



150
YEARS

1872 | 2022

POWER IS NOTHING WITHOUT CONTROL™

Integration of Driving Simulator in Tyre Virtual Development

Dario Marrafuschi – Head of Product

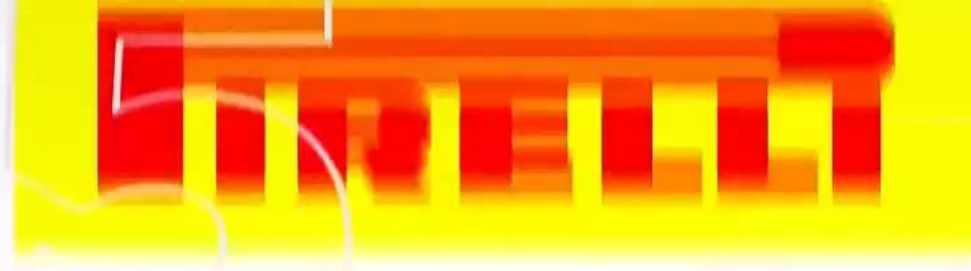


THE POWER OF THE BRAND

OUR BRAND IS RENOWNED WORLDWIDE
WITH AN ARRAY
OF ASSETS. FROM MOTORSPORT TO THE
CREATIVE ARTS, IT'S ALL PART OF PIRELLI
EXCELLENCE.

[Pirelli Graphic Novel](#)





150 YEARS AT A GLANCE

1872 View of the first Pirelli factory in Via Ponte Seveso in Milan in 1873



Incorporation of G.B. Pirelli & C. The first Pirelli factory, in Via Ponte Seveso in Milan, begins work in 1873.

1901 Section for the Pirelli Ercole car tyre, 1903



The Ercole, the first car tyre, is patented. In 1902 Pirelli is the first Italian company to open a factory abroad, in Spain. It opens a branch in London in 1909 and in South America in 1917.

1929 Pino Tovaglia, advertisement for the Pirelli Cinturato tyre, 1968



Pirelli is the first Italian company to be listed on the New York Stock Exchange. In the same year the company sets up its first factory in Brazil.

1953 Riccardo Manzù, advertisement for the Cinturato Pirelli tyre, postcard, 1955



The launch of the Cinturato™, the Pirelli tyre that adopts a revolutionary radial technology.

1964 1964 - fotografia Robert Freeman, modella Sonny Freeman Drane, mese di luglio



The publication of the first Pirelli Calendar, a cultural phenomenon that reflects the evolution of fashion and lifestyles.

1994 Young & Rubicam, Carl Lewis in the Pirelli tyre advertisement, 1994



In the 1990s Pirelli forms a partnership with the Young & Rubicam agency; this is the age of the great endorsers, like Carl Lewis and Ronaldo, and the famous slogan "Power is nothing without control".

Il processo produttivo Next Mira™, 2016, foto Carlo Furgeri Gilbert



Pirelli is now on the ground in 12 countries and continues to invest in technological innovation in manufacturing in its 18 plants. This is the world of Industry 4.0, the new industrial production model based on full digitization.

TODAY

1890

Pirelli produces the first "velocipede tyre". The Tipo Milano model with elastic beads comes out.



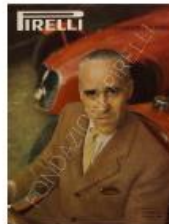
1907

Pirelli's first victory in international sport: the Peking-Paris motor race. The same year sees the introduction of the "Long P" logo.



1948

The first issue of Pirelli magazine is published. For over twenty years, the pages of this periodical of technical information become home to some of the most advanced cultural debates in Italy.



1960

The Pirelli Skyscraper, or "Pirellone", is opened: designed by the architect Gio Ponti, it becomes the symbol of Milanese manufacturing.



1985

Pirelli launches an international competition for the redevelopment of the former industrial areas of the Milano Bicocca district: the Bicocca Project gets under way.



2000s

Pirelli returns to Formula 1 in 2011. The company's commitment to racing now spans all car and motorcycle sports from rallying to one-make championships, Superbike and motocross.



150 YEARS

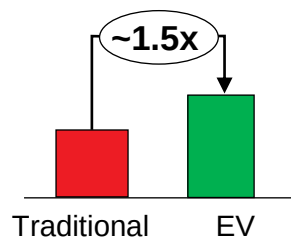
Pirelli keywords

TECHNOLOGY FOR ELECTRIC VEHICLES



Ambitious EVs growth

2025E OE Pirelli Premium Share



Ultra Low Rolling Resistance to improve battery range

SUSTAINABLE INDUSTRIAL FOOTPRINT

Leading positions in ESG Indexes & Initiatives



100% renewable electricity worldwide by 2025



Group Carbon Neutrality by 2030



Commitment to the Science Based Target initiative
in alignment with our CO2 emissions reduction strategy¹



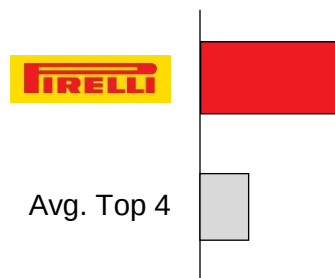
Most efficient plants in terms of sustainability²
(e.g. excellence in water management, zero waste to landfill)

TYRES FOR HIGH VALUE MARKET



Leader in ≥ 19" marked tyres

of OE marked items vs peers

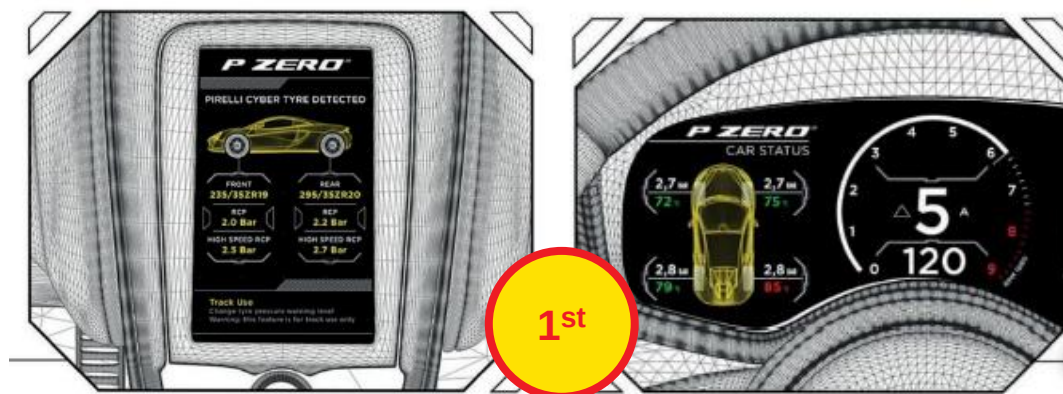


FORMULA 1
TYRES

Challenging targets achievements

TYRES FOR AUTONOMOUS VEHICLES

First CyberTyre™ integration with vehicle dashboard



Key macro-trends in the high value car/tyre market



AUTOMOTIVE/MOBILITY

- ▶ High End Consumer growth, with higher sustainability awareness **+7%** CAGR 20'25 - Global # Households with Annual Income >\$75 K
 - ▶ SUV outplacing sedans, with incremental offer **>50%** SUV/Pickup sales on total, >75% in North America
 - ▶ EV transition moving at full speed, 100% connected tyre **>30%** Ev sales on total for premium brands by 2025
-
- ▶ Increasing variety in OE fitments, and specialty
 - ▶ Higher performance requirements for eco-safety features
 - ▶ Consumer specific preferences at regional level

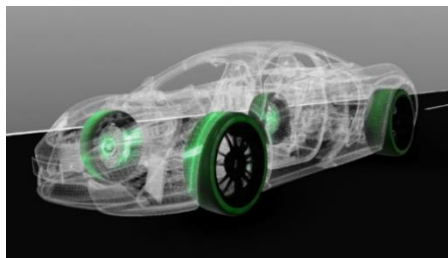
Design Innovation

Virtualization and Simulation bringing tangible benefits in both product development and industrialization

Development phase



Virtual Tyre Design



Virtual Tyre Test



Vehicle Perf. simulation



Industrialization phase



Modelling & Parametric Design

Milestones

	2022	2025
OE	~30%	~60%
REPL	~80%	~100%
	Static simulator	Dynamic simulator
	Handling	NVH
	HQ	Local R&D

KPIs

Product Development Time

-30%

Prototype Costs

-20%

New Product Line Availability

+30%

History of virtualization ... from F1 to road cars

- Pirelli has several years of collaboration with OEM on virtual development
- From 2011 Pirelli started building KH on Real Time tyre modeling on F1 driving simulators
- First road car application on driving simulators back in 2015 - virtual development of Supercar

FROM RACE TO ROAD

UNIQUE
SUPPLIER
MOST
PRESTIGIOUS
GT SERIES

EXPERIENCE
LUXURY
LIFESTYLE

TECHNICAL
PARTNER
FORMULA 1®



SIMULATION
AND
VIRTUAL
MODELLING

+350
MOTORSPORT
SERIES
IN 40
COUNTRIES



1° PROTOTYPE SECTION

VS

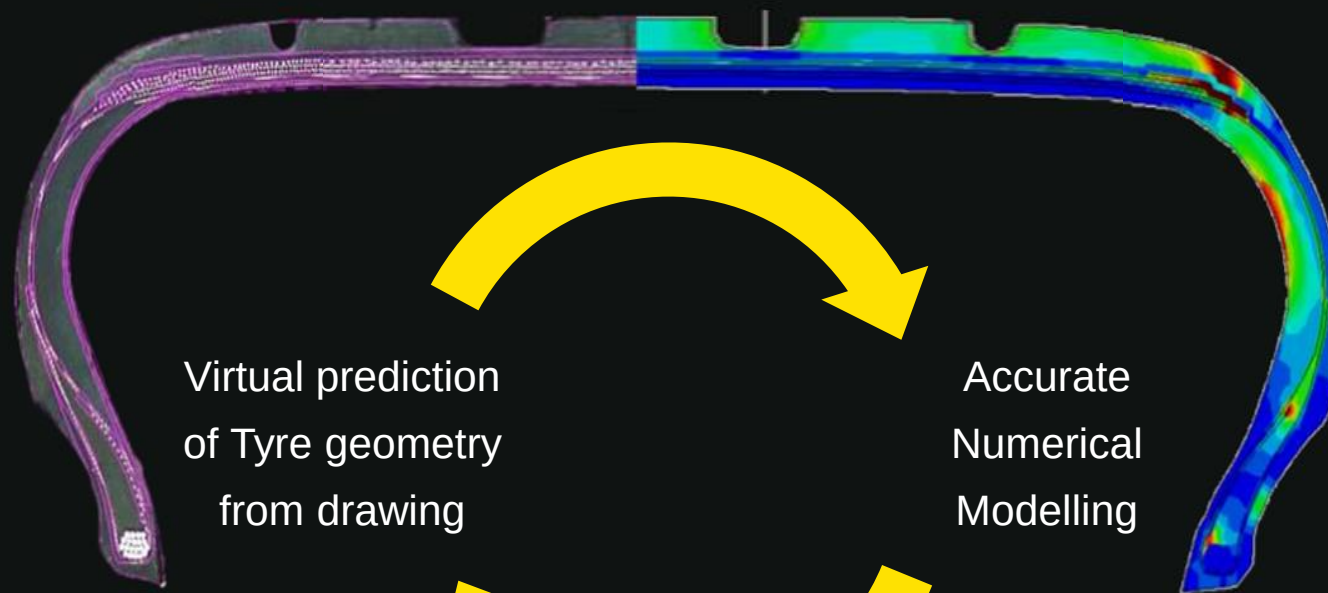
DESIGN CONSISTENCY



- Test results vs simulations consistency
- Elimination of prototypes trials built to fit the design

Accurate Tyre Digital Twin

Tyre building process parameters and semi-finished



Virtual prediction
of Tyre geometry
from drawing

Accurate
Numerical
Modelling

enabler

Virtual Spec Optimization

Pirelli driving simulators

Available from Q3
2022



Available from Q3
2022



OWN STATIC SIMULATOR



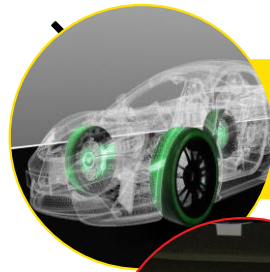
DYNAMIC SIMULATOR partnership with
POLITECNICO di MILANO



Driving simulator applications

Driving
Simulator

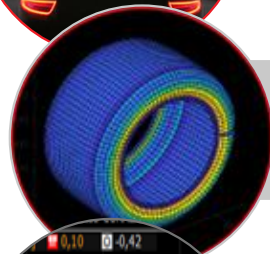
PIRELLI



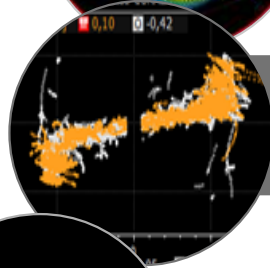
Internal development tests / pre-session OE projects



Driver Training



Advanced TYRE MODEL development



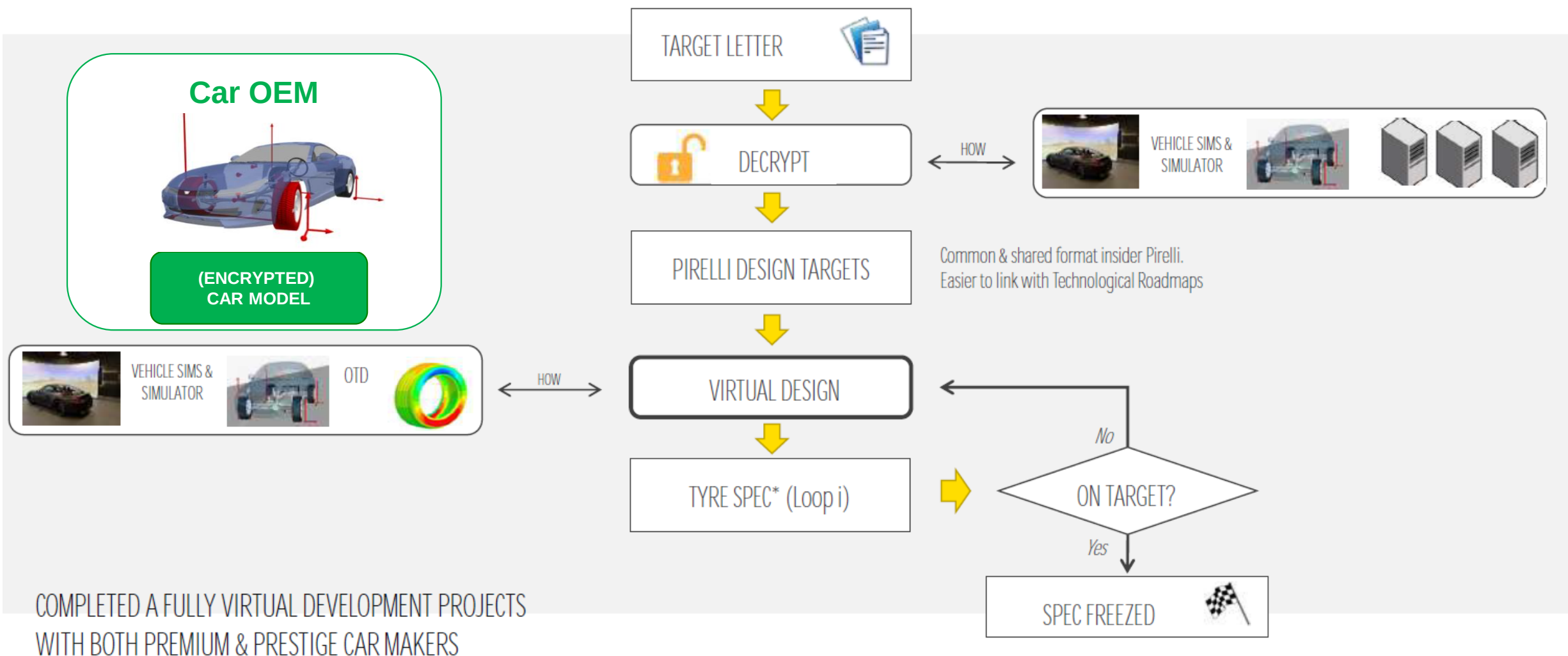
Correlation OH vs. SH / Know-How Studies



CyberTyre development

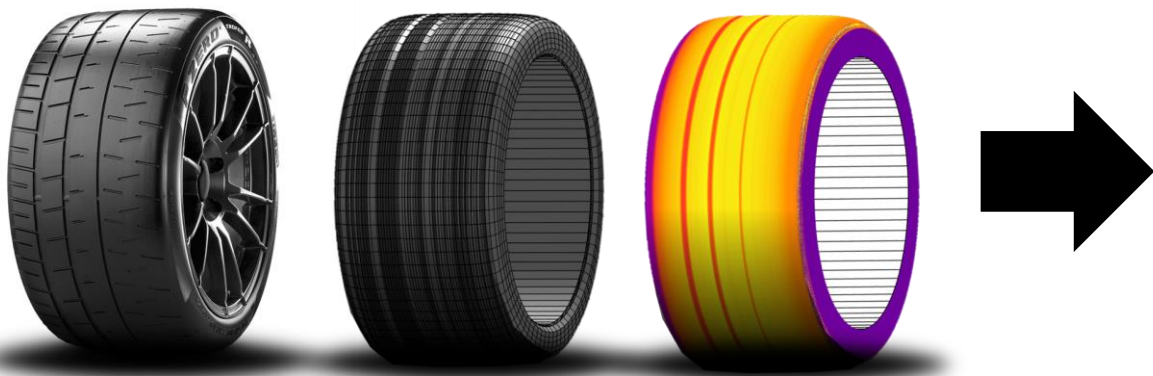
Driving simulator applications – Virtual Tyre Development

- Importance of a strong partnership between Car maker & Tire maker
- Possibility to use various virtual tool to support / speed-up / guide the design



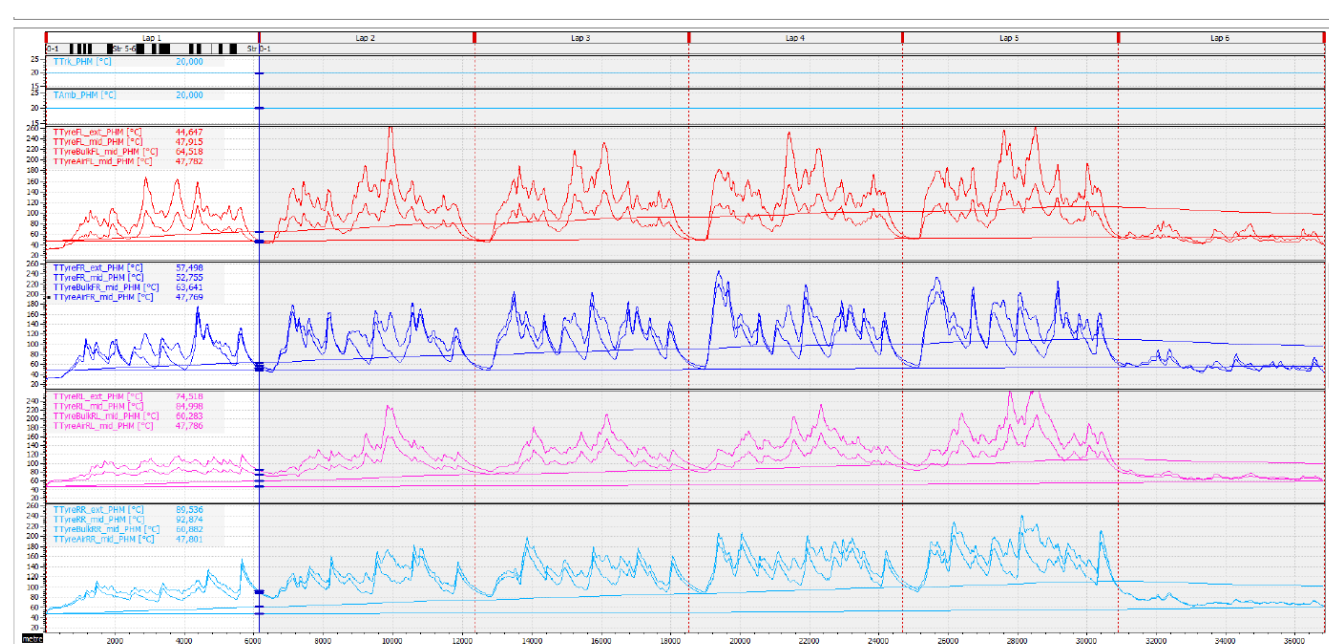
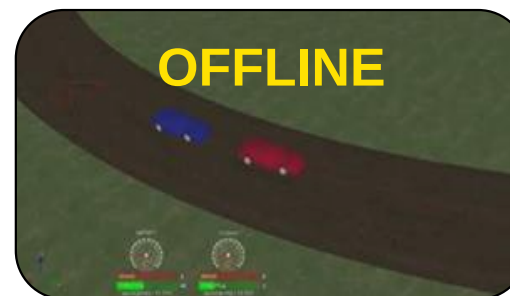
Driving simulator applications – Advanced development

Thermo-mechanical models application and development



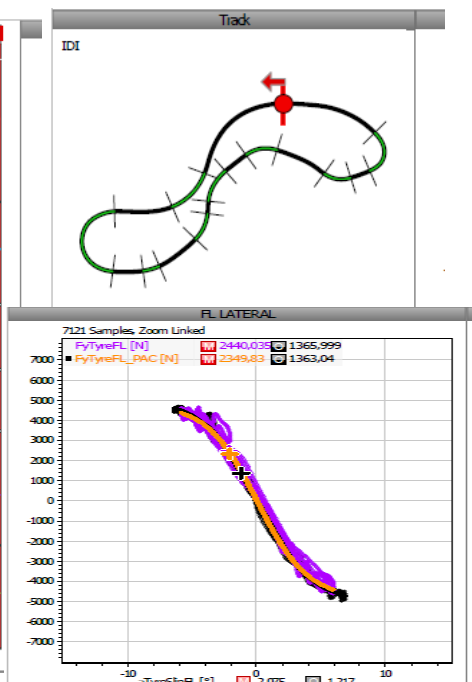
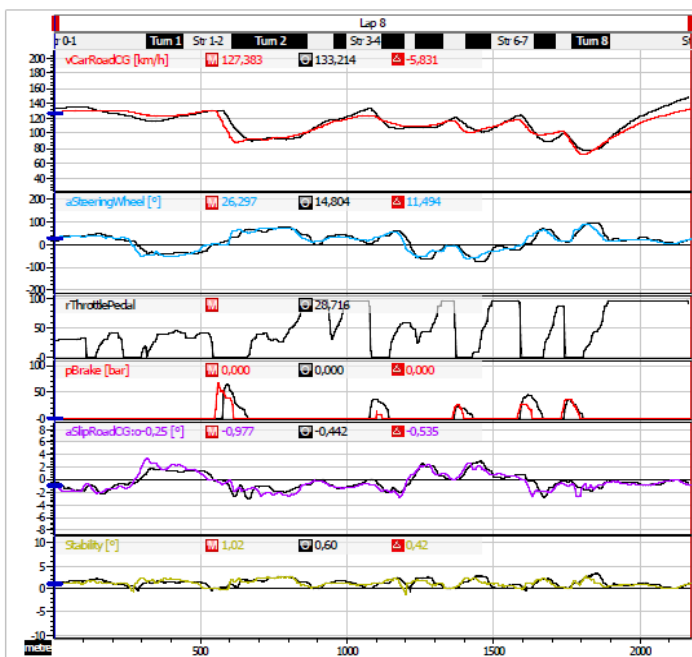
Simulating vehicle-tyre assemblies

Integration with vehicle simulation and RT capabilities



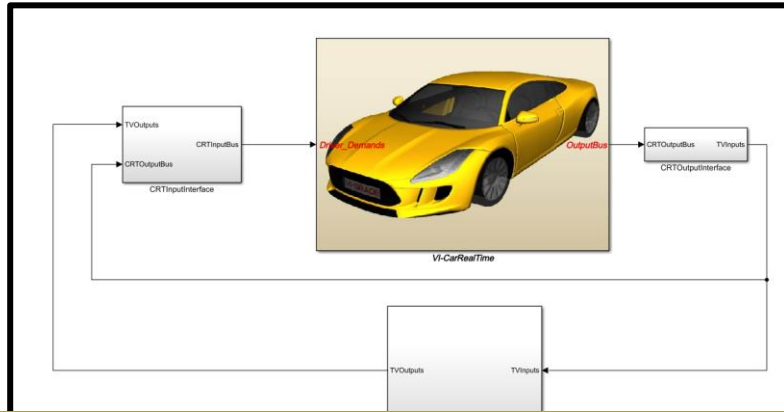
Driving simulator applications – Replacement

- Key challenge for replacement tire is **adaptability to different vehicle**
- **Pirelli internal vehicle database validated** with track measurements
- Possibility to **run sensitivity studies** to basic vehicle parameters



Driving simulator applications – Cyber

Focus on Vehicle Control Systems interaction



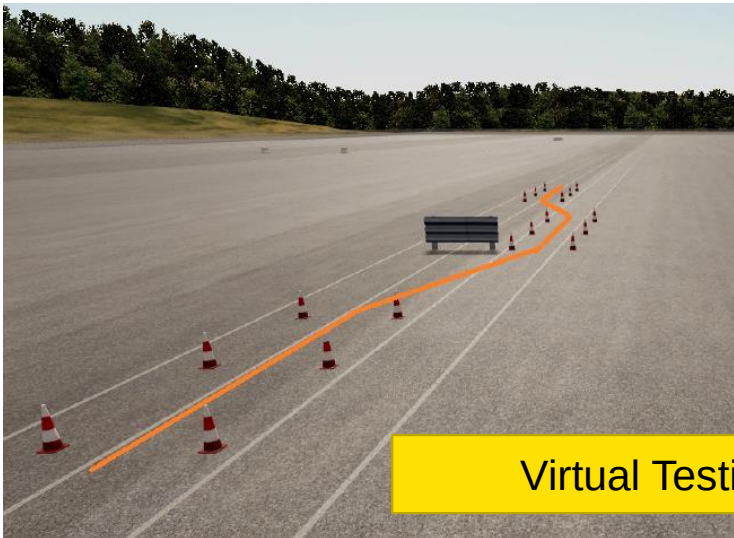
Off line simulations



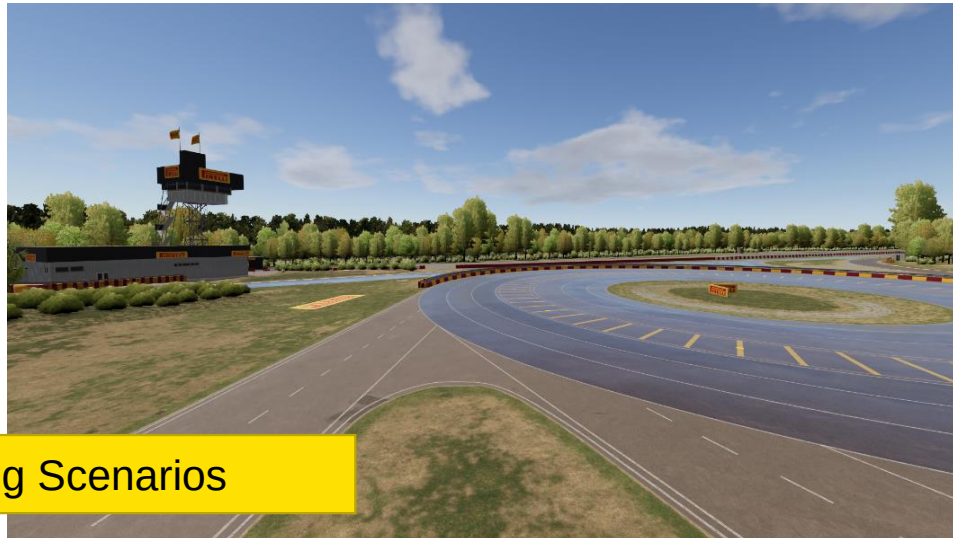
Driver in the loop simulations



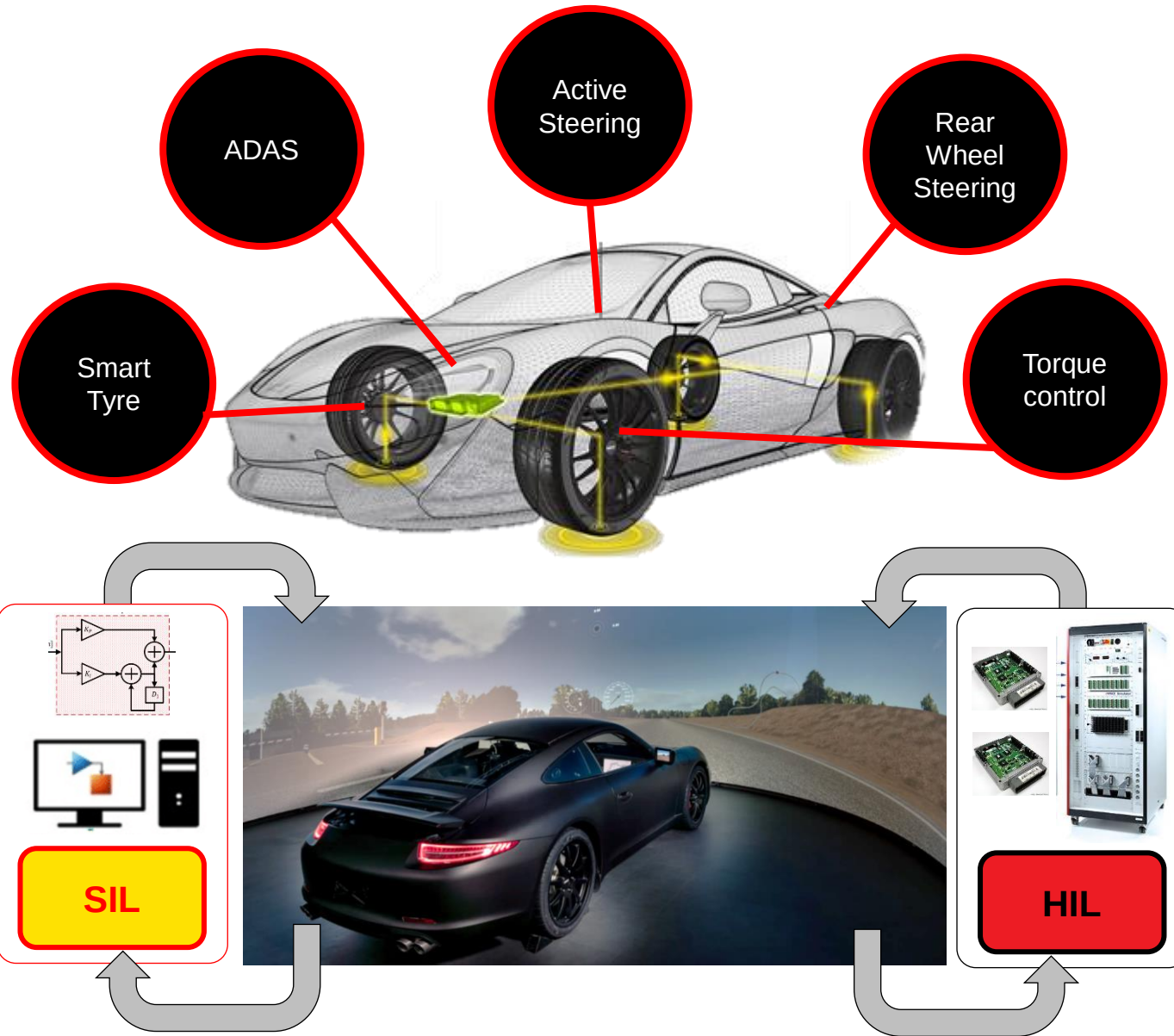
Applications on real controlled vehicles



Virtual Testing Scenarios



Next challenges



- Integration with **HIL, SIL**
- Integration with **ADAS**
- Integration with **Autonomous vehicles** logics
- Extension to **RIDE/NVH** performance



A nighttime photograph of a city street featuring a large highway interchange in the foreground and several illuminated skyscrapers in the background. The scene is lit with a mix of cool blue city lights and warm orange streetlights.

150

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Thank you for your attention!

