ELEMENTS FOR HIGH SPEED AUTOMOTIVE APPLICATIONS

GOFUN 2022

Thomas Schumacher

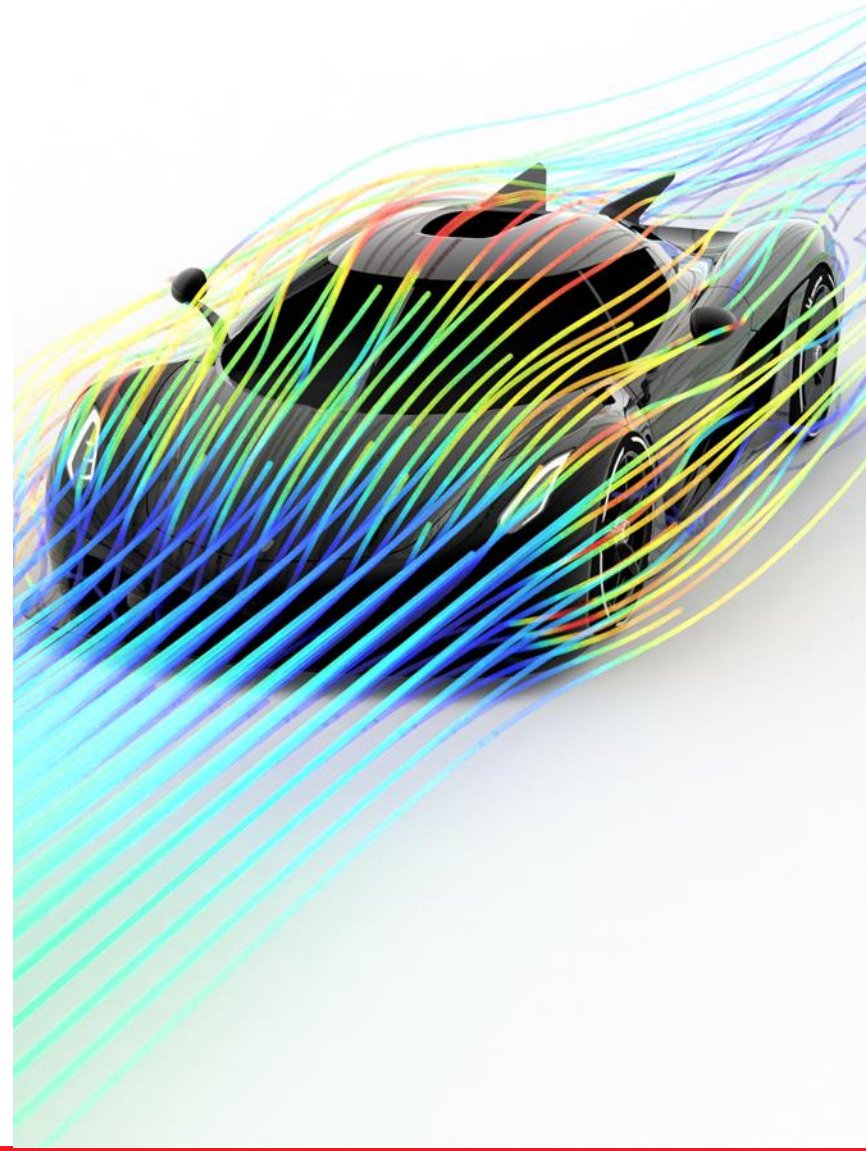
March 2022

© Copyright 2022 ENGYS Limited. All rights reserved.

engys®

Content

- Introduction
  - ENGYS
  - ELEMENTS
- Koenigsegg Jesko Absolut
- Mesh & Setup
- Results
- Conclusions & Future Work



© Copyright 2022 ENGYS Limited. All rights reserved.

Engys Worldwide

- Global providers of CFD products and services
- Founded in the UK (2009)
- Main focus on leveraging open-source software
  - FOAM/OPENFOAM developers since 1999
- 8 offices worldwide
  - UK, Germany, Italy, USA, Australia, RSA, Brazil, Greece
- Established reseller network
  - Japan, South Korea, USA, France, Spain, Germany…

© Copyright 2022 ENGYS Limited. All rights reserved.

engys®

Our Enterprise CFD Products

Commercial CFD Software Benefits

- Easy-to-use GUI
- Best-in-class technical support
- Extensive written documentation

Open-source CFD Technology Benefits

- Full capacity of code customization
- Free scalability (no HPC licenses)

ADD-ONS

HELYX ADJOINT

HELYX COUPLED

HELYX MARINE

HELYX HYDRO

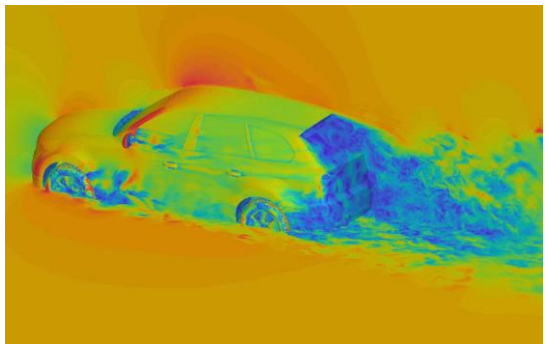
ELEMENTS ADJOINT

ELEMENTS COUPLED

© Copyright 2022 ENGYS Limited. All rights reserved.

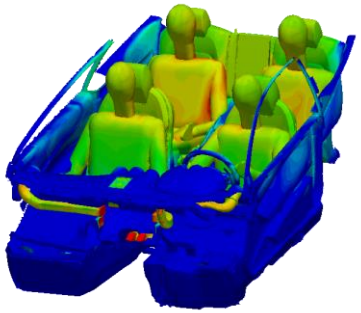
engys®

ELEMENTS Applications



External Aero
(+ Virtual Wind Tunnel)

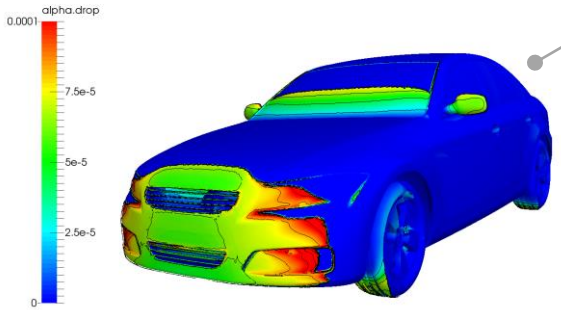
Thermal Management



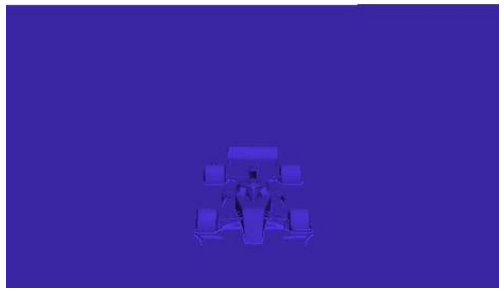
HVAC

Aeroacoustics

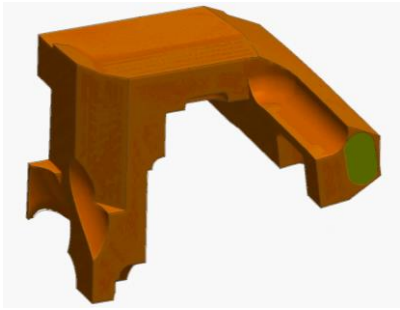
ELEMENTS
STREAMLINE VEHICLE DESIGN



Soiling



Motorsports



Adjoint Optimisation
(Topology and Shape)

© Copyright 2022 ENGYS Limited. All rights reserved.

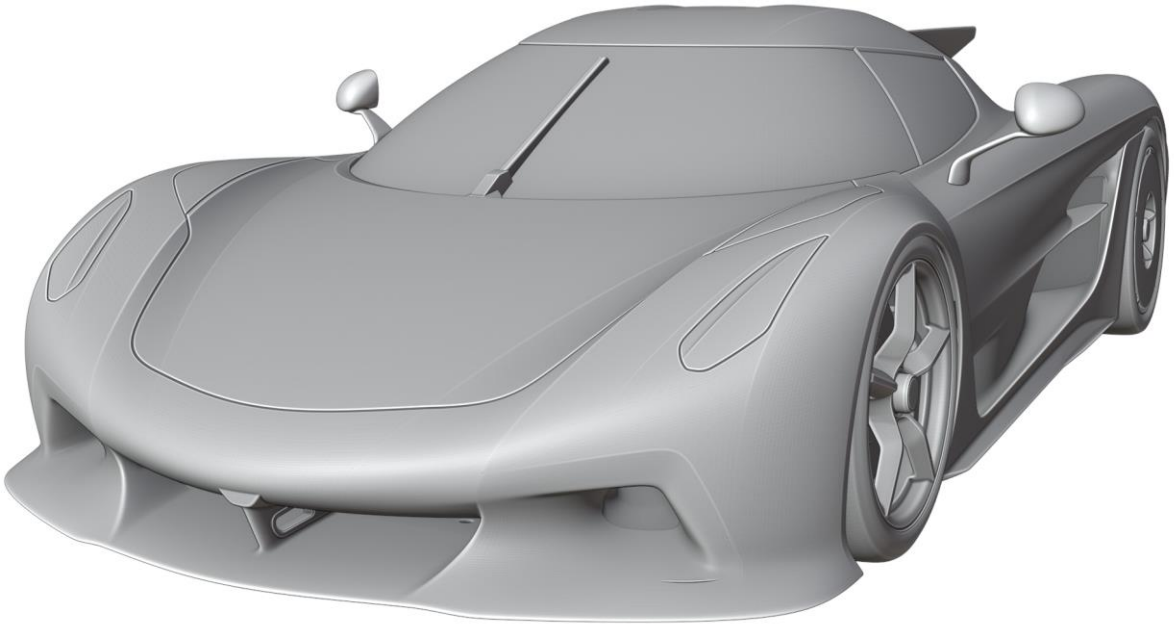
engys®

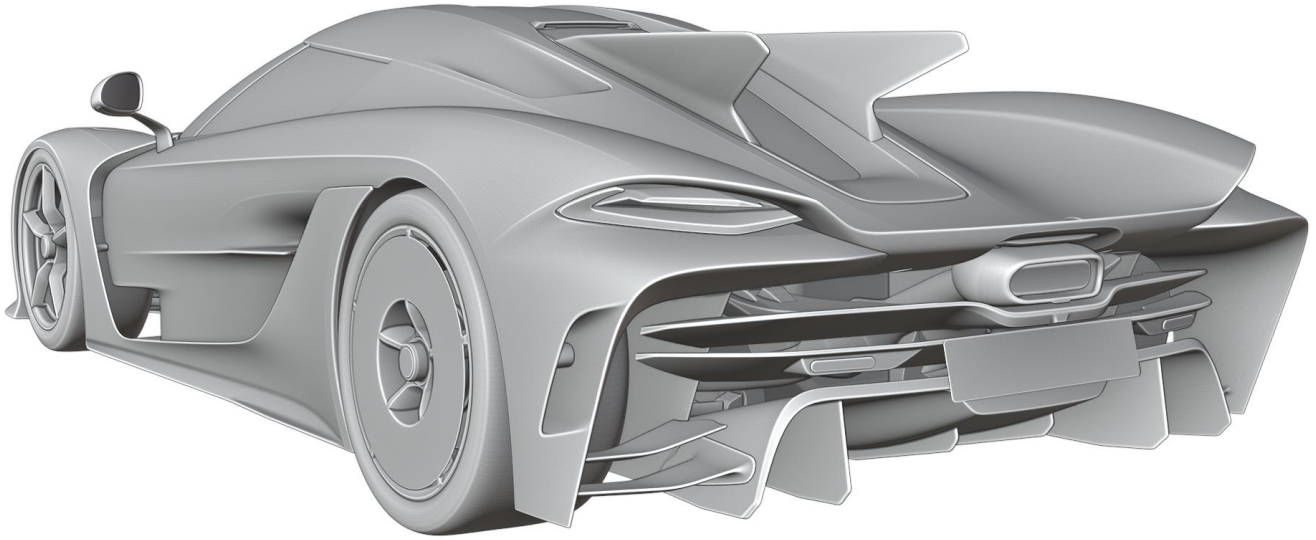
Koenigsegg Jesko Absolut

- Swedish megacar manufacturer
- Low drag version of Jesko
- 1600 HP
- Planned to break land speed record for street legal cars at 531km/h

© Copyright 2022 ENGYS Limited. All rights reserved.

Geometry



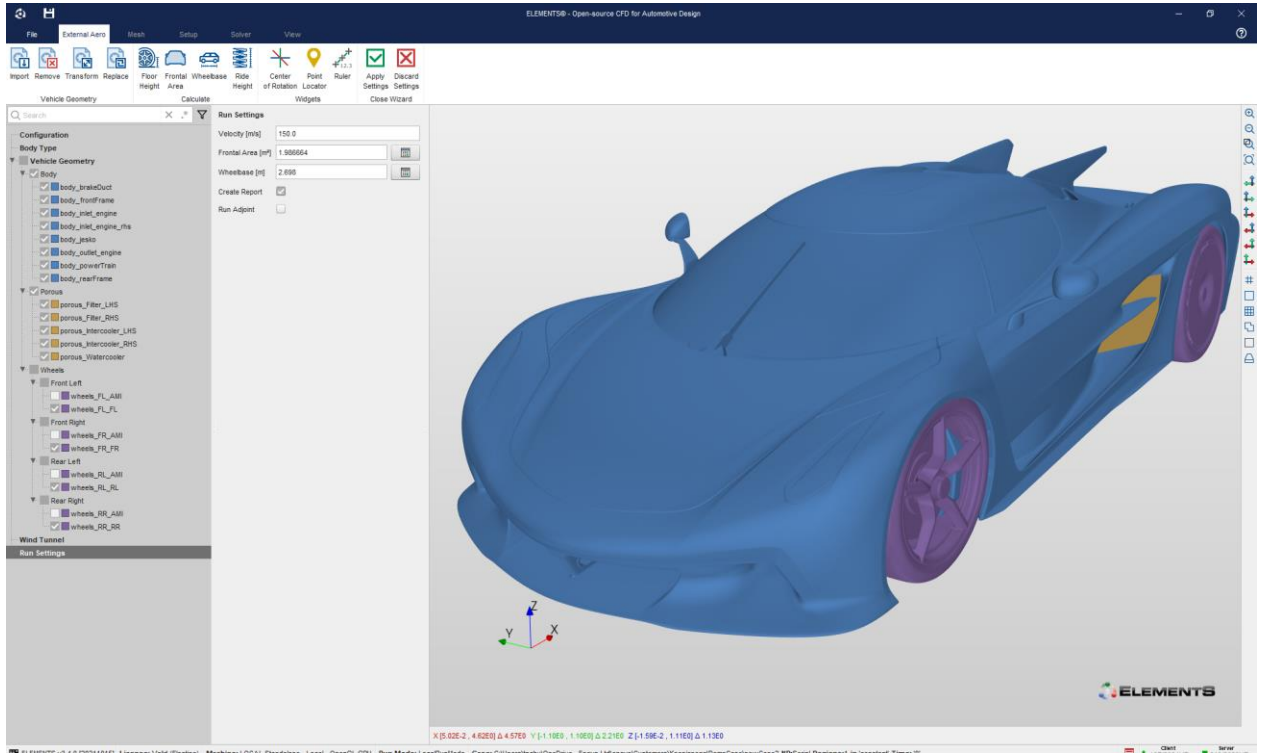


© Copyright 2022 ENGYS Limited. All rights reserved.

Challenge

- High accuracy CFD assessment needed to optimise aerodynamic performance
- Dynamic mesh for wheel rims
- Detached Eddy Simulation
- Compressible flow regime (Ma ~0.5)

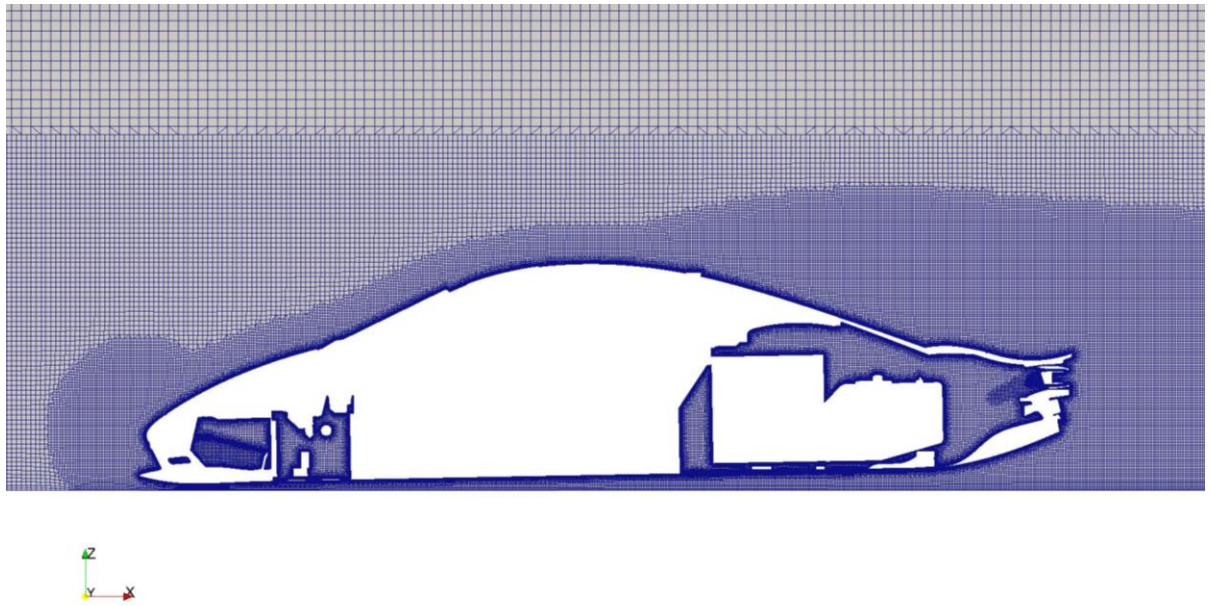
- Adopting ELEMENTS work flow for fast simulation turn around times



© Copyright 2022 ENGYS Limited. All rights reserved.

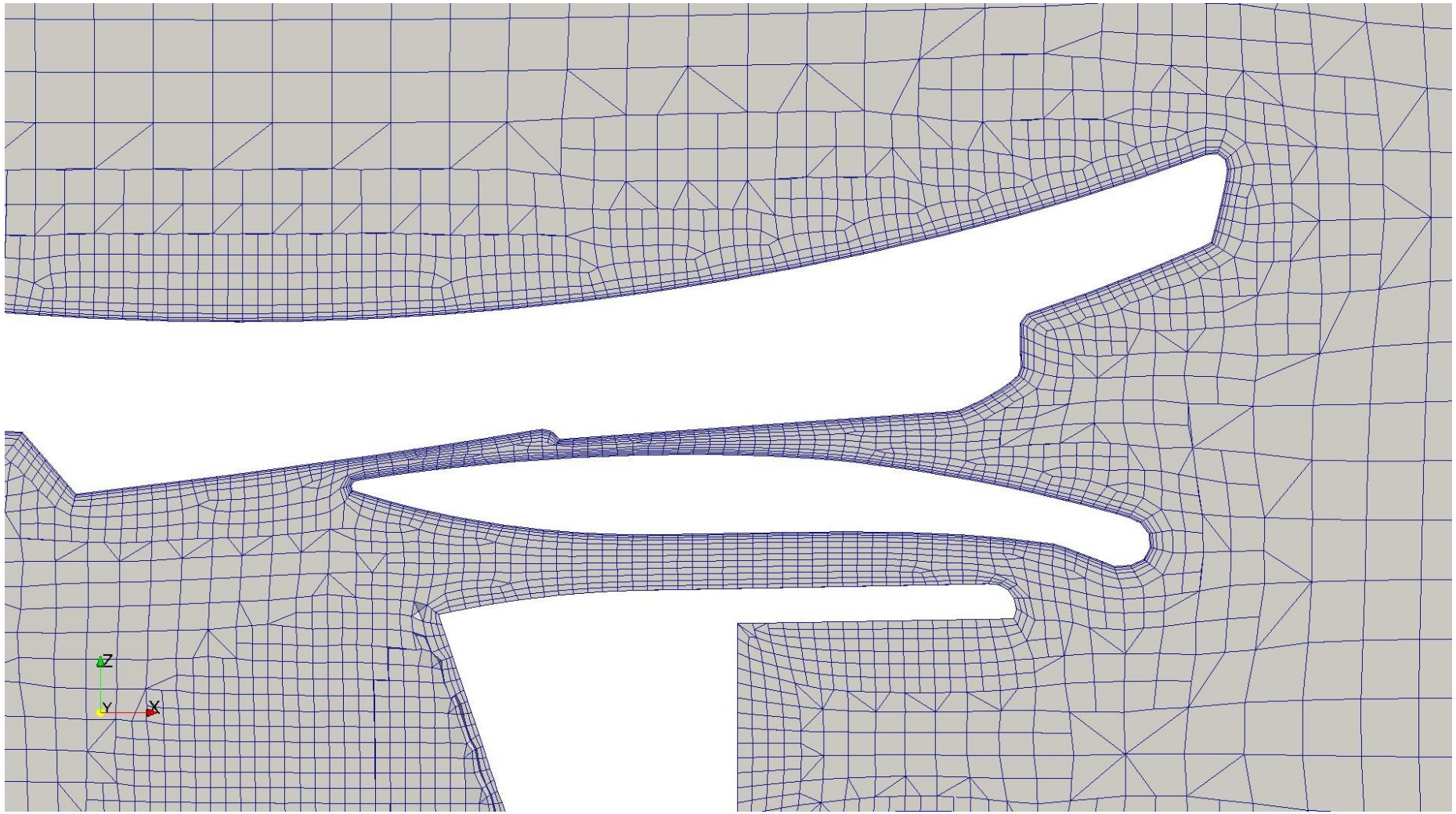
Meshing

- New extrude mesh algorithm for helyxHexMesh
- 100% layer coverage
- Mesh size: 85M cells



© Copyright 2022 ENGYS Limited. All rights reserved.

Mesh Detail

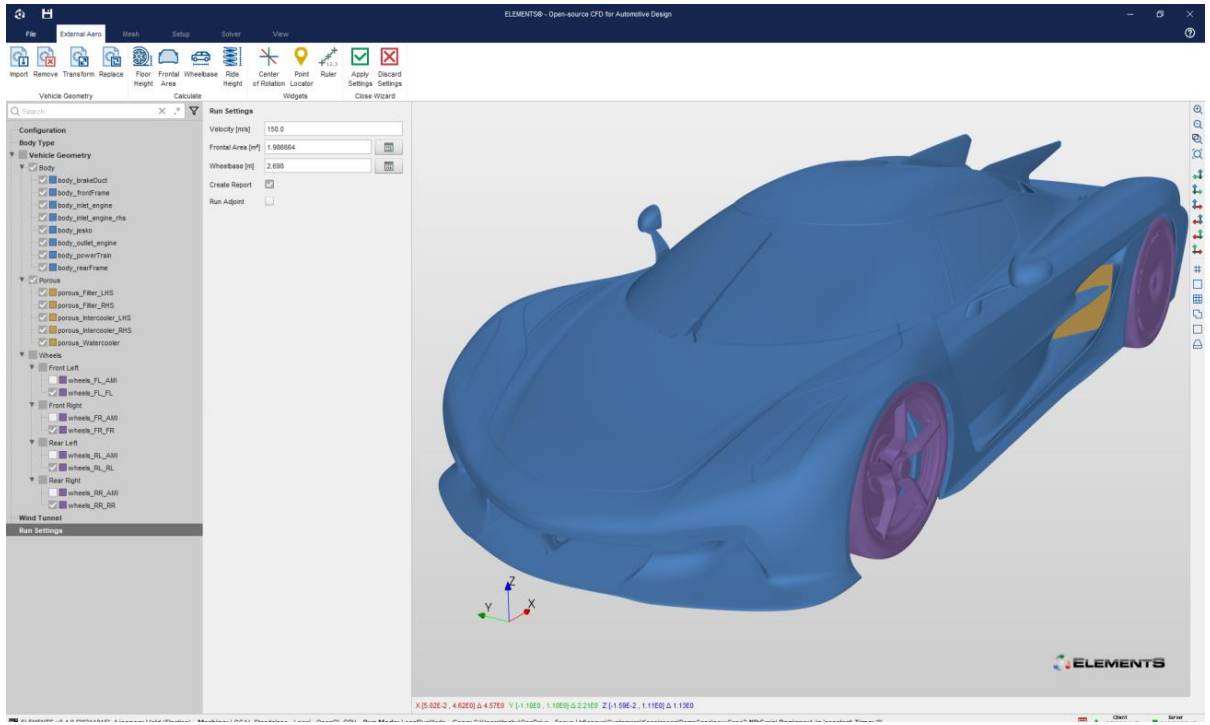


© Copyright 2022 ENGYS Limited. All rights reserved.

Setup

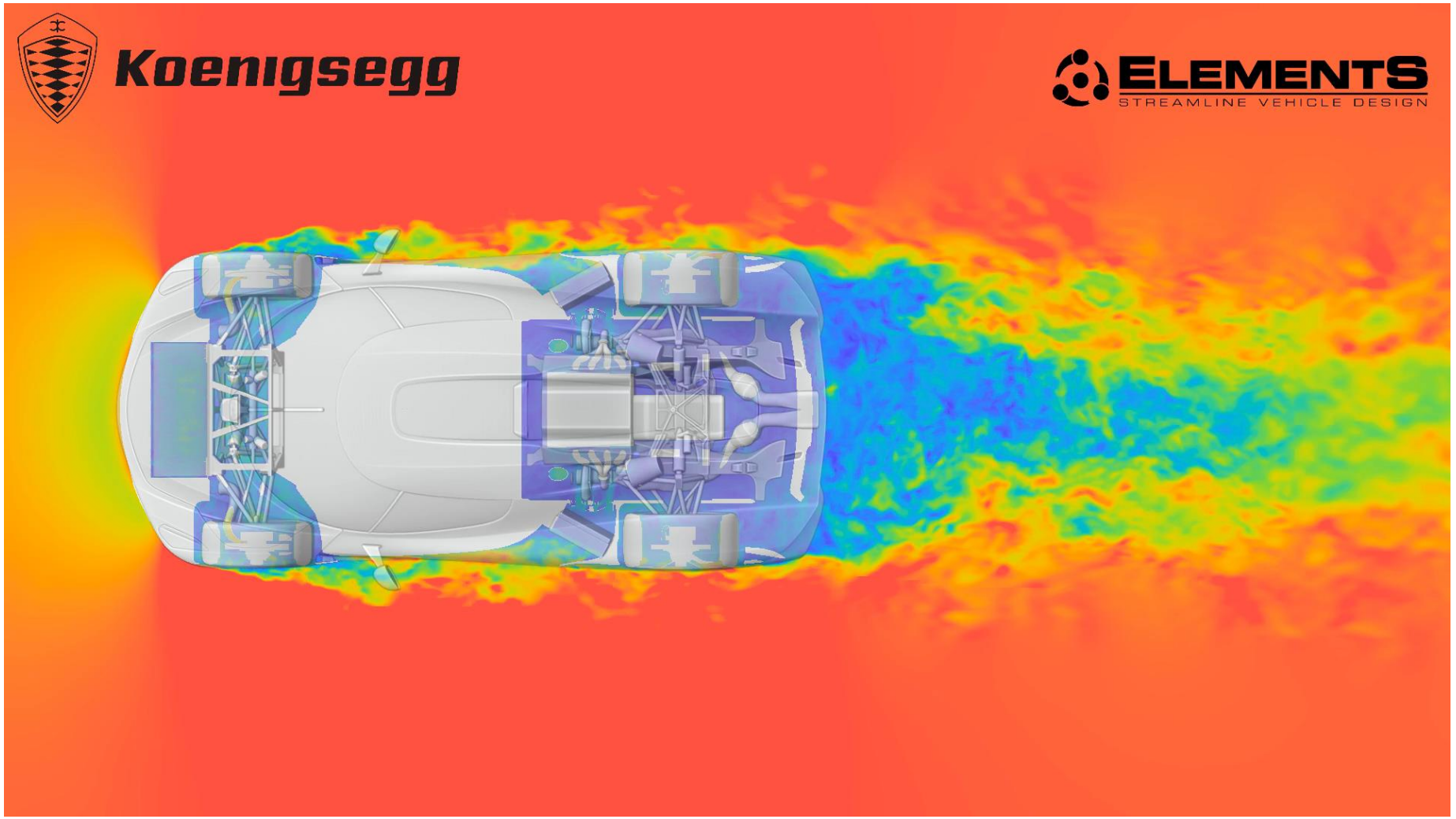
- SA-DDES
- Time step Δt=7.5e-5s
- Solver rhoPimpleDyMFoam
- 4x AMI for wheels
- 128 cores

- Runtime Postprocessing (RTPP) test for animations



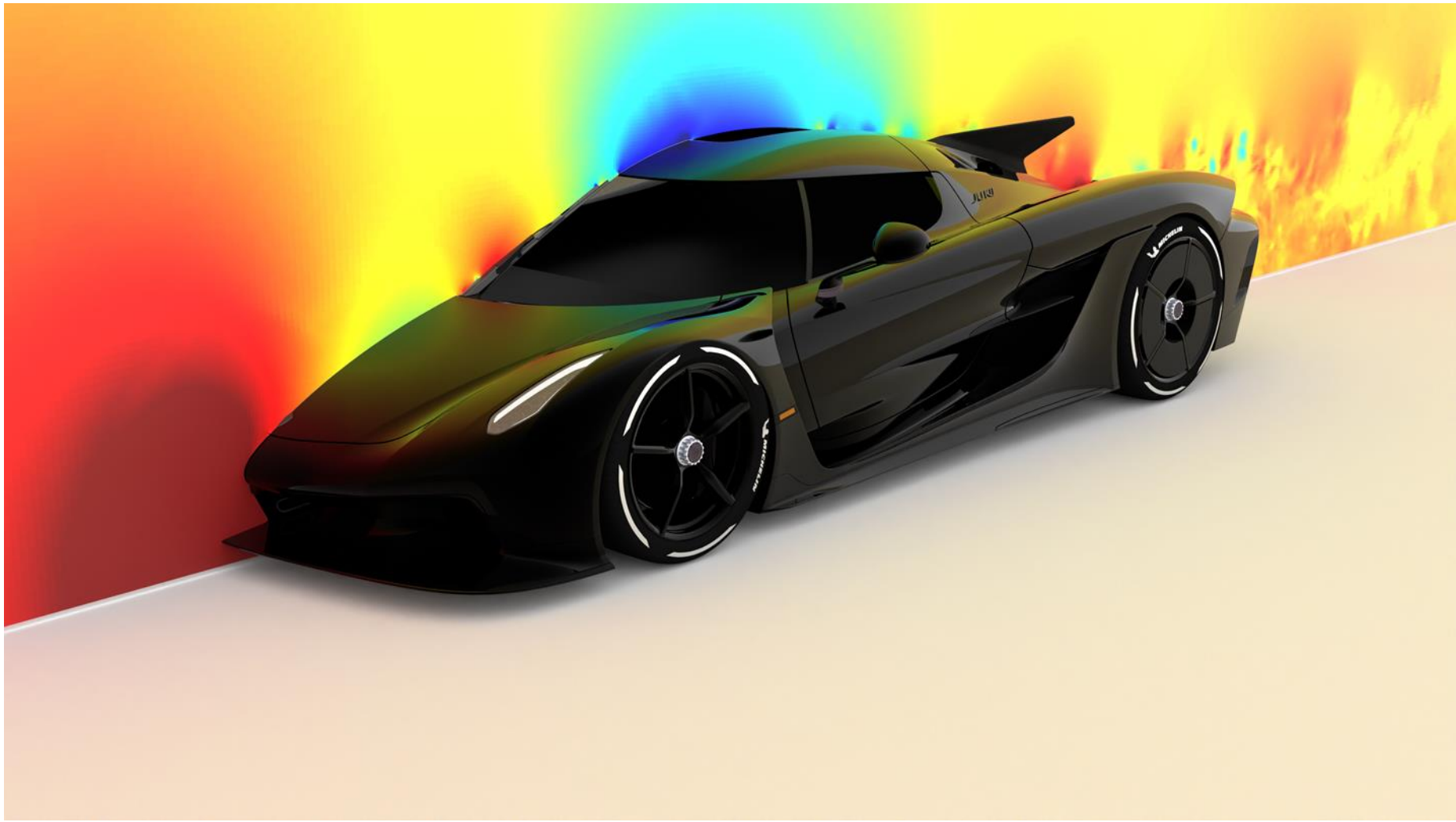
© Copyright 2022 ENGYS Limited. All rights reserved.

Results



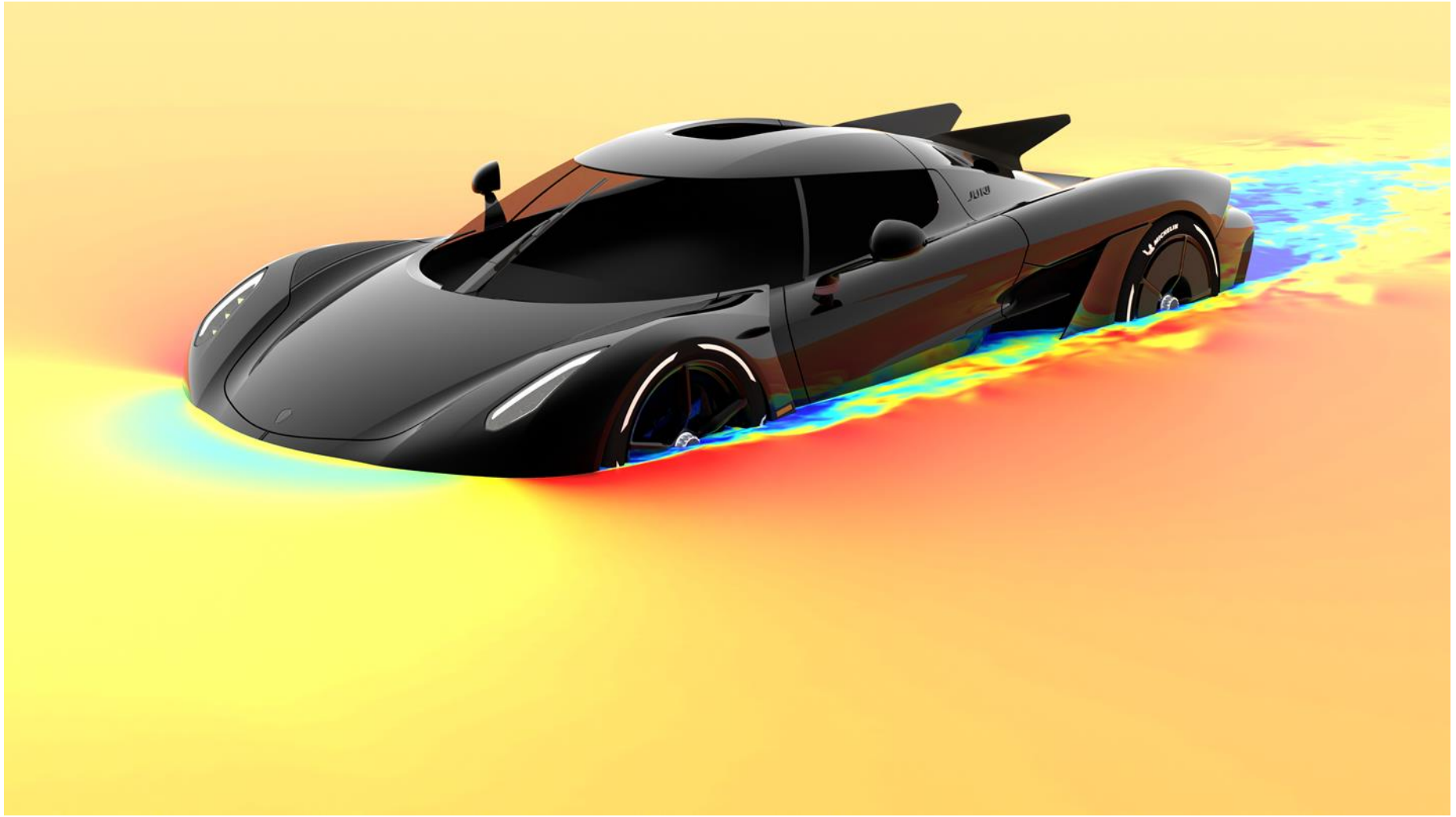
© Copyright 2022 ENGYS Limited. All rights reserved.

Results



© Copyright 2022 ENGYS Limited. All rights reserved.

Results



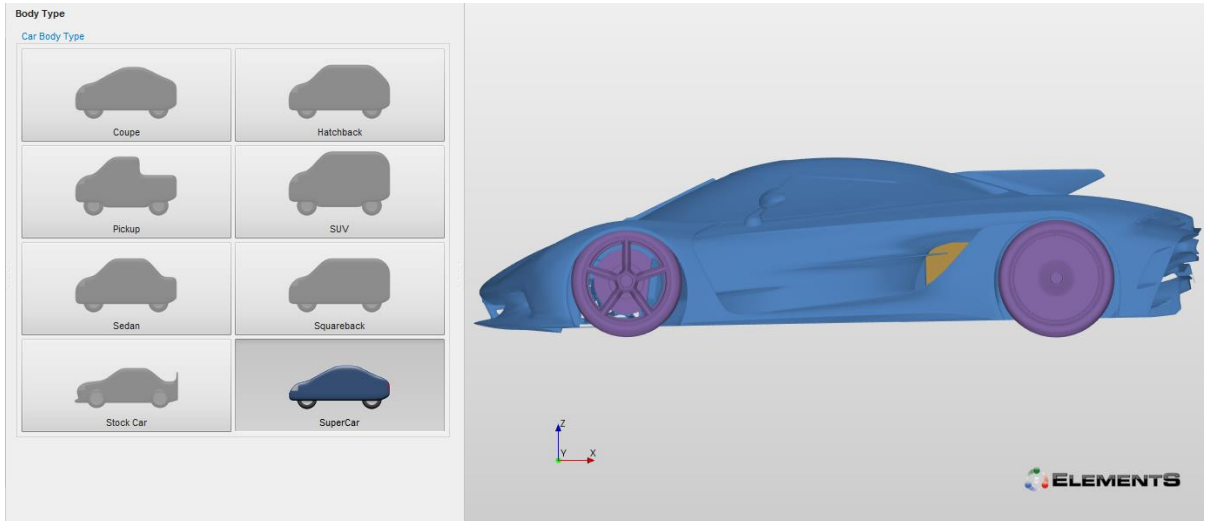
© Copyright 2022 ENGYS Limited. All rights reserved.

Results

© Copyright 2022 ENGYS Limited. All rights reserved.

Conclusions

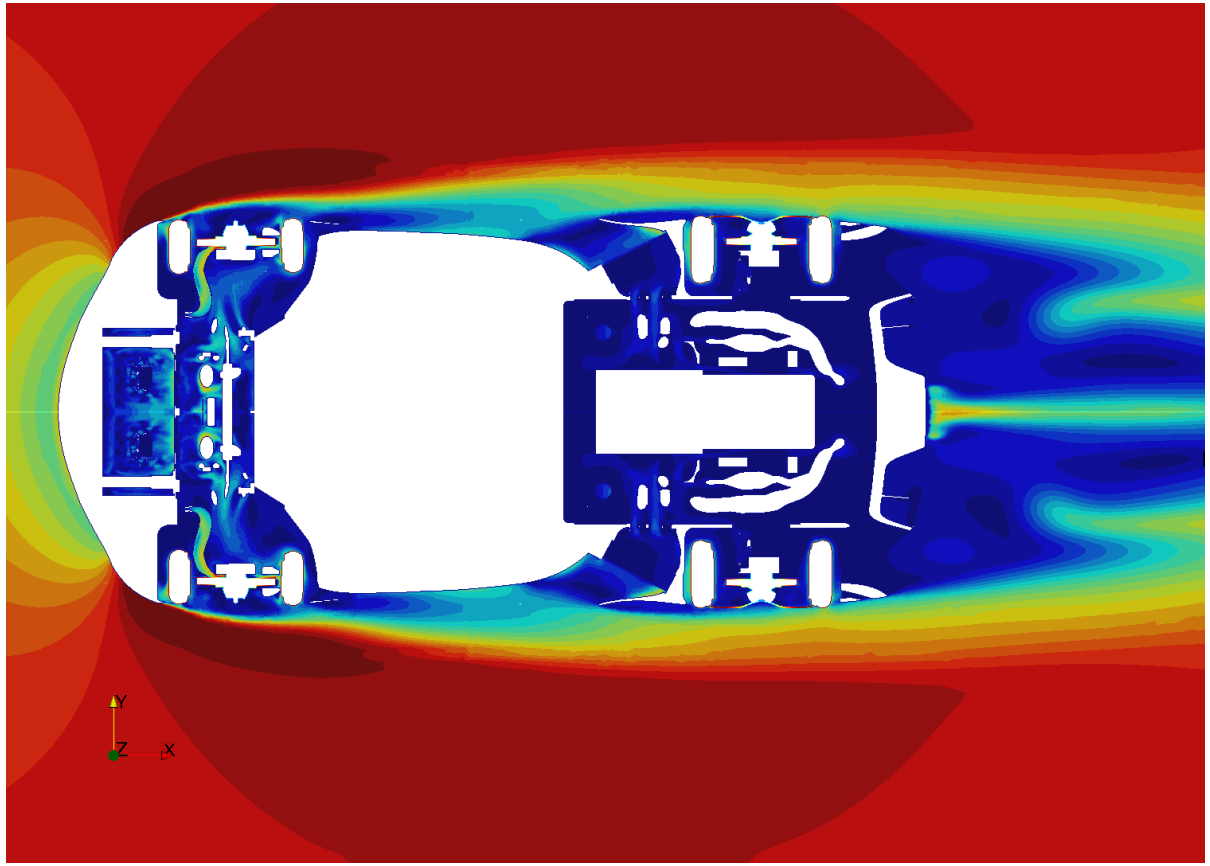
- ELEMENTS templated virtual wind tunnels easily adapted to new flow regime
- RTPP saves time and data for postprocessing
- ELEMENTS Python journaling and ride height tool can be used to quickly setup and run different rake angles



© Copyright 2022 ENGYS Limited. All rights reserved.

Conclusions

- HELYX-Coupled solver for fast turn around times of steady state runs
- Speed up of 3-6x observed for trial runs



© Copyright 2022 ENGYS Limited. All rights reserved.

Questions?

© Copyright 2022 ENGYS Limited. All rights reserved.

engys®

Disclaimer

ENGYS is the proprietor of the copyright subsisting in this work. No part of this work may be translated, reprinted or reproduced or utilised in any material form either in whole or in part or by any electronic, mechanical or other means, now known or invented in the future, including photocopying and recording, or in any information storage and retrieval system, without prior written permission from ENGYS.

Applications for permission to reproduce any part of this work should be addressed to ENGYS at info@engys.com

© Copyright 2022 ENGYS Limited. All rights reserved.