

MOTOR & UMWELT – ENGINE & ENVIRONMENT
The Trend Conference in Graz



Program

Competition of Powertrain Systems

TO MINIMIZE CO₂ AND EMISSIONS 2020/2025

29th International AVL Conference “Engine & Environment”
1st – 2nd of June 2017, Helmut-List-Halle, Graz, Austria

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& Environment”
Mobile App.



FOREWORD



The development of powertrains is currently in a phase of enormous change. Electric vehicles have been announced for some time, but now several OEMs are planning market shares up to 25 % within 10 years. Hence the focus of development must be shifted NOW: The competition of powertrain systems is intensifying.

Does the combustion engine still have a future in this scenario? Will it lose ground or will it be able to assert itself by implementing new technologies and highly efficient exhaust gas aftertreatment systems together with e-fuel or bio-fuel? What role will the

diesel engine play? Particularly when the well-to-wheel method is applied to electric hydrogen to drive fuel cell vehicles? Do plug-in hybrids still make sense if electricity is not counted as having a zero CO₂ contribution? Is the 48 Volt route perhaps the better choice for hybrids? Will there still be many add-on hybrid transmissions or only DHTs (Dedicated Hybrid Transmissions)? What does the transmission of the future even look like?

The conference will cover and discuss the competitive approaches on a system level and the technical solutions for such concepts.

A handwritten signature in black ink, appearing to read 'H. List'.

Prof. Dr. h.c. Helmut List
Chairman and CEO
AVL List GmbH

A handwritten signature in black ink, appearing to read 'R. Fischer'.

Dr. Robert Fischer
Executive Vice President, Engineering and Technology
Powertrain Systems , AVL List GmbH

CONTENTS

- 2 Foreword
- 3 General Information
- 4 List of Speakers
- 6 Conference Program
- 10 Welcome to Graz
- 11 General Map of Graz
- 12 Test Drives and Welcome Reception
- 13 Social Program
- 14 About AVL

Please see attachment for registration and hotel reservation.

Subject to modifications.

GENERAL INFORMATION

Conference Office: AVL List GmbH,
Hans-List-Platz 1, A-8020 Graz,
Tel.: +43 (316) 787 927,
Telefax: +43 (316) 231123 4490,
E-Mail: event@avl.com

Conference Venue: Helmut-List-Halle,
Waagner-Biro-Straße 98a, A-8020 Graz

Registration: In the Helmut-List-Halle on
Thursday, June 1st, 2017

Conference Fee: € 1.190,- plus 20 % tax,
Students € 110,- plus 20 % tax,
Free of charge for members of the press.
Fees include proceedings, 2 lunches and
snacks, social evening events.

Conference Languages: German and English
(simultaneous translation)

Conference Documents: An order form for
additional conference documents is attached.

Additional conference documents are also
available at the registration desk.
(price: € 140,- plus 10 % tax)

Hotel Reservation: Please see the reservation
form attached.

Arrival: By plane: Graz-Thalerhof,
by train: Graz Main Station,
by car: see map of Graz (page 11)

Evening Program:
31st May, 13:00 Opening of the AVL-TU Graz
Transmission Center, Inffeldgasse 25e;
15:00 AVL Test Track in Gratkorn with
Welcome Reception at 19:00.
June 1st, 19:30 Social Evening at the
"Soap Factory"

Partners' Program:
Excursion to the National Park Visitor Center
Weidendom (Willow Dome) and monastery
library at Admont Abbey

PRESENTING AUTHORS



CONFERENCE AND SESSION CHAIRMAN

Dr. Robert Fischer, Executive Vice President Engineering and Technology Powertrain Systems, AVL List GmbH

Prof. Dr. h.c. Helmut List, Chairman and CEO, AVL List GmbH
Siegfried Nagl, Mayor of the City of Graz

Alexandra Pichler-Jessenko, Representative of the Province of Styria

Anton Angermaier, Head of Department "Electric Drive", AVL List GmbH

Prof. Dr. Joachim Böhme, Honorary Professor, University of Applied Sciences Zwickau

Brian Cooper, Manager Combustion and Emissions Research, Jaguar Land Rover

Dr. Wolfgang Demmelbauer-Ebner, Head of Gasoline Engine Development, Volkswagen AG

Iain Fleming, Deputy Director – Engines, SAIC

Dr. Günter Fraidl, Senior Vice President, Powertrain System Passenger Cars, AVL List GmbH

Prof. Dr. Uwe Dieter Grebe, Executive Vice President, Global Business Development, Sales & International Operations, AVL List GmbH

Jürgen Grimm, Vice President System Engineering, Continental Automotive GmbH

Michael Harpster, Global Chief Engineer, General Motors

Mitsuo Hitomi, Master, Managing Executive Officer, Mazda Motor Corporation

Harry L. Husted, Engineering Director Electronics & Electrification (Delphi Powertrain Systems), Delphi Automotive Systems, LLC
Denis Jeckel, Director Powertrain Engineering, Honeywell
Dr. Merten Jung, Head of Development Fuel Cell, BMW AG
Gerald Killmann, Vice President, Toyota Motor Europe
Nick Lester-Davis, Former Director, London Councils
Patrice Marez, Vice President, Powertrain System Senior Expert, PSA Group
Christof Schernus, Director Business Development R&D, FEV Europe GmbH
Ingo Scholten, Executive Director, SAIC
Prof. Dr. Manfred Schrödl, Head of Institute, Inst. of Energy Systems and Electrical drives, University of Technologie Vienna
R. Velusamy, B.Sc. BTech, Senior Vice President Engineering & Component Development PTD & Vehicle COE Systems (NVH, Materials Technology), Mahindra & Mahindra Ltd

CHAIRMEN

Dr. Robert Fischer, AVL List GmbH
Prof. Dr. Helmut Eichlseder, University of Technology Graz
Prof. Dr. Michael Bargende, Research Institute of Automotive Engineering and Vehicle Engines Stuttgart

Prof. Dr. Ferit Küçükay, University of Technology Braunschweig
Prof. Dr. Hans Peter Lenz, Austrian Society of Automotive Engineers

PANEL DISCUSSION

Moderator: Ulrich Walter M.A.

Members (in alphabetical order):

Dr. Wolfgang Demmelbauer-Ebner, Head of Gasoline Engine Development, Volkswagen AG
Prof. Dr. Uwe Dieter Grebe, Executive Vice President, Global Business Development, Sales & International Operations, AVL List GmbH
Jürgen Grimm, Vice President System Engineering, Continental Automotive GmbH
Gerald Killmann, Vice President, Toyota Motor Europe
Nick Lester-Davis, Former Director, London Councils
Patrice Marez, Vice President, Powertrain System Senior Expert, PSA Group
Ingo Scholten, Executive Director, SAIC

CONFERENCE PROGRAM – WEDNESDAY, MAY 31st, 2017

13:00	Opening of the AVL – TU Graz Transmission Center by Prof. Dr. h.c. Helmut List and Univ.-Prof. Dr.techn. Dr.h.c.mult. Harald Kainz
15:00	Welcome Reception at the AVL Test Track in Gratkorn TEST DRIVES START 15:00, opening address 19:00

CONFERENCE PROGRAM – THURSDAY, JUNE 1st, 2017

Conference and Session Chairman: Dr. Robert Fischer, AVL List GmbH

09:00–09:10	Welcome Address , Prof. Dr. h.c. Helmut List, Chairman and CEO, AVL List GmbH
09:10–09:20	Welcome , Siegfried Nagl, Mayor of the City of Graz
09:20–09:30	Opening of the Conference , Alexandra Pichler-Jessenko, Representative of the Province of Styria
09:30–10:00	ICE's Role for Overall Optimization Mitsuo Hitomi, Master, Managing Executive Officer, Mazda Motor Corporation
10:00–10:30	Next Generation PSA Powertrains: Efficient and Clean Solutions for Mobility Patrice Marez, Vice President, Powertrain System Senior Expert, PSA
10:30–11:15	Coffee Break
11:15–11:45	Towards Sustainable Mobility – Learning from Hybrid Gerald Killmann, Vice President, Toyota Motor Europe
11:45–12:15	The Powertrain of the Future for India R. Velusamy, B.Sc. BTech, Senior Vice President Engineering & Component Development PTD & Vehicle COE Systems (NVH, Materials Technology), Mahindra & Mahindra Ltd
12:15–14:00	Lunch

CONFERENCE PROGRAM – THURSDAY, JUNE 1st, 2017

Chairman: Prof. Dr. Helmut Eichlseder, University of Technology Graz

- | | |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 14:00–14:30 | The Future Role of the ICE in Transport Strategies of Major Cities
Nick Lester-Davis, Former Director, London Councils |
| 14:30–15:00 | E-Drives: Highly Efficient and Highly Integrated
Anton Angermaier, Head of Department “Electric Drive”, AVL List GmbH |
| 15:00–15:30 | e-Gas – An Important Element on the Way to CO₂-Neutral Mobility
Dr. Wolfgang Demmelbauer-Ebner, Head of Gasoline Engine Development, Volkswagen AG |
| 15:30–16:15 | Coffee Break |

Chairman: Prof. Dr. Michael Bargende, Research Institute of Automotive Engineering and Vehicle Engines Stuttgart

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|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 16:15–16:45 | BMW Zero-Emission Hydrogen Powertrain for Long-Range Mobility
Dr. Merten Jung, Head of Development Fuel Cell, BMW AG |
| 16:45–17:15 | Zero CO₂ Powertrains in Comparison between Well-to-Wheel and Tank-to-Wheel Balance
Christof Schernus, Director Business Development R&D, FEV Europe GmbH |
| 17:15–17:45 | Electrification – A New Springtime for the Combustion Engine
Dr. Günter Fraidl, Senior Vice President, Powertrain System Passenger Cars, AVL List GmbH |
| 17:45–18:15 | The PLANETARY MOTOR – A Novel, Unconventional Combination of Electric Motor and Planetary Gear for Driving Vehicle Axes
Prof. Dr. Manfred Schrödl, Head of Institute, Inst. of Energy Systems and Electrical drives, University of Technology Vienna |
| 19:30 | AVL Social Evening at the “Soap Factory”
Aperitifs at the invitation of the Mayor of Graz Siegfried Nagl |

CONFERENCE PROGRAM – FRIDAY, JUNE 2nd, 2017

Chairman: Prof. Dr. Ferit Küçükkay, University of Technology Braunschweig

09:00–09:30	Is Hydrogen the Solution for the Future Internal Combustion Engine? Prof. Dr. Joachim Böhme, Honorary Professor, Westsächsische Hochschule Zwickau
09:30–10:00	Building an Integrated Propulsion Capability Brian Cooper, Manager Combustion and Emissions Research, Jaguar Land Rover
10:00–10:30	Managing the Transition – ICE to Non Fossil Future! A Chinese OEM Perspective Iain Fleming, Deputy Director – Engines, SAIC
10:30–11:15	Coffee Break
11:15–11:45	Future High Efficiency, Low Emission, High Performance Gasoline Engines: Boosting Systems as a Key Enabler for Upcoming Legislation. Denis Jeckel, Director Powertrain Engineering, Honeywell
11:45–12:15	GM's New EV Propulsion System for the Chevrolet Bolt Michael Harpster, Global Chief Engineer, General Motors
12:15-12:30	ADAS/ Autonomous Driving & Vehicle Development Center Prof. Dr. h.c. Helmut List, Chairman and CEO, AVL List GmbH
12:30–13:45	Lunch

CONFERENCE PROGRAM – FRIDAY, JUNE 2nd, 2017

Chairman: Prof. Dr. Hans Peter Lenz, Austrian Society of Automotive Engineers

13:45–14:15 Electronics vs. Chemistry – How Will We Propel Ourselves?

Harry L. Husted, Engineering Director Electronics & Electrification (Delphi Powertrain Systems),
Delphi Automotive Systems, LLC

14:15–14:45 Energy Based Optimization of a Diesel Hybrid Fullfilling Future Real Driving Emission Legislation

Jürgen Grimm, Vice President System Engineering, Continental Automotive GmbH

14:45–15:15 Coffee Break

15:15–16:30 Panel Discussion

Moderator: Ulrich Walter M.A.

Members (in alphabetical order):

Dr. Wolfgang Demmelbauer-Ebner, Head of Gasoline Engine Development, Volkswagen AG

Prof. Dr. Uwe Dieter Grebe, Executive Vice President, Global Business Development,
Sales & International Operations, AVL List GmbH

Jürgen Grimm, Vice President System Engineering, Continental Automotive GmbH

Gerald Killmann, Vice President, Toyota Motor Europe

Nick Lester-Davis, Former Director, London Councils

Patrice Marez, Vice President, Powertrain System Senior Expert, PSA Group

Ingo Scholten, Executive Director, SAIC

16:30–16:45 Closing Remarks

Dr. Robert Fischer, Conference and Session Chairman, AVL List GmbH

THE PLEASURES OF GRAZ



Graz is indeed a striking beauty, to the point of rendering one sleepless. Self-confidently, the city presents itself both with new, fascinating landmarks and historic monuments, among them entire districts such as the Old City centre, honored and protected as a UNESCO World Cultural Heritage Site or the designation City of Design.

The city's "lifeline" is the broad river Mur, providing a relaxed atmosphere to the rhythm of flowing water. But Graz is above all a melting pot of cultures. For centuries, musicians, writers, architects and designers have set the tone in this, the European Cultural Capital 2003.

So how do you go about exploring this impressive cultural heritage site? The answer is simply "at your leisure". Most of its many sights are located within easy reach of elegant coffee houses, fine restaurants, colorful country markets and trendy bars. Graz can be discovered and rediscovered time and time again. A noble flair reigns, as in the arcaded courtyard of the Landhaushof, a masterpiece of the Italian Renaissance.

Have no second thoughts about visiting the attractions: Eggenberg Palace, the Museum of Contemporary Art (Kunsthau), Island in the Mur, Schlossberg, Opera and all the rest, the "compulsory" tourist program in Graz is a pure pleasure.



Hotel:

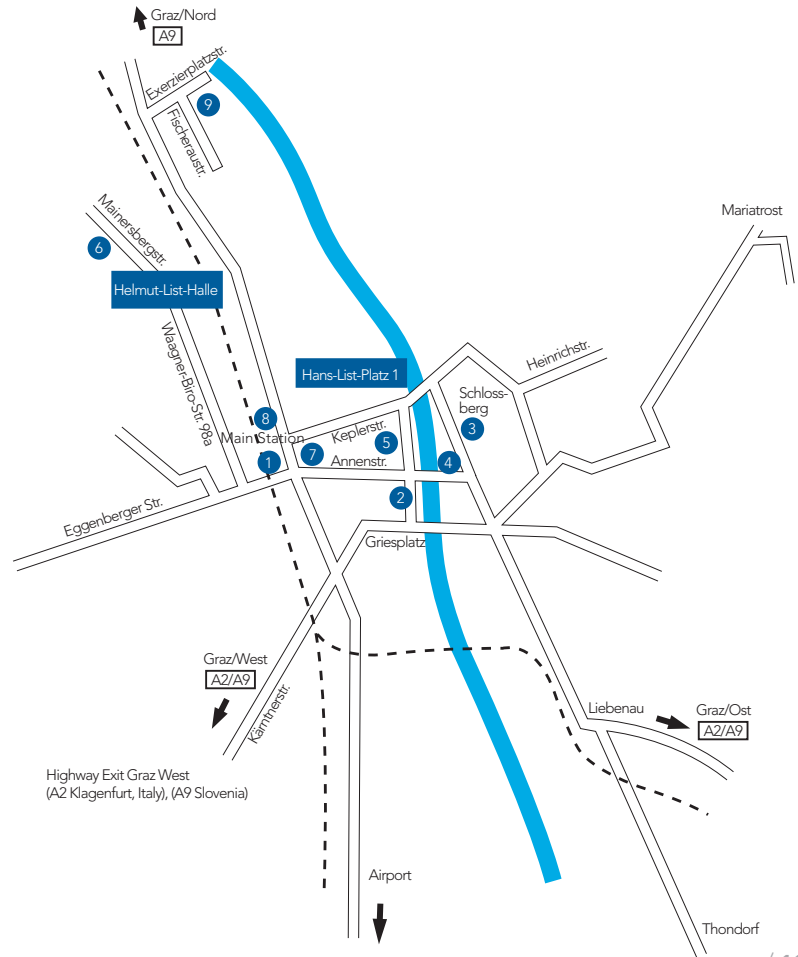
- ① Hotel Daniel
- ② Hotel Weitzer,
Hotel Wiesler
- ③ Schlossberghotel
- ④ Hotel Erzherzog Johann
- ⑤ Mercure Graz City
- ⑥ Hotel Bokan
- ⑦ Hotel Europa
- ⑧ Hotel Ibis
- ⑨ Wohlfühlhotel Novapark

Taxi:

Phone: +43 (316) 28 01
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Photos: Copyright Graz Tourismus - Hans Wiesenhofer

Highway Exit Graz North (A9 Salzburg, Linz, Germany)



TEST DRIVES AND WELCOME RECEPTION



WEDNESDAY, MAY 31st, 2017

WELCOME RECEPTION AT THE AVL TEST TRACK IN GRATKORN

Introduced in 2015 for the first time, the test drives with AVL vehicles on the AVL test track turned out to be a real highlight of the conference program. This year the participants will once again have the unique opportunity to drive demonstrator vehicles. Not only solutions for challenges, but also available technology for enthusiasts will be shown. Look forward to a fascinating, exciting and innovative start into our 29th International AVL Conference "Engine & Environment".

15:00 AVL Test Drives

followed by 19:00 Welcome Reception

SOCIAL PROGRAM



THURSDAY, JUNE 1st, 2017

PARTNERS' PROGRAM

Joy of nature and culture Plus...

Combine a tour of the world's largest monastery library at Admont Abbey with a visit to the area around the National Park Visitor Center Weidendom (Willow Dome). After a relaxed lunch at a restaurant in the heart of the National Park Gesäuse, many attractions will be waiting for you: a giant walk-in ecological footprint, a traditional farm garden, many resting areas and a shadowy theme path through the river wetlands. **Please bring weatherproof clothes and firm shoes.**

Meeting point: 09:00 Helmut-List-Halle

Expected End: 17:00

With sufficient demand: 2nd June, 2017, 3-Hour Graz Sightseeing Tour

THURSDAY, JUNE 1st, 2017

SOCIAL EVENING AT THE "SOAP FACTORY"

Erected in 1872 as a "Poudrette Factory" and revitalized in 2001 as event center, the "Soap Factory", situated near the river Mur, is the perfect setting for our Social Evening. We invite you to continue networking in the relaxed atmosphere of the outdoor dining area in the shade of beautiful trees at our special event location. Don't worry, the historical timberframed hall is an excellent weather-proof alternative. You will be entertained musically by the "Sara Hoffer Jazz Ensemble". The formation that has grown out of the Institute for Jazz in Graz will play jazz tunes that move.

19:30 Social Evening at the "Soap Factory"

AVL LIST GMBH



AVL is the world's largest independent company for the development of powertrains (engines, transmissions, e-motors, batteries and control systems) for passenger cars, commercial vehicles and industrial applications, as well as for instrumentation and test systems, with activities ranging from concept through to series development. Building on insights gained from its own research, AVL serves a global customer base by developing drive systems of all sizes and designs and integrating these into overall systems.

Currently, powertrain development is experiencing a phase of phenomenal dynamic change. It is often assumed that the next 5 years will see far more significant technological change than the previous 30 years. The increasing reduction in fuel con-

sumption and emissions levels, particularly in the passenger car sector, has forced the intensive development of electrified powertrains. The direct and indirect consequences of the real world emissions problem ("Dieselgate") has not only led to further short-term tightening of emissions legislation (RDE – Real Driving Emissions, packages 3 and 4), but also extreme uncertainty concerning the future of diesel engines in particular, and of the combustion engine in general. This has resulted not just in the current discussion of access limitations for diesel engines in inner cities, but even already executed as temporary measures under immission-critical boundary conditions. Furthermore, a blanket ban on new combustion engines from 2030 is finding an increasing number of supporters, particularly in the German political environment. The very fact that such



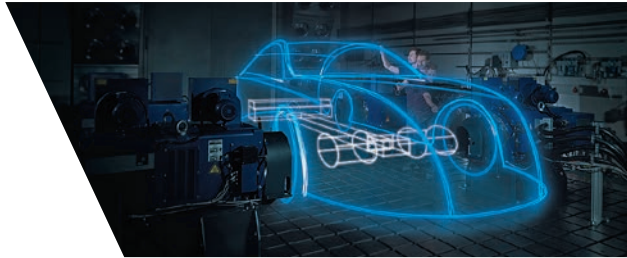
discussions are taking place could lead to a disruptive change in buying behaviour. This results in the introduction of further, extremely complex and above all non-technical influences into the rivalry between different powertrain concepts, which have traditionally focussed on fuel consumption, emissions, costs and performance.

However, in the competition between powertrain systems, electrification is not just a competitor but can also be regarded as a supporter for the combustion engine, and in conjunction with hybridisation enables the penetration of low fuel consumption and “zero-impact emission” areas that were considered unattainable for the combustion engine a few years ago.

Not only do driver-assistance systems up to completely autonomous driving have an enormous potential to increase traffic safety and transport efficiency, they also enable further operational improvements in the powertrain.

However, the practical implementation of the resulting emission and fuel consumption potential requires an ever-increasing level of integration of the combustion engine. Up until now, apart from the best possible calibration of the engine and transmission characteristics, the focus with conventional powertrains has been on the “geometric” and thermal integration of the powertrain in the vehicle.

Beyond this, hybridisation requires an intelligent inclusion of the combustion engine in the energy flow of the vehicle – the



“energetic integration”. This results in a range of useful powertrain configurations considering the different ratios of combustion engine and electrical power to battery capacity. The layout of the electric motors – modular (“BSG, ISG”), engine-integrated (“48V base engine”) or transmission-integrated (“DHT – dedicated hybrid transmission”) represents decisive differentiation characteristics.

The highest levels of integration are located on the “data level” – often called the digitalisation of the powertrain. The volume of traffic and environment information available enables a highly predictive, energy and emissions-optimized operation of complex powertrains.

The battle of the powertrains will see the emergence of new synergetic effects as one-time opponents become new allies, as the strengths of the other’s technology is recognized and used synergistically. It is exactly this path that will bring forth completely new technological solutions.

ADAS/AUTONOMOUS DRIVING & VEHICLE DEVELOPMENT CENTER



ADAS and autonomous driving will bring tremendous improvements in terms of vehicle safety, comfort and efficiency.

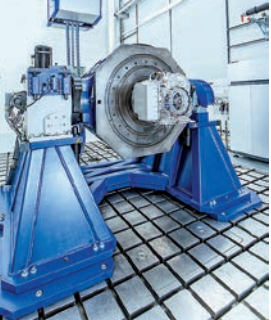
The rapid introduction of new ADAS and AD features requires new solutions for development, evaluation and validation procedures of ADAS functionalities.

AVL has established a new development center for ADAS/AD & Vehicle Engineering. New development methodologies for cars build up, testing and simulation will be developed, tested and demonstrated in this development center. The aim is to improve development and validation speed significantly, as well as to improve the customer acceptance of autonomous driving.

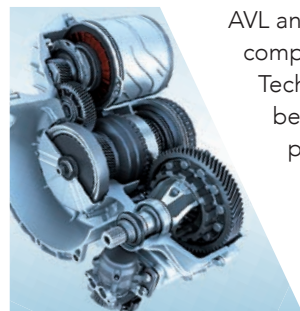
The opening of this development center will take place together with the inauguration of an autonomous driving test track in Styria.

The Opening of the AVL ADAS/AD & Vehicle Development Center including a virtual tour will happen during the conference on Friday, June 2nd, 2017 at 12:15.

We are looking forward to welcoming you to our new AVL-ADAS/AD Vehicle Development Center!



AVL-TU Graz Transmission Center



AVL and TU (University of Technology) Graz are pleased to announce the completion of a new corporate Transmission Center at the University of Technology premises in Graz. Augmenting the existing transmission test beds at AVL's Headquarters, this research and development center represents a further milestone in the development of AVL's transmission capabilities. Further test beds at this location are already planned.

We would like to invite you to the

OPENING AND TOUR OF THE AVL-TU GRAZ TRANSMISSION CENTER

on Wednesday, 31st of May, 2017, at 13:00.

Inffeldgasse 25/e, 8010 Graz

The event will be followed by test drives and the
"Engine & Environment" Welcome Reception which
will take place at the AVL test track starting at 15:00.

We look forward to being able to welcome you
to the new AVL-TU Graz Transmission Center.

