



Astemo
Mobility Beyond

Virtual Ride Tuning using AI-MBD Damper Models

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Vehicle Dynamics / Chassis Development
Astemo Americas Inc.

May 2026

Hitachi Automotive Systems

KEIHIN

SHOWA

NISIN

have integrated to become

Astemo

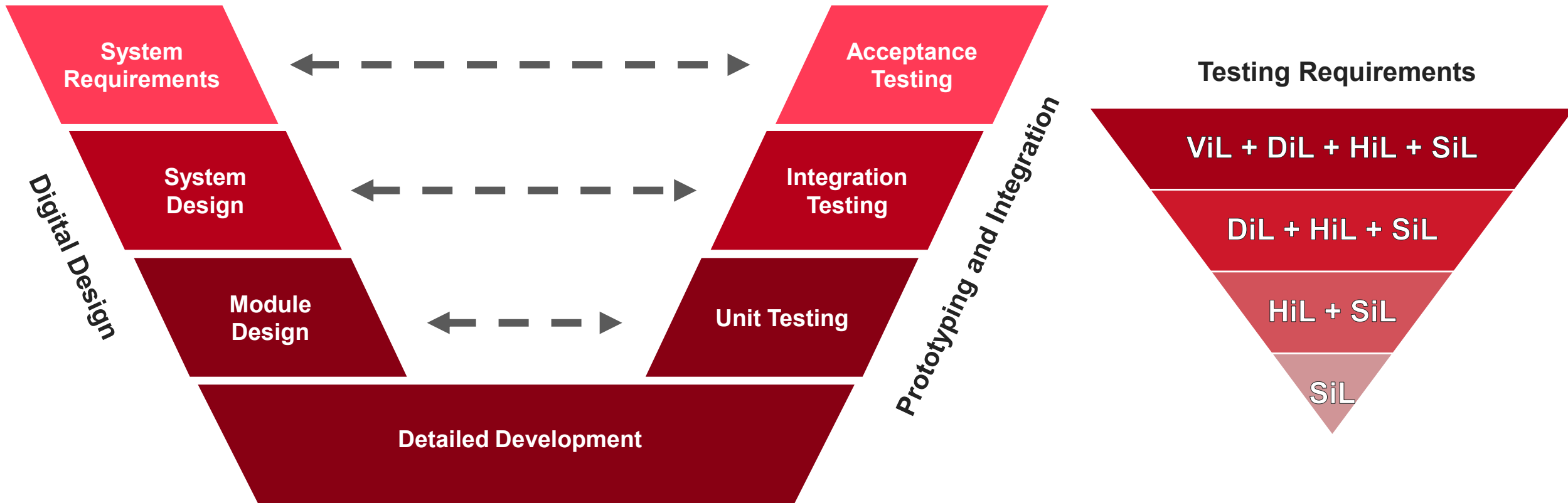
Powertrain Systems

Chassis Systems

Motorcycle Systems

Autonomous Driving/Advanced Driver Assistance Systems

- Tier-1 suppliers are being pushed by OEMs to follow their pace for **virtual path** and become Tier-0.5 level
- Astemo has been pro-active towards implementing this philosophy of **increased virtual activities** and is developing **new methods** and investing in **new tools**.



- Astemo has been evolving its virtual capabilities over the years

Full vehicle correlation

HITACHI Inspire the Next

- Implementation of the 1D physical FRD 1 model into the full vehicle environment. Ride analysis were the focus.

2023

Full vehicle offline simulations with advanced damper models

3. Simulator Overview / Capability

HITACHI Inspire the Next

- Vi-Grade Compact Simulator

- Features to enhance experience:
 - Active seatbelts;
 - Inflating seats;
 - Force feedback steering wheels;
 - Shakers at suspension corners and engine / steering column;
 - 120Hz projector.

2023

Compact simulator tryout and understanding of benefits

Model Generation

HITACHI Inspire the Next

2024

HITACHI ASTEMO AMERICAS - Application of machine learning damper models on full vehicle simulation

NN Damper model creation and implementation

Model history inside Astemo

HITACHI Inspire the Next

2024

HITACHI ASTEMO - AI MBD Damper Model Integration - Deep Learning Methods to Improve Damper Models

AI-MBD damper model release

and iterative process and turn that into a virtual process.

2025

FSS Installation at Farmington Hills office

HiL Setup and Installation

Astemo Mobility Beyond

- Astemo is leading the way for virtual simulation and development in the Tier 1 space.
- Our facility supports Driver-in-Loop testing through our acquisition of Vi-Grade's Compact FSS simulator.
- Today we offer Damper-in-Loop (HiL) testing for our customers through our StepLab HUD020 machines.

2025

HiL Damper dynos installation

2025/26

Hitachi Astemo - Damper Development Technology: 'Hardware-in-the-Loop Applied to The COMPACT FSS'

HiL Damper dynos presentation

Virtual Tuning Overview

Astemo Mobility Beyond

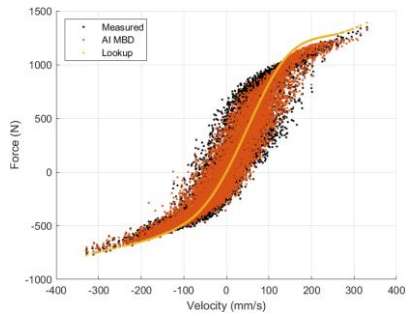
- Predictor tool → DiL + AI-MBD + HiL:

2025/26

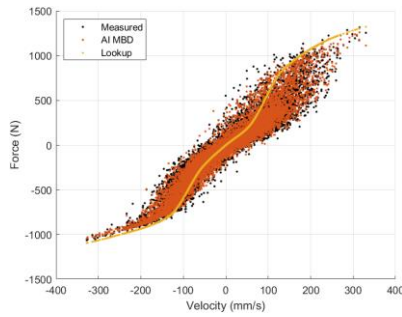
Virtual Tuning Strategy

Portfolio of Internal Technologies

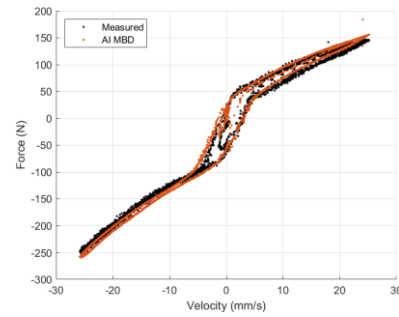
Passive Twintube



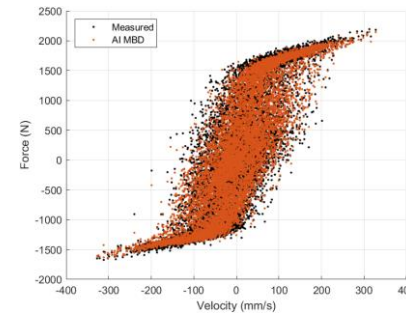
Passive + FRD



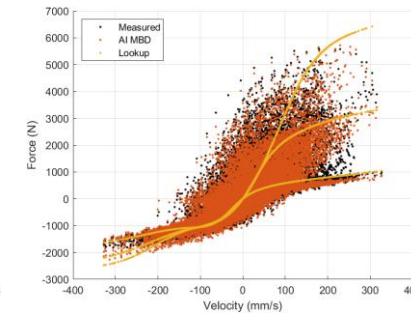
Passive + ALV



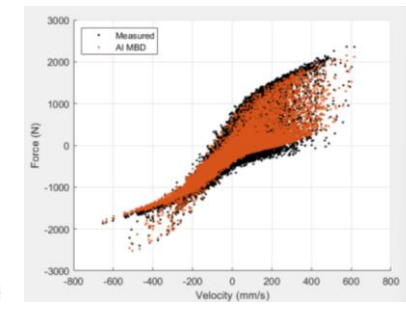
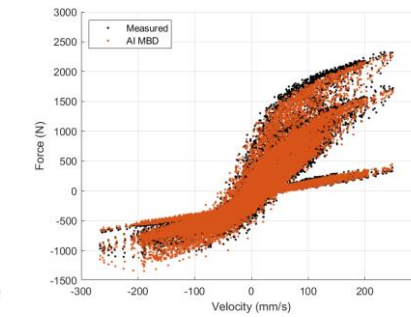
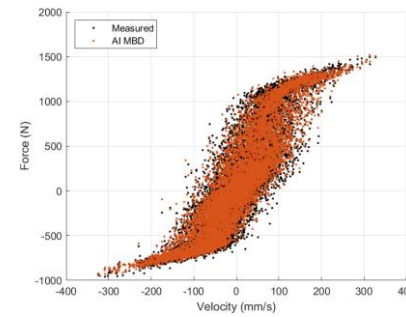
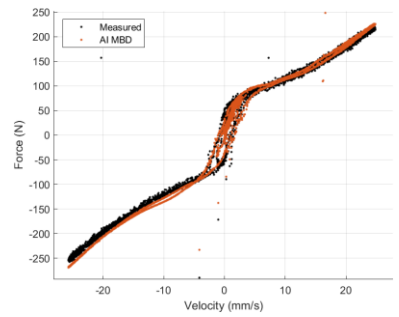
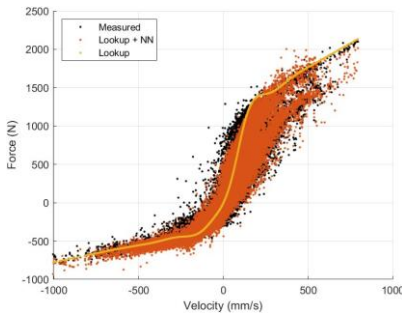
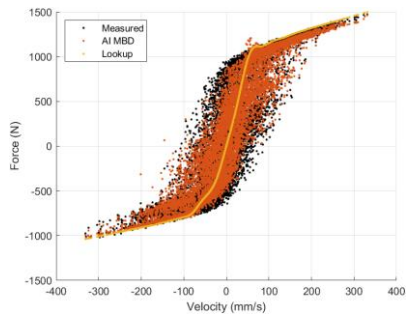
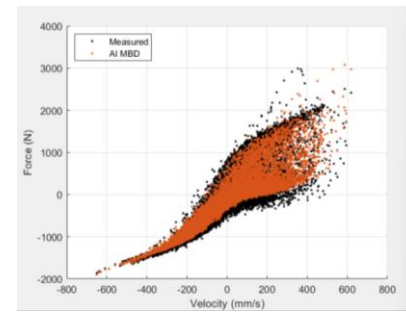
Passive Monotube



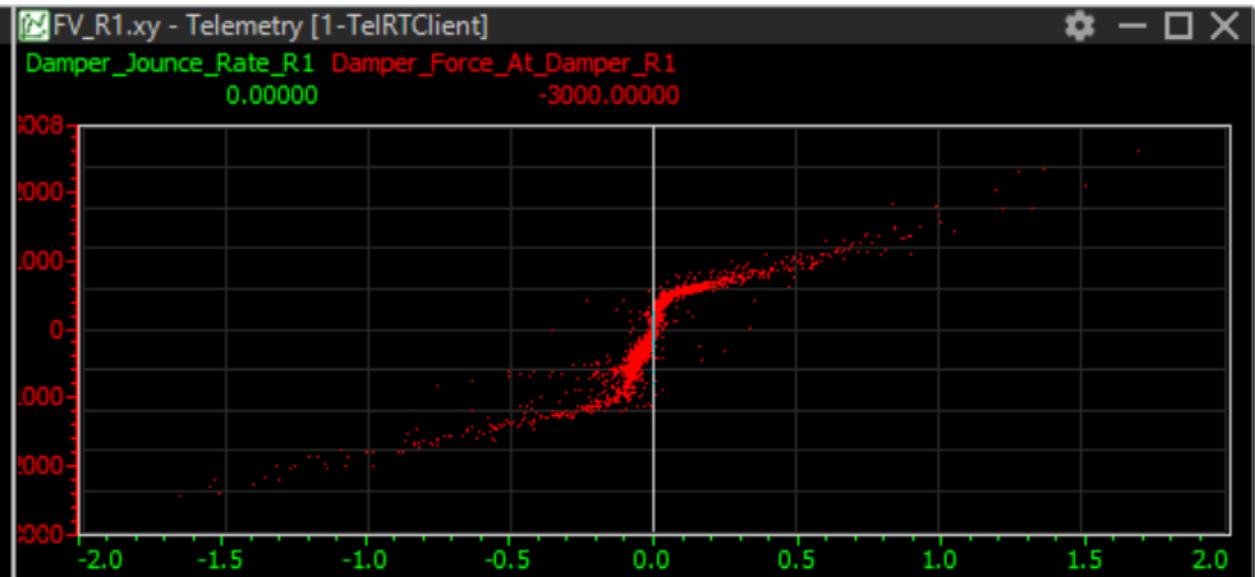
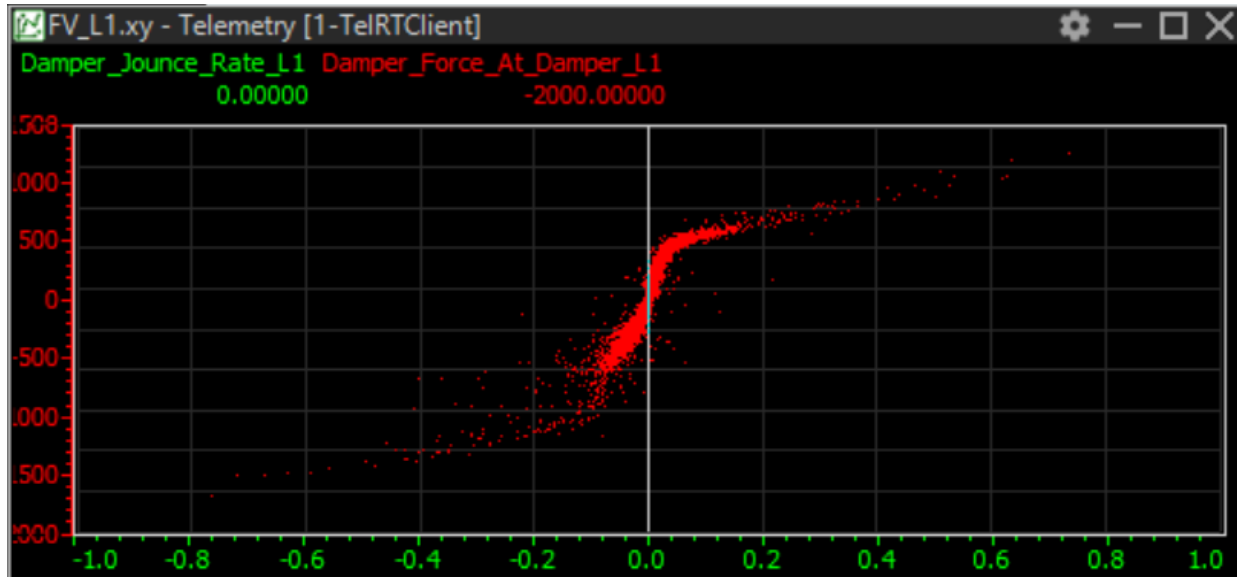
Semi-Active



HRS / HCS

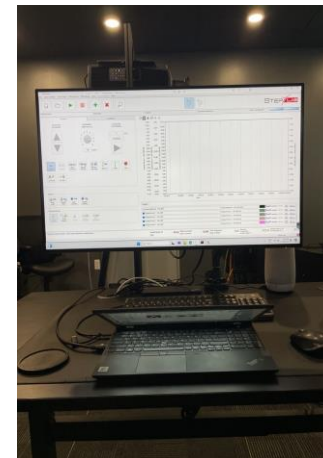


LUT & AI-MBD on FSS

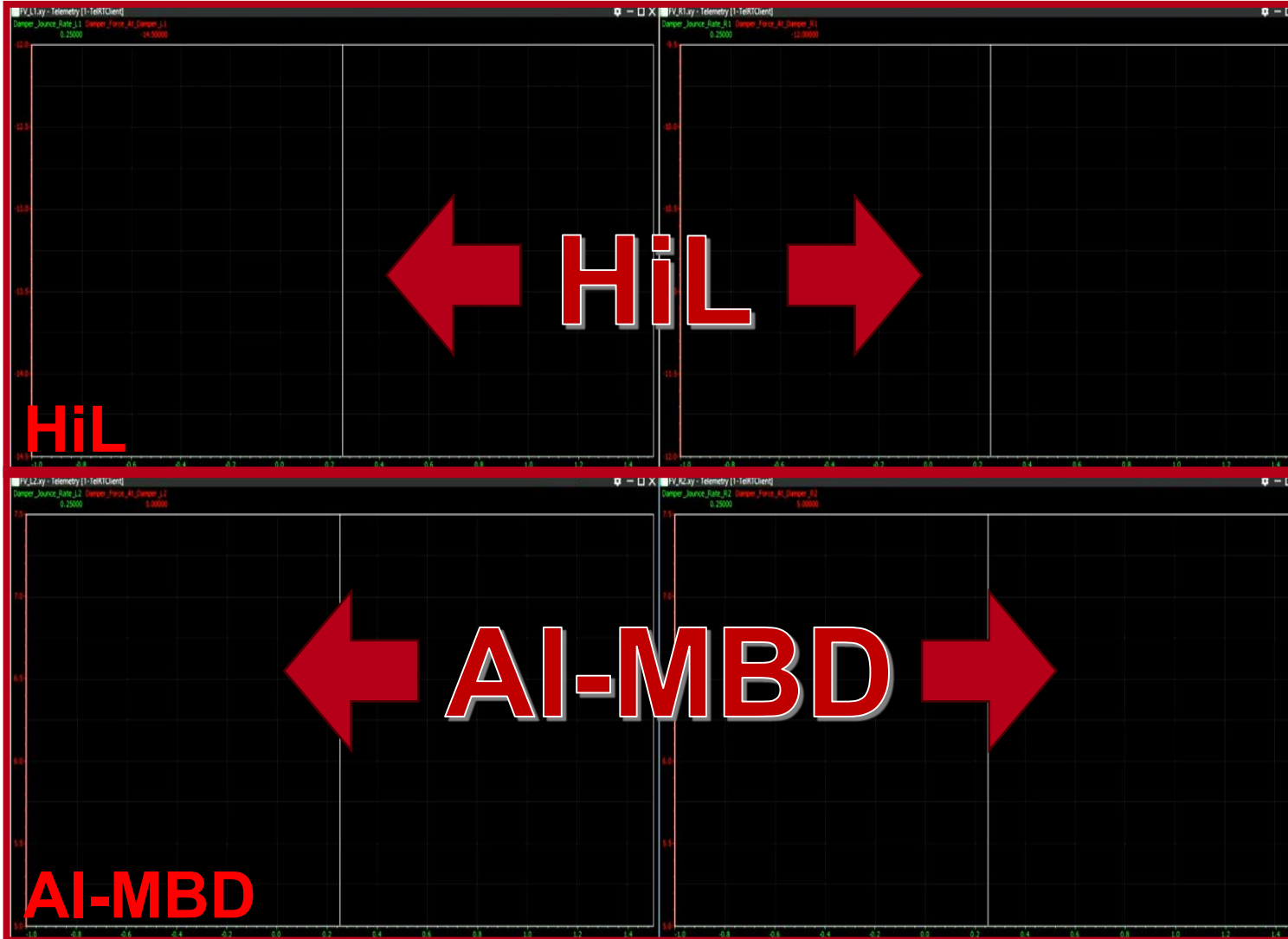


HiL Setup and Installation

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- Our facility supports Driver-in-Loop testing through our acquisition of **VI-Grade's Compact FSS** simulator.
- Today we offer Damper-in-Loop (HiL) testing for our customers through our **StepLab HUD020** machines.



HiL Demonstration with FSS Compact

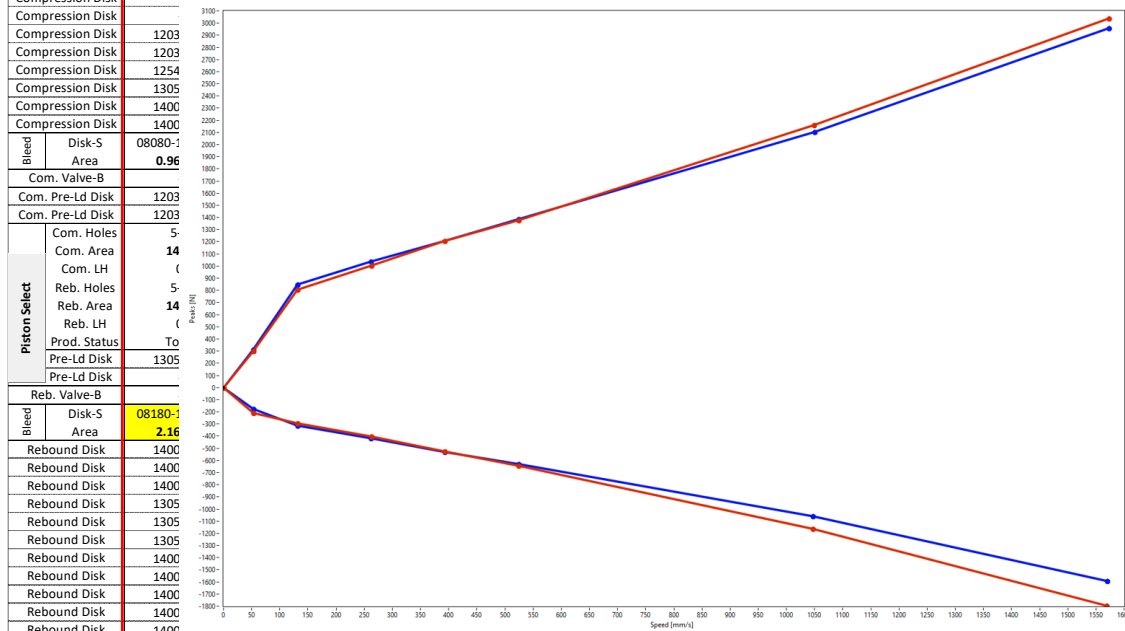


- The integration of the FSS together with the AI-MBD helped Astemo to develop a virtual tuning process that helps all costumers expedite and enhance their virtual target setting signoff. Even small differences on the valve code that aren't supposed to show differences on the look up table forces but are felt on the vehicle ride evaluations can be translated to the virtual environment trough the AI-MBD.
 - Valving types: twin-tube to monotube;
 - Structural differences: pre-load with stack rebalance;
 - Flow path rebalance: low speed bleed adjustments.

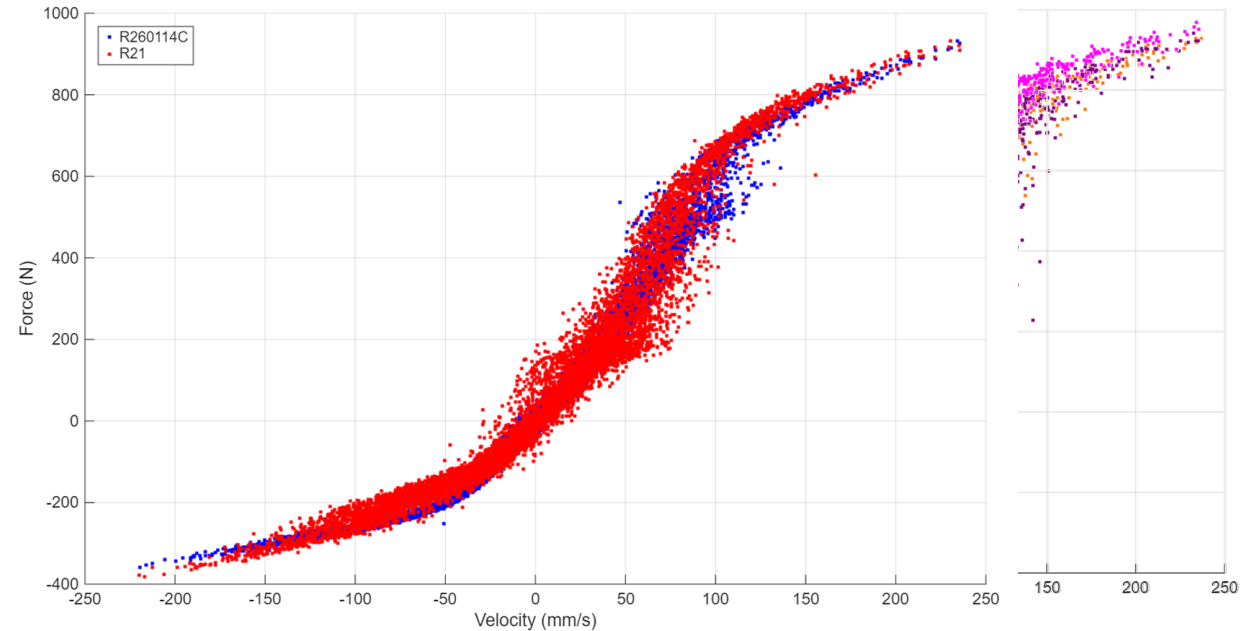
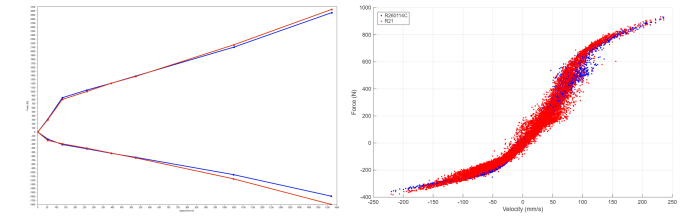
Past Virtual Tuning w/ AI-MBD – Twintube to Monotubes

- Tuning replacing twintubes (blue) to monotube dampers (red):

Washer	t2.65-18 (8)	8A11673-1	t2.65-18 (8)	8A11673-1	t3.25-18 (8)	8A11674-1
Back-Up Disk	1305-26 (8)	6A19457-1	1305-26 (8)	6A19457-1	1305-26 (8)	6A19457-1
Retainer-Disk	1400-15 (8)	4A14625-1	1400-16 (8)	7A17310-1	1400-16 (8)	7A17310-1
Compression Disk	---	---	---	---	---	---
Compression Disk	---	---	---	---	---	---
Compression Disk	---	---	---	---	---	---
Compression Disk	---	---	---	---	---	---
Compression Disk	---	---	---	---	---	---
Compression Disk	1203	---	---	---	---	---
Compression Disk	1203	---	---	---	---	---
Compression Disk	1254	---	---	---	---	---
Compression Disk	1305	---	---	---	---	---
Compression Disk	1400	---	---	---	---	---
Compression Disk	1400	---	---	---	---	---



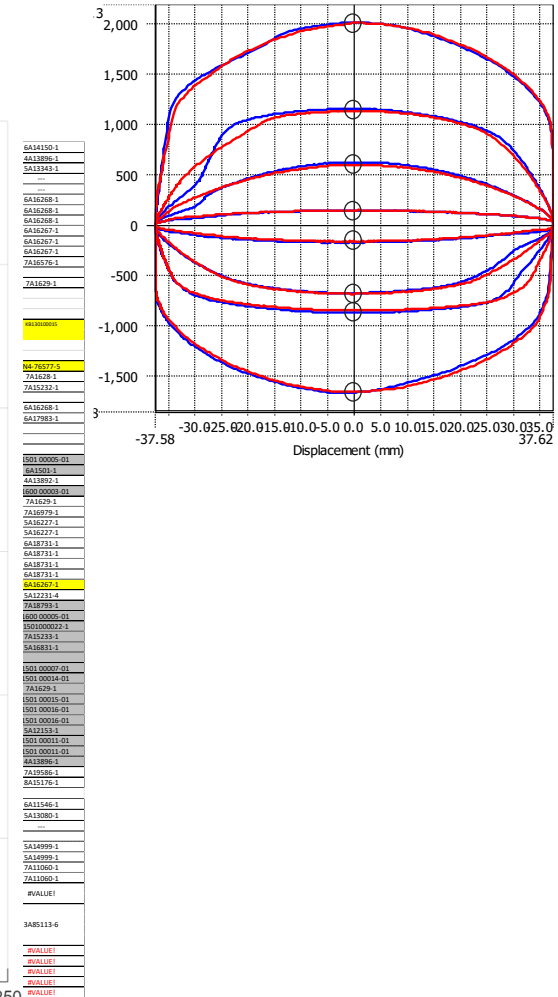
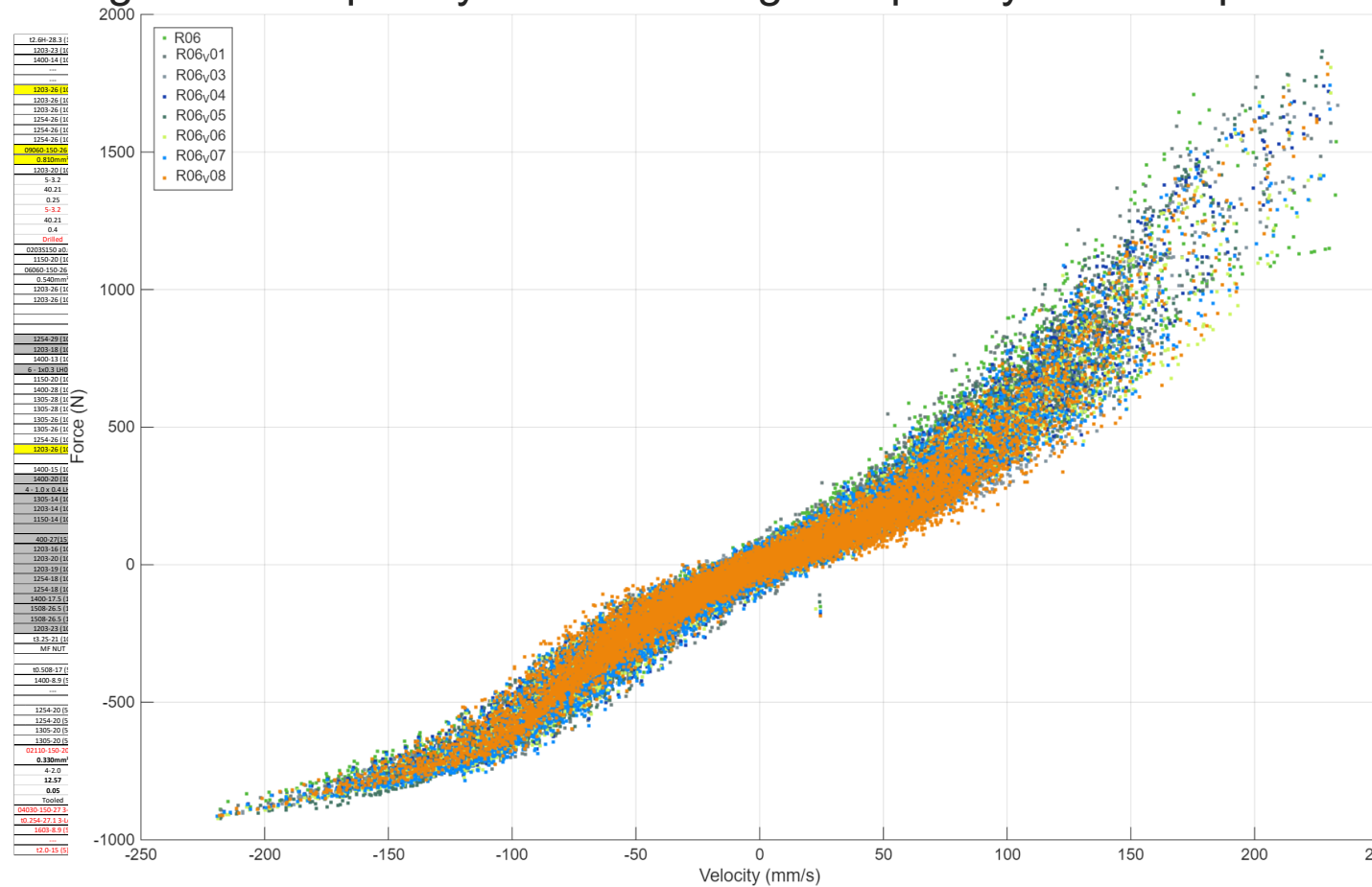
Rebound Disk	---	---	---	---	---	---
Rebound Disk	---	---	---	---	---	---
Rebound Disk	---	---	---	---	---	---
Retainer-Disk	1400-16 (8)	7A17310-1	1400-16 (8)	7A17310-1	1400-16 (8)	7A17310-1
Back-Up Disk	1203-23 (8)	7A17714-1	1203-23 (8)	7A17714-1	1203-23 (8)	7A17714-1
Washer	t3.25-18 (8)	8A11674-1	t3.25-18 (8)	8A11674-1	t3.25-18 (8)	8A11674-1
Washer	---	---	---	---	---	---
Nut	Style MF NUT	8A15332-1	MF NUT	8A15332-1	MF NUT	8A15332-1
Tap/No-tap	No-Tap	---	No-Tap	---	No-Tap	---



Monotube Valve Structure Proposals

Past Virtual Tuning w/ AI-MBD – Frequency Reactive Dampers

- Tuning on FRD pursuing better frequency cut-off and high frequency force drop



FRD – Force Drop and Frequency Cut-off

- Virtual tuning sessions held on Astemo's FSS showed how accurate the process can be with having final proposals tested on vehicles for checks.
- It showed considerable efficiency on timing when comparable with hardware / vehicles.
- Mindset from in-vehicle tuning can be carried-over to the virtual session (ride the damper, not the curve) make easy and transparent for ride engineers.

**Sign up the DiM150 demo for knowing more
details about our AI-MBD damper models**

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