTEKT NA, USA

E-DRIVE DESIGN & OPTIMIZATION

12:15

Electric Vehicle Powertrain Optimizer

- Selection of suitable optimum BEV powertrain
- Optimization of BEV powertrain elements

Muammer Yolga, Department Manager, AVL List GmbH, Austria
Michael Bernhard, AVL List GmbH, Austria

12:45

Optimizing BEV Powertrain Components and Architcture for Maximum Efficiency and Least Cost

- Modelling of EV powertrain components and architecture
- Optimisation of powertrain to mimise energy consumtion in drive-cycle using genetic algorithms
- Evaluation of energy efficiency of current and future powertrains
- Least cost powertrain solutions with lightweight EDU (e-axle)

Ajay Lukha, Chief Commercial Officer, YASA Ltd., UK

01:15

Highspeed rotor bearing dynamics and validation for 35000rpm

- High speed bearing rig

- Rotor dynamics
- axial load change

Andreas Puntigam, Technical Supervisor Transmission Simulation/Testing, AVL List GmbH, Austria

01:45

Coffee Break and Visit to the Digital Exhibition

02:15

Balancing of Fatigue, Efficiency, and NVH in an Electric Drive Transmission System

- Balancing the basic features from sketch onwards
- Durability footprint
- Efficiency footprint
- NVH footprint

Molly Kampschroeder, Engineer, GKN Automotive, USA

02:45

Noise Share Characterization of Electric Drive Units

- A novel transfer function based model for characterizing EDU noise shares

Jeffrey Pruetz, Manager of NVH and Vehicle Integration, FEV North America Inc., USA

03:15

Investigation into effects of transmission errors on the dynamic response of a high-speed epicyclic

- High speed gear NVH performance
- Virtual development of high speed transmission
- Dynamic load sharing simulation

Calum Brown, Chief Engineer, Ricardo Inc., USA

E-DRIVES, COMPONENTS

12:15

Powertrain, steering and suspension in a compact corner module for future urban mobility vehicles

- Limitless steering enables maximum vehicle manoeuvrability
- Quad-pivot lower wishbone allows compact suspension setup

- Integrated in-wheel motor delivers maximum power efficiency
- Single module design is fully symmetrical and common across all four corners of the vehicle, and enables front, rear and side access

Robert Lewin, Senior Systems Engineer, Protean Electric, UK

12:45

Designing an electrical machine: Just an electromagnetic problem?

- Multi-physics analyses of electrical machines
- Electrical machine design approach
- Electric powertrains

Michael Rubbo, Lead Application Engineer, Motor Design Ltd., UK

01:15

Evolution of 3:1 BEV drivtrains from single speed to two speed

- Development of 3:1 single speed drivetrain
- Development of two speed drivetrain
- Issues surrounding shift disturbances while shifting

Mike Duhaime, Vice President JJE & President of JJE North America, Jing-Jin Electric North America LLC, USA

01:45

Coffee Break and Visit to the Digital Exhibition

02:15

Advancements in electric drive and inverter technology for high performance long range BEV's

- E-motors
- Inverters
- Thermal management

Harsha Nanjundaswamy, Director, FEV North America Inc., USA

02:15

PEEK Polymers Enabling Improved Performance in Electrified Transmissions

- Higher Speeds Demand Increased Material Performance
- Mitigating Electrical Discharge Damage
- eMotor Insulation for Improved Thermal Performance

Chris Slowinski, Victrex Europa GmbH

02:45

The Coil Switching Inverter – A Step Change in Powertrain Design

- Mobility drive system optimization with coil switching
- Expanding motor utilization through inverter design
- Increasing system efficiency utilizing coil switching

Eric Hustedt, Chief of Engineering, Exro Technologies Inc.

02:45

Manufacturing Considerations for Traction Motor Assembly

Edoardo Freschi & **John Amery,** ATOP-IMA Automation

03:15

The right motor for the job

- Vertically integrated motor partner
- From machines to full motors
- Next generation efficiency
- E-mobility for tomorrow

Daniel Sayre, Manager eMotor Development, Schaeffler Group

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14 October 2020 **03:45**

Summary and Closing of the Conference by the chairman and CTI

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