

DRIVING SIMULATOR APPLICATION FOR TIRE ASSESSMENT

RUTGER UIL

PRINCIPAL ENGINEER PERFORMANCE SCIENCE

VI-GRADE ZERO PROTOTYPES SUMMIT 2022

18TH OF MAY



LOOKING BACK

GOODYEAR AND VI-GRADE PARTNERSHIP



TIMELINE



—First and only tire manufacturer to purchase dynamic driving simulator

AKRON, Ohio, Jan. 15, 2020 - The Goodyear Tire & Rubber Company announced today it will enhance its product development capabilities with the purchase of new vi-grade driving simulators, including a dynamic model, a first for tire manufacturers.

Goodyear has selected a COMPACT Simulator recently delivered to the company's Innovation center in Luxembourg and a Dynamic Driving Simulator DIM250 (Driver-in-Motion) that will be installed in Akron, Ohio, in the coming months.

"This level of simulation sophistication will allow Goodyear to drive breakthroughs in future tire creation, leading to an enhanced customer and driver experience," said Chris Heisel, Goodyear's senior vice president and chief technology officer. "I'm proud to say that Goodyear is leading the industry with vi-grade and our simulation solutions, and we look forward to sharing that benefit with our customers."

The automotive industry trend toward a virtual development cycle provides an opportunity for the development and this new simulation avenue will allow Goodyear to work more collaboratively with automobile manufacturers on original equipment fitments.



1ST DIM250 ANNOUNCED
BEGINNING OF 2020 GOODYEAR ANNOUNCED INVESTMENT IN SEVERAL VI-GRADE DRIVING SIMULATORS



COMPACT SIMULATORS
FIRST HALF OF 2020 COMPACT SIMULATOR INSTALLED GLOBALLY



SIMCENTER AKRON
FIRST VI-GRADE DIM250 DYNAMIC SIMULATOR INSTALLED IN GOODYEAR INNOVATION CENTER AKRON, OHIO



2ND DIM250 ANNOUNCED
GOODYEAR ANNOUNCED INVESTMENT FOR 2ND DIM250 FOR INNOVATION CENTER LUXEMBOURG



SIMCENTER LUXEMBOURG
SIMCENTER COMPLETION AND INSTALLATION OF 2ND DIM250 DYNAMIC DRIVING SIMULATOR IN GOODYEAR INNOVATION CENTER LUXEMBOURG IN JUNE 2022



INSTALLATION LOCATIONS



USA: Innovation
Center Akron, Ohio

- Compact Simulator
- DiM250 Dynamic Simulator



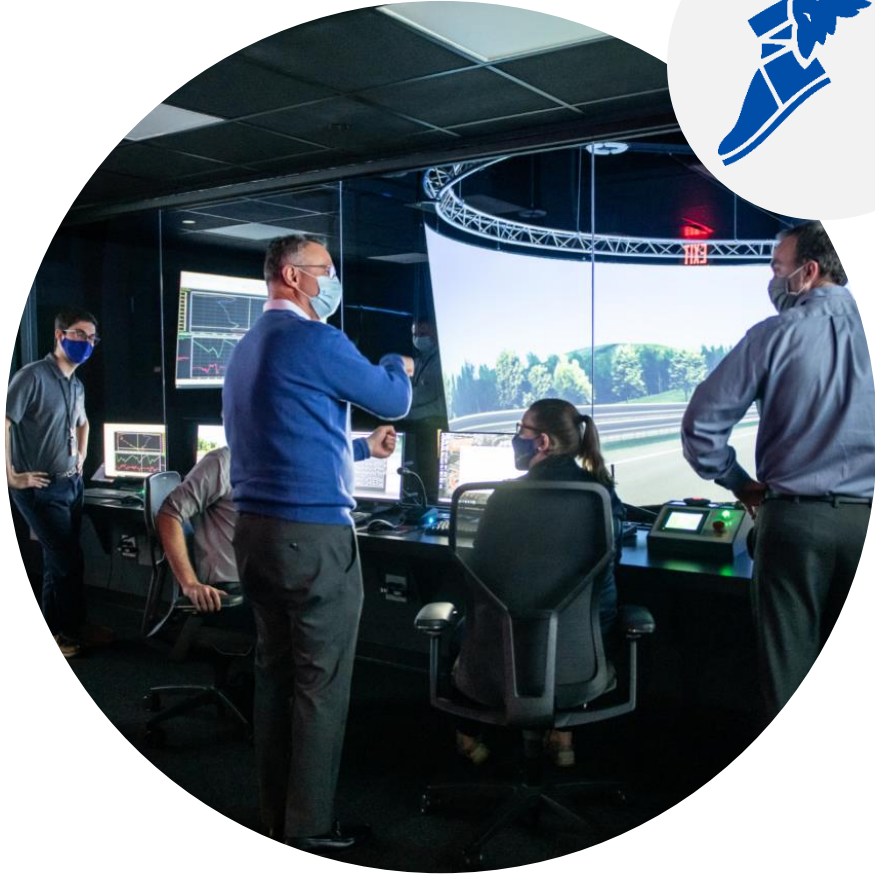
LUX: Innovation
Center Colmar-Berg

- Compact Simulator
- DiM250 Dynamic Simulator (June 2022)

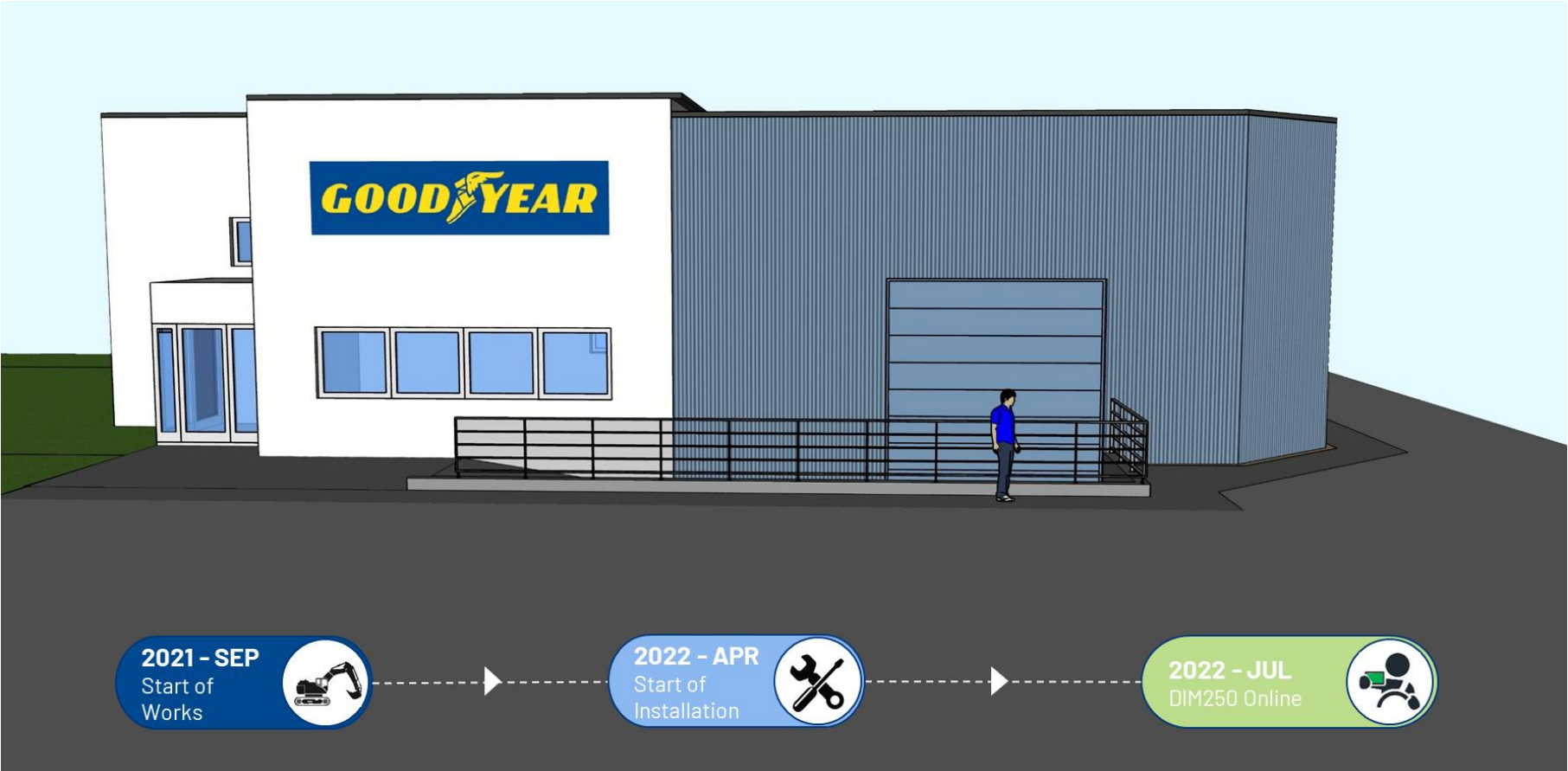


SIMCENTER AKRON

DIM250 INSTALLATION



SIMCENTER LUXEMBOURG

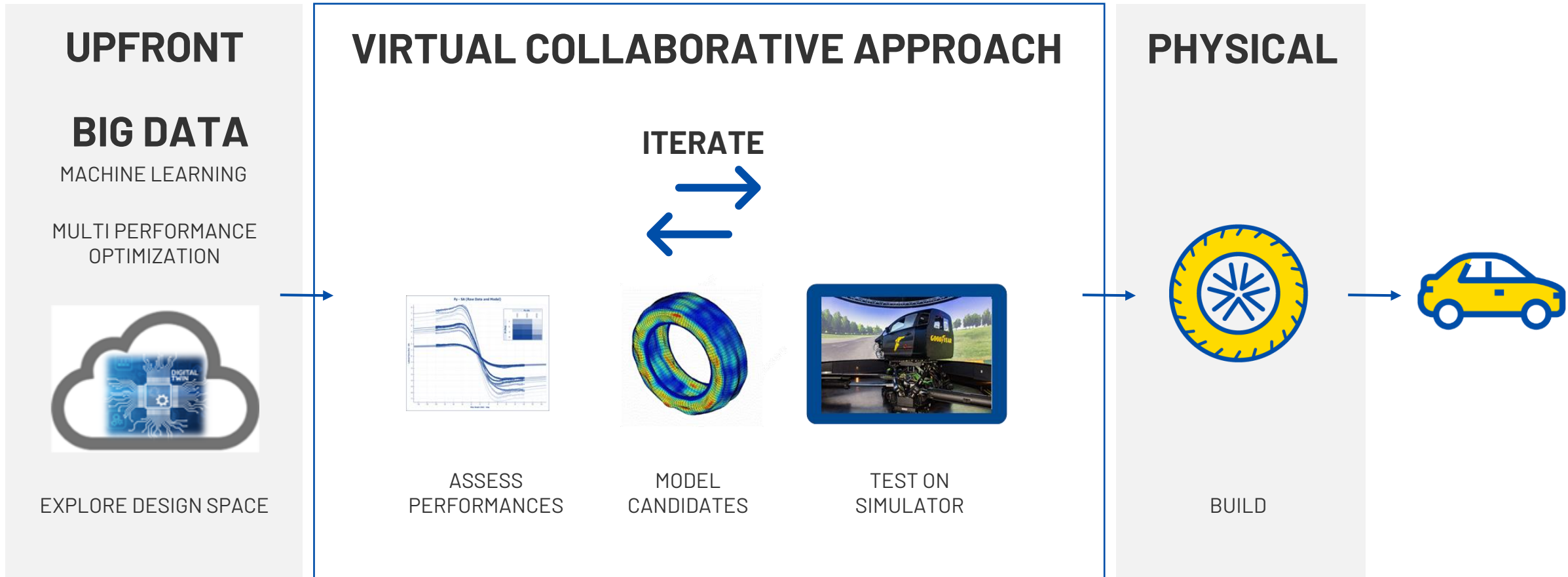


VIRTUAL DEVELOPMENT APPROACH

USING DRIVING SIMULATOR TECHNOLOGY

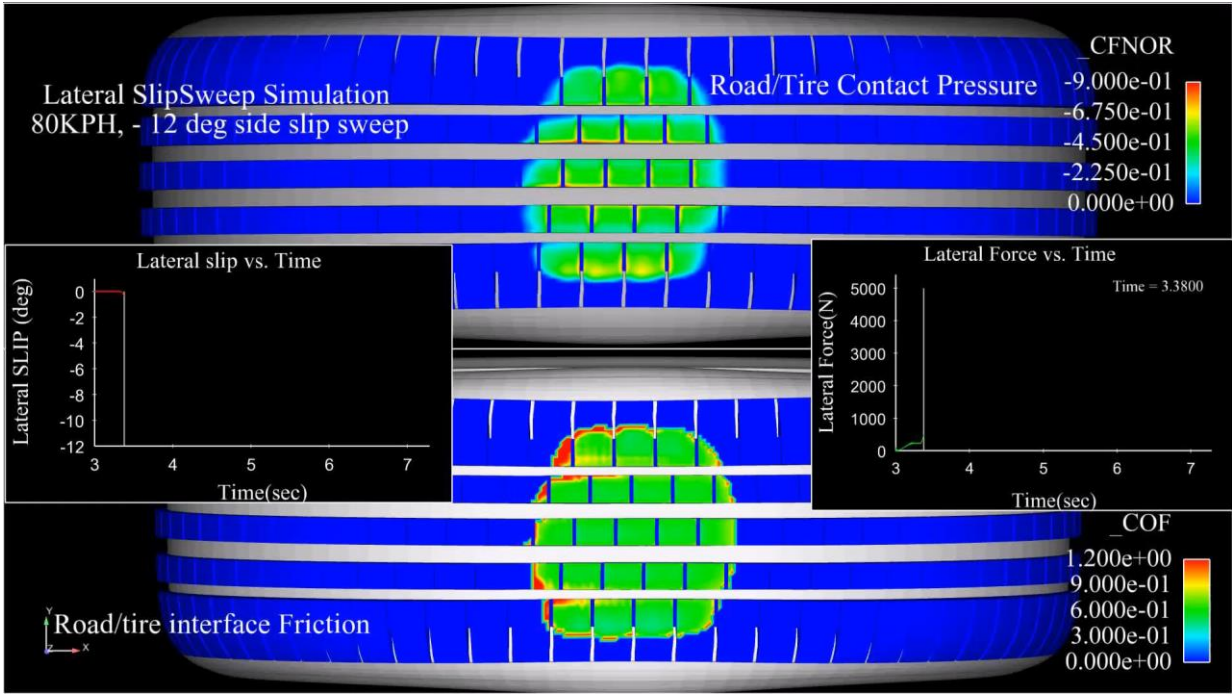


VIRTUAL DEVELOPMENT PROCESS

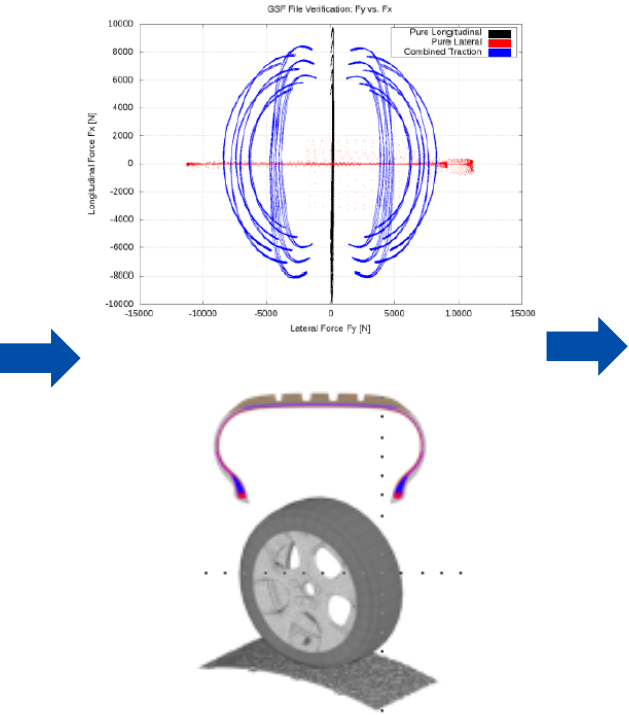


VIRTUAL TIRE ASSESSMENT APPROACH

Study: Demonstrate capability with **virtual** derived tire models



FE simulations



RT derived model



Dynamic Simulator



VEHICLE MODEL CHARACTERIZATION

Vehicle Platform GOLF 8 1.5 eTSi



Tire Line

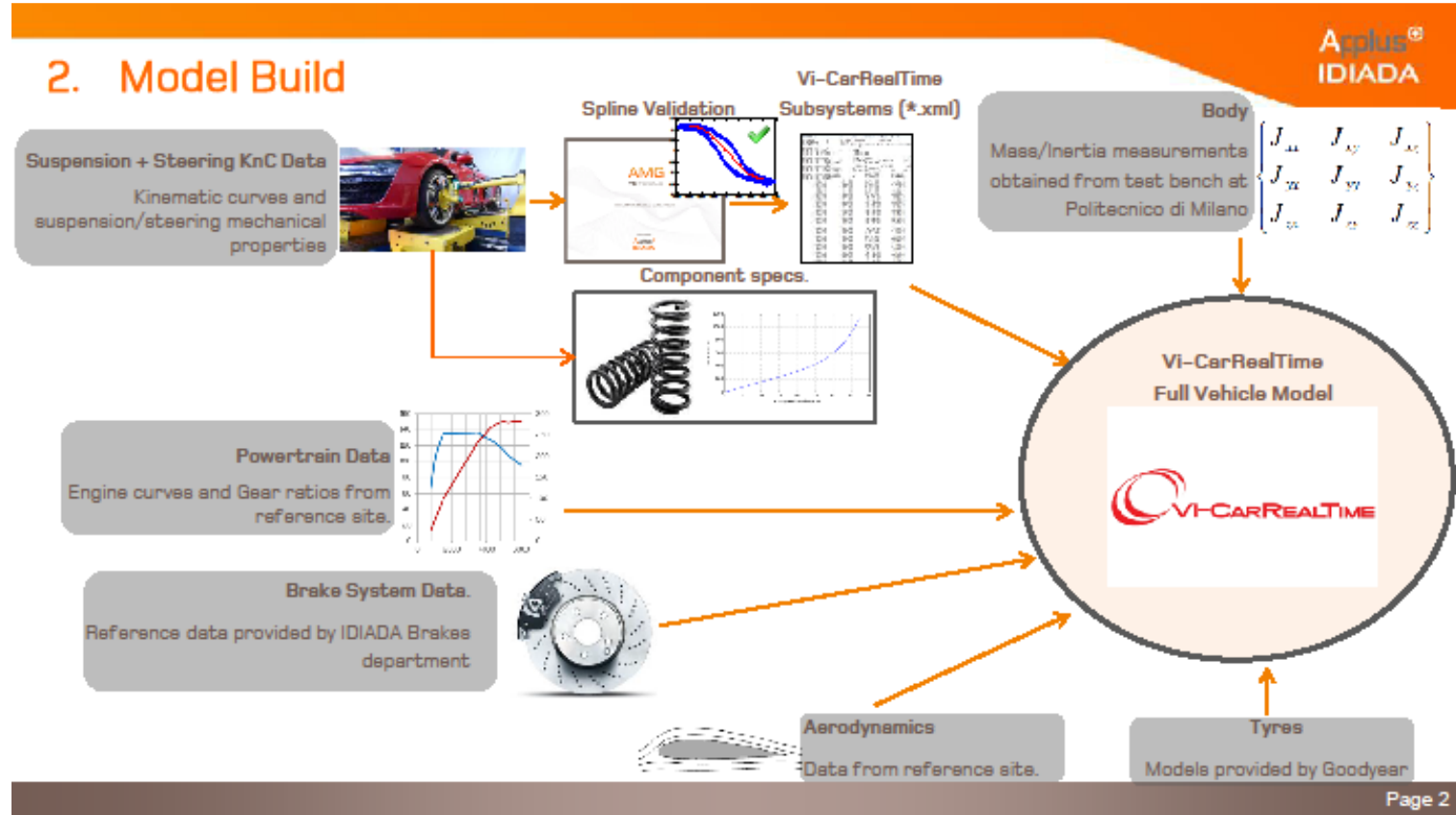
Size

Eagle F1 SuperSport 235/35R19 91Y XL

Eagle F1 AS3 225/45R17 91W

Efficient Grip Perf 205/55R16 91V

2. Model Build

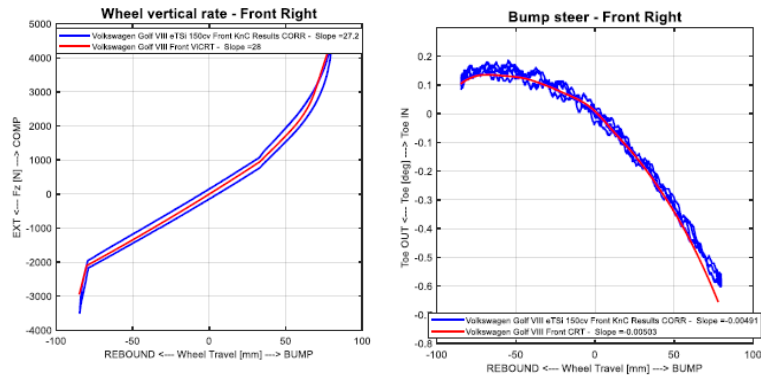


Vehicle model characterization performed by IDIADA Engineering Services



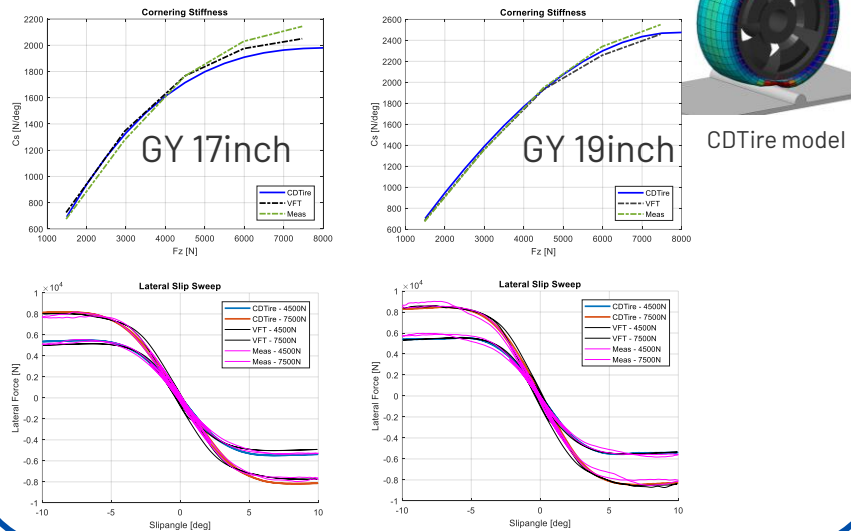
DATA PROCESS FLOW

Vehicle model characterization

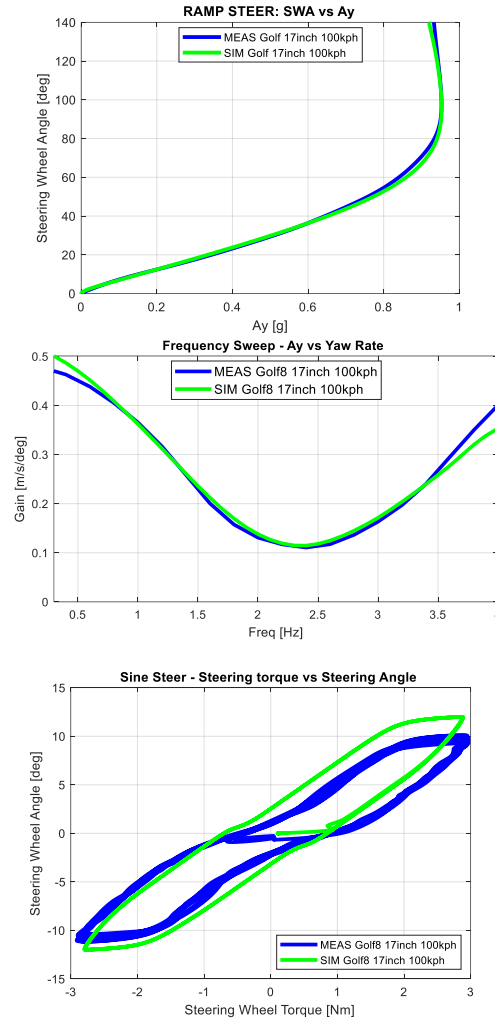


Performed by IDIADA Engineering

Tire model parameterization



Validation simulation vs objective characterization



Driving Simulator assessment

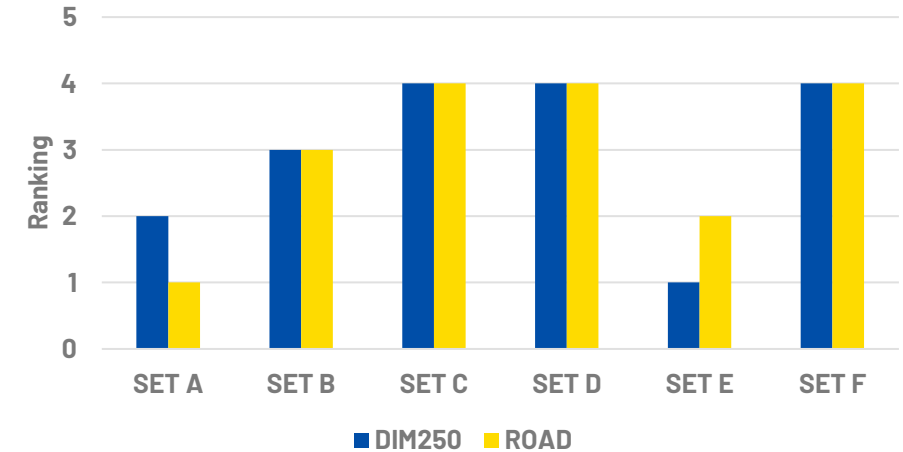


SIMULATOR ASSESSMENT

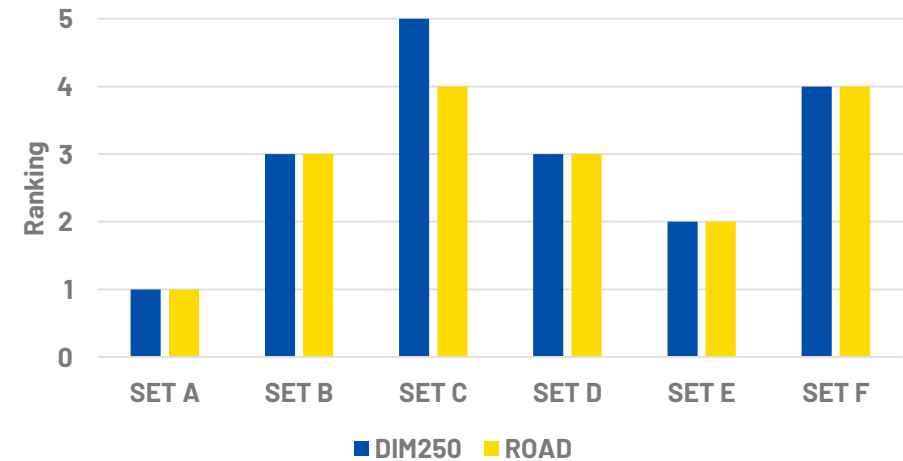
Sets	Front	IP	Rear	IP
Set A	235/35R19	2.5bar	235/35R19	2.5bar
Set B	235/35R19	2.5bar	225/45R17	2.5bar
Set C	205/55R16	2.5bar	225/45R17	2.5bar
Set D	225/45R17	2.8bar	225/45R17	2.5bar
Set E	235/35R19	2.8bar	235/35R19	2.3bar
Set F	205/55R16	2.5bar	205/55R16	2.8bar



STEERING OVERALL



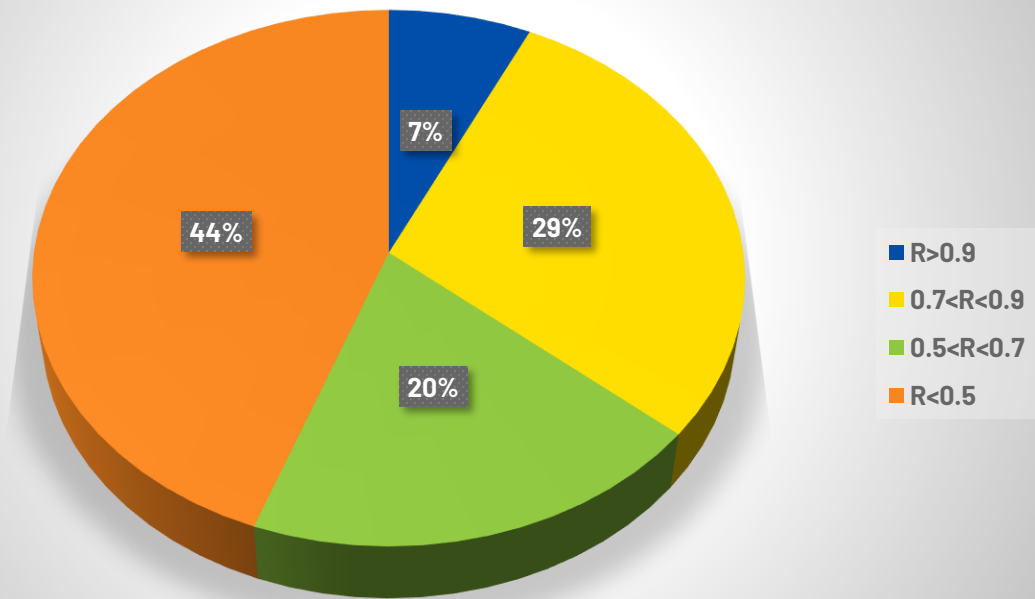
HIGH SPEED HANDLING OVERALL



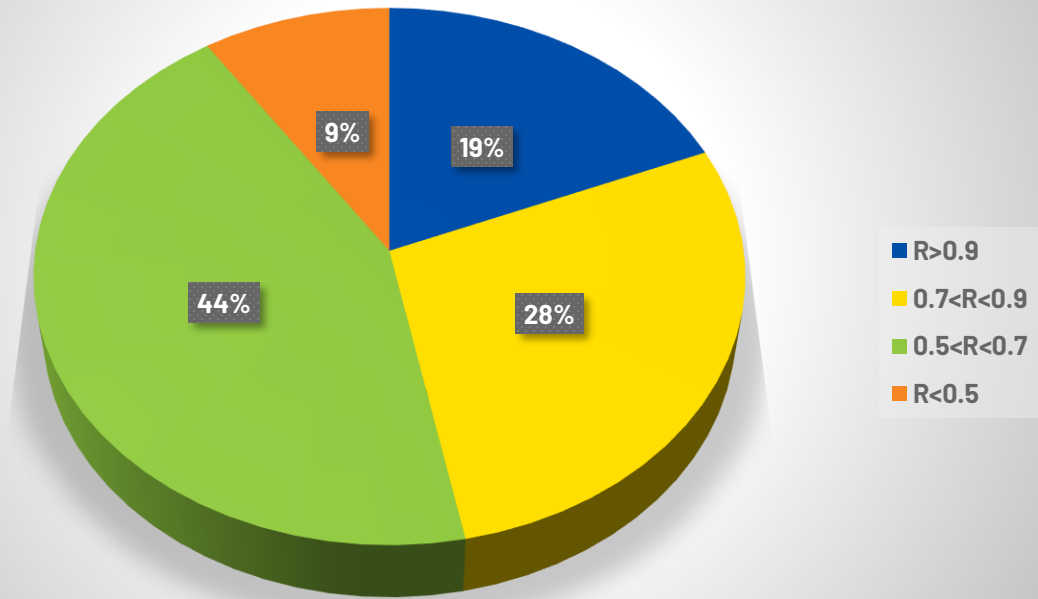
SIMULATOR ASSESSMENT

PEARSON CORRELATION SUBJECTIVE EVALUATION DIM250 VS ROAD

STEERING/HANDLING ATTRIBUTES
169 COEFFICIENTS



HIGH SPEED HANDLING ATTRIBUTES
64 COEFFICIENTS



STEERING/HANDLING ITEMS ARE SHOWING OVERALL LOWER CROSS-CORRELATION, HIGH SPEED HANDLING ATTRIBUTES EXHIBITS HIGHER CORRELATION



OUTLOOK

DRIVING VIRTUAL TIRE DEVELOPMENT THROUGH DRIVING SIMULATOR TECHNOLOGY TO DEVELOP EVEN BETTER PRODUCTS





THANK YOU

VI-GRADE ZERO PROTOTYPES SUMMIT 2022

