

# SCALE

IT-Solutions for CAE



# Master Complexity of Engineering in SDM by AI-Driven Assistance

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# Introduction: Simulation Data Management



## Simulation Setup

Input Data & Workflows



## Result Data

Evaluation & Assessment

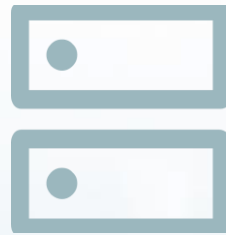


## Monitor

Project Targets



Collaboration



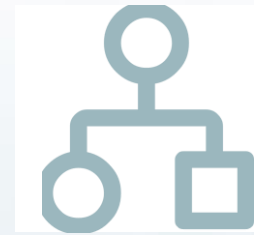
Traceability &  
Integrity



Standards



Time Saving

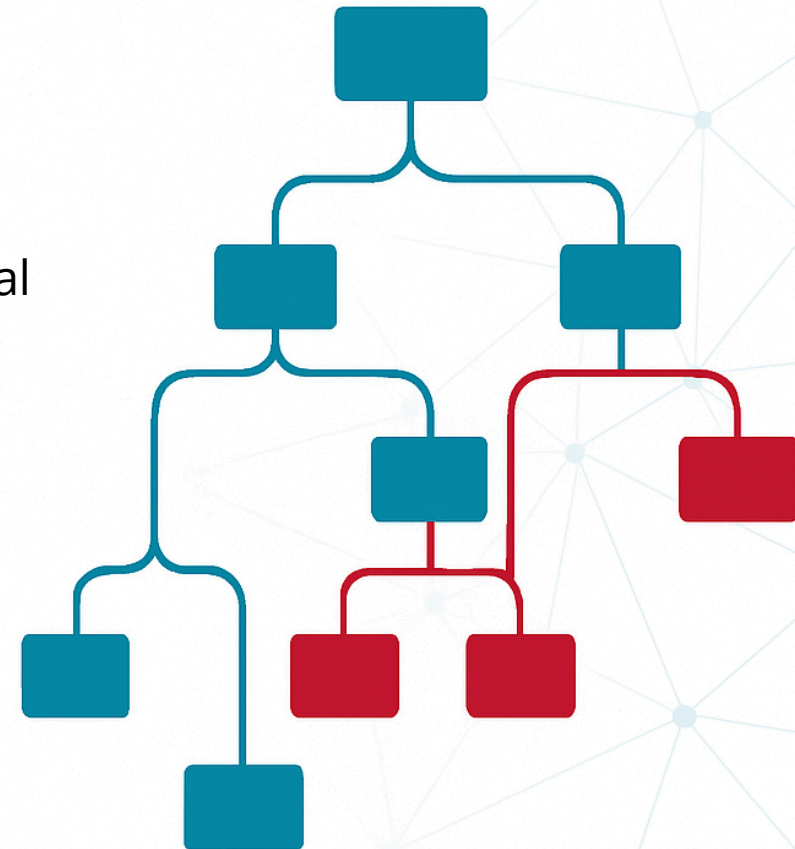


Democratization &  
Transparency

# Introduction: Master Complexity in SDM by AI-Driven Assistance

## Challenge of Complexity

- **Countless CAE model iterations**  
Simulation-based design generates numerous CAE model iterations
- **Collaboration between numerous users**  
Coordinating multiple simulation versions across distributed engineering teams
- **Incredible amount of result data**  
Dealing with the large amount of complex simulation and testing result data
- **Exploring the relationship between cause and effect in virtual product development**  
Which measure leads to which result?



# Introduction: Master Complexity in SDM by AI-Driven Assistance

## Virtual Product Development

an iterative process

### 1. Choose a base Version

- Modifications to improve the behavior

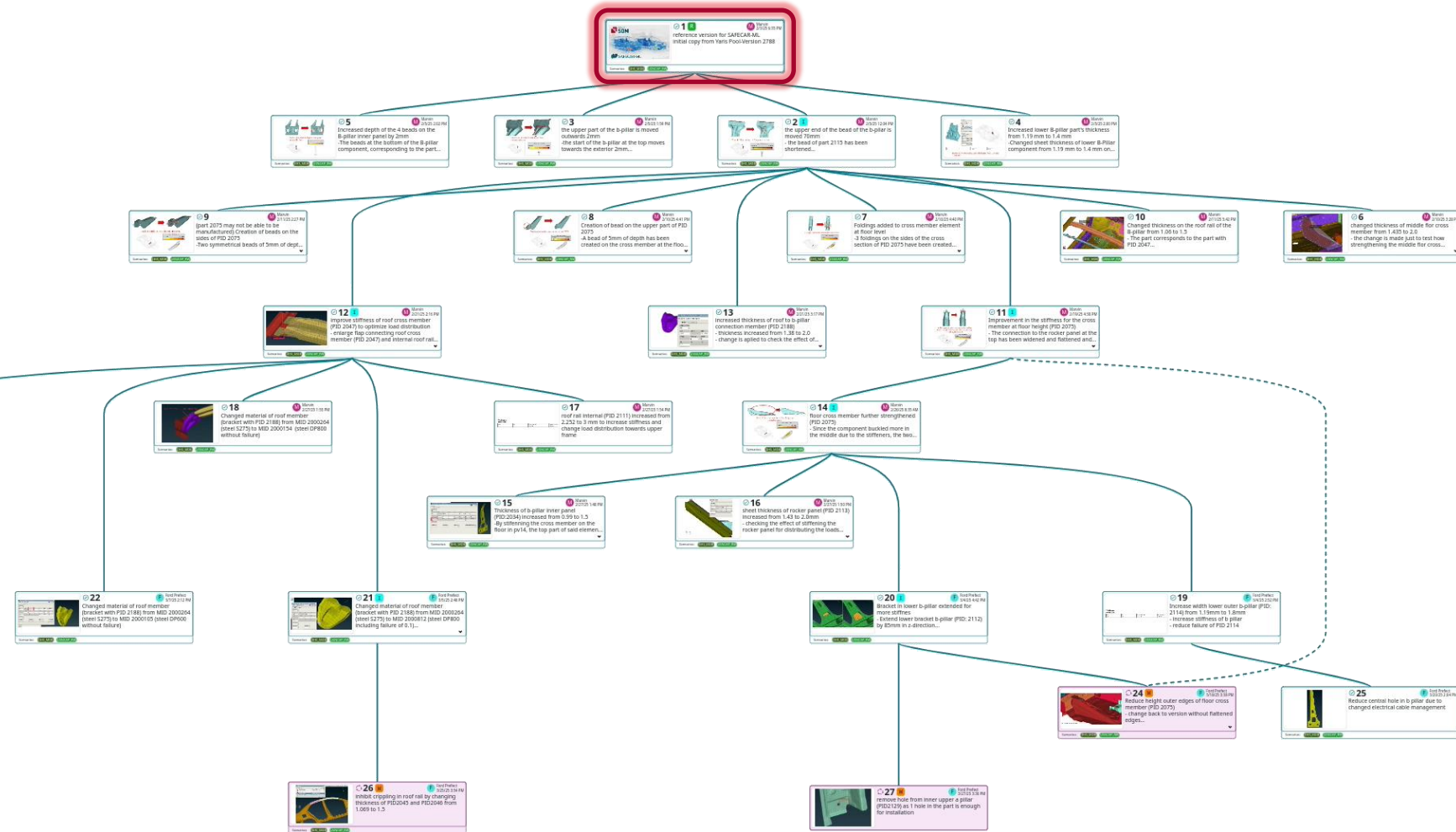
### 2. Apply the changes

- Run simulations

### 3. Evaluate the results

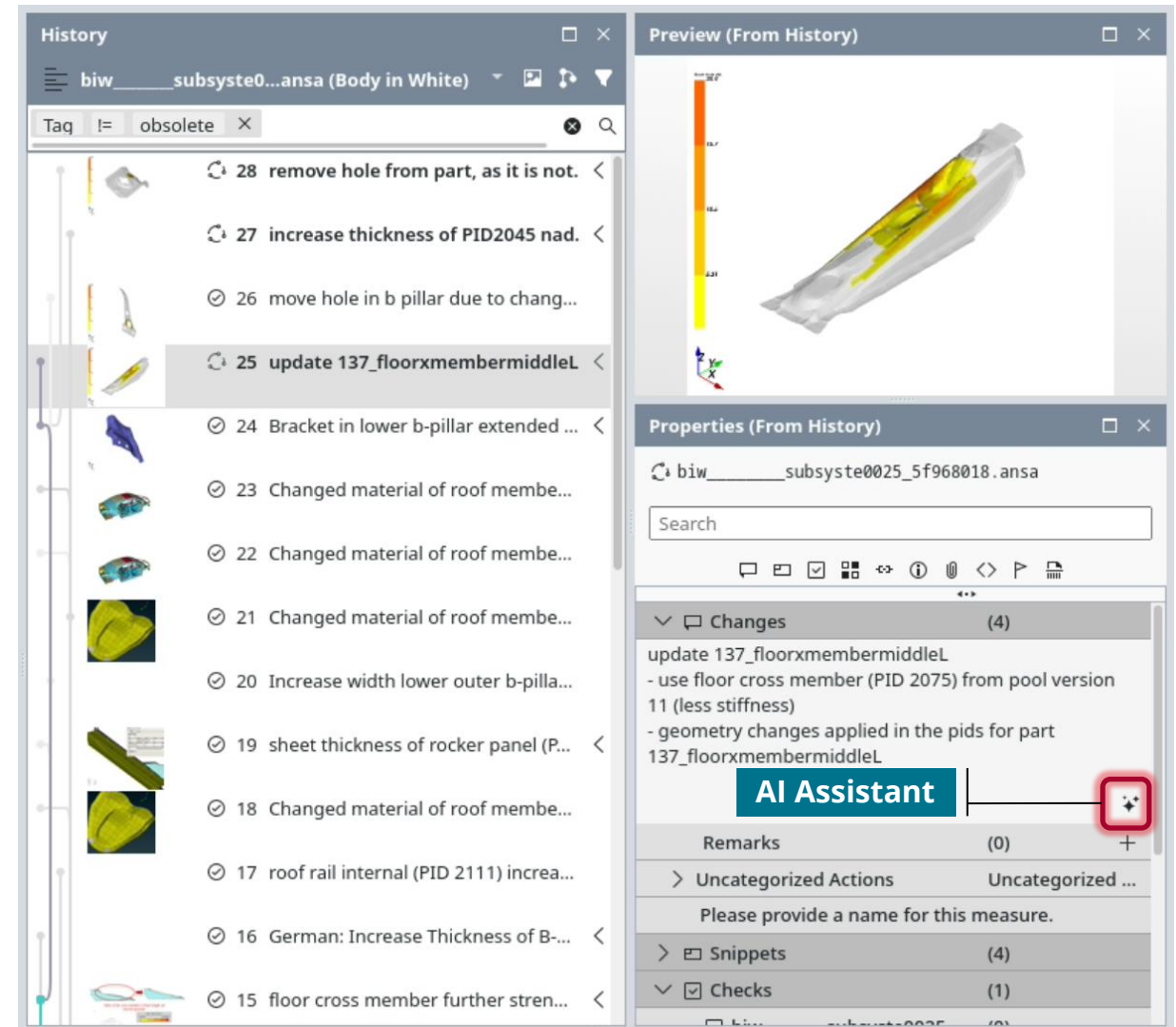
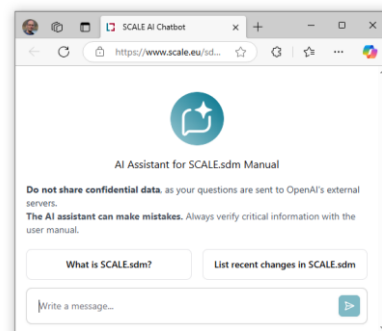
- Chose the best

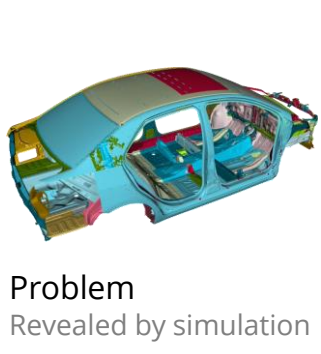
### 4. Start over with 1.



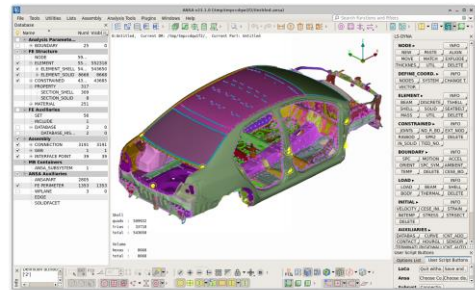
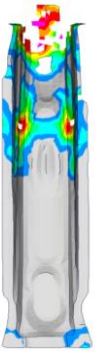
## AI-Driven Applications

- Facilitate change documentation  
Takes unpopular tasks off the simulation engineer's hands
- Augment change documentation  
By using automatically extracted details
- AI that understands the nature of changes  
Get change description even for geometry updates
- Search and summarization on all data stored in the SDM system (*Work in Progress*)  
Generate reports and summaries on detailed subjects based on all key data, observations, change descriptions, documents,...
- Chat assistant for talking with the documentation  
SDM and related CAE user manuals stored in the SDM system, ...

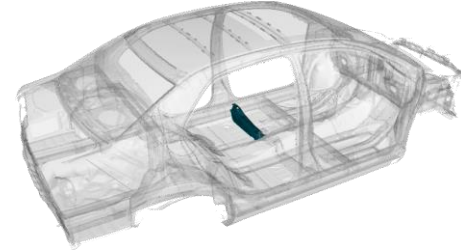




Problem  
Revealed by simulation



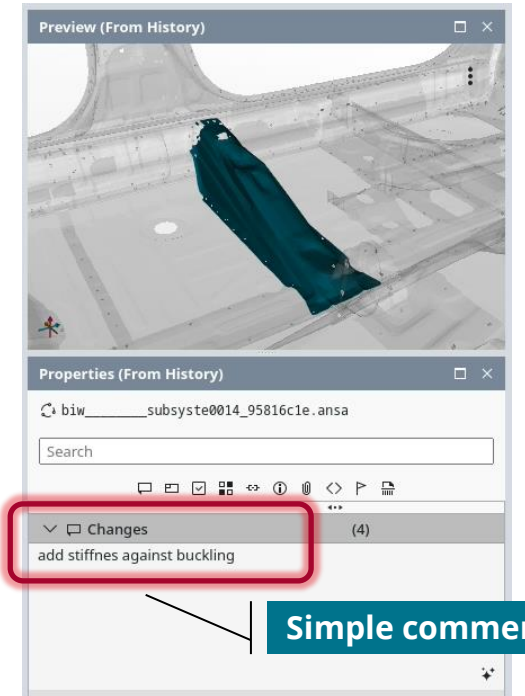
Improvements  
Applied in CAE preprocessor



Modified version



Automatic change extraction



Simple comment

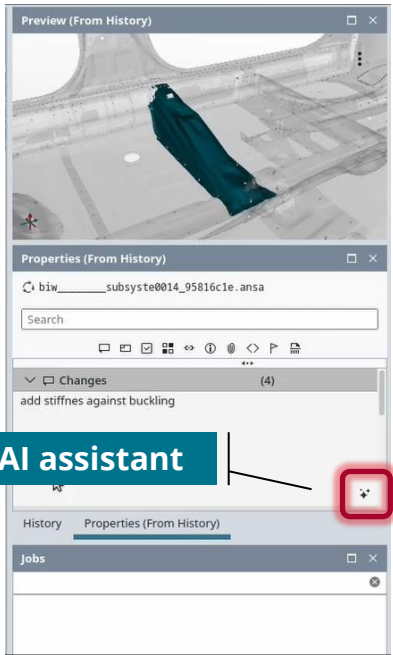


Augmented change documentation

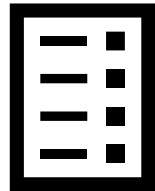
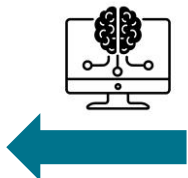
Enhanced change description:

Update 137\_floorxmembermiddleL stiffness

- add stiffness against buckling: Applied changes to part 137\_floorxmembermiddleL (PID 2075) for enhanced buckling stiffness
- Updated geometry details in the PIDs 2001 and 2002



AI assistant



Prompt for LLM  
Generated from

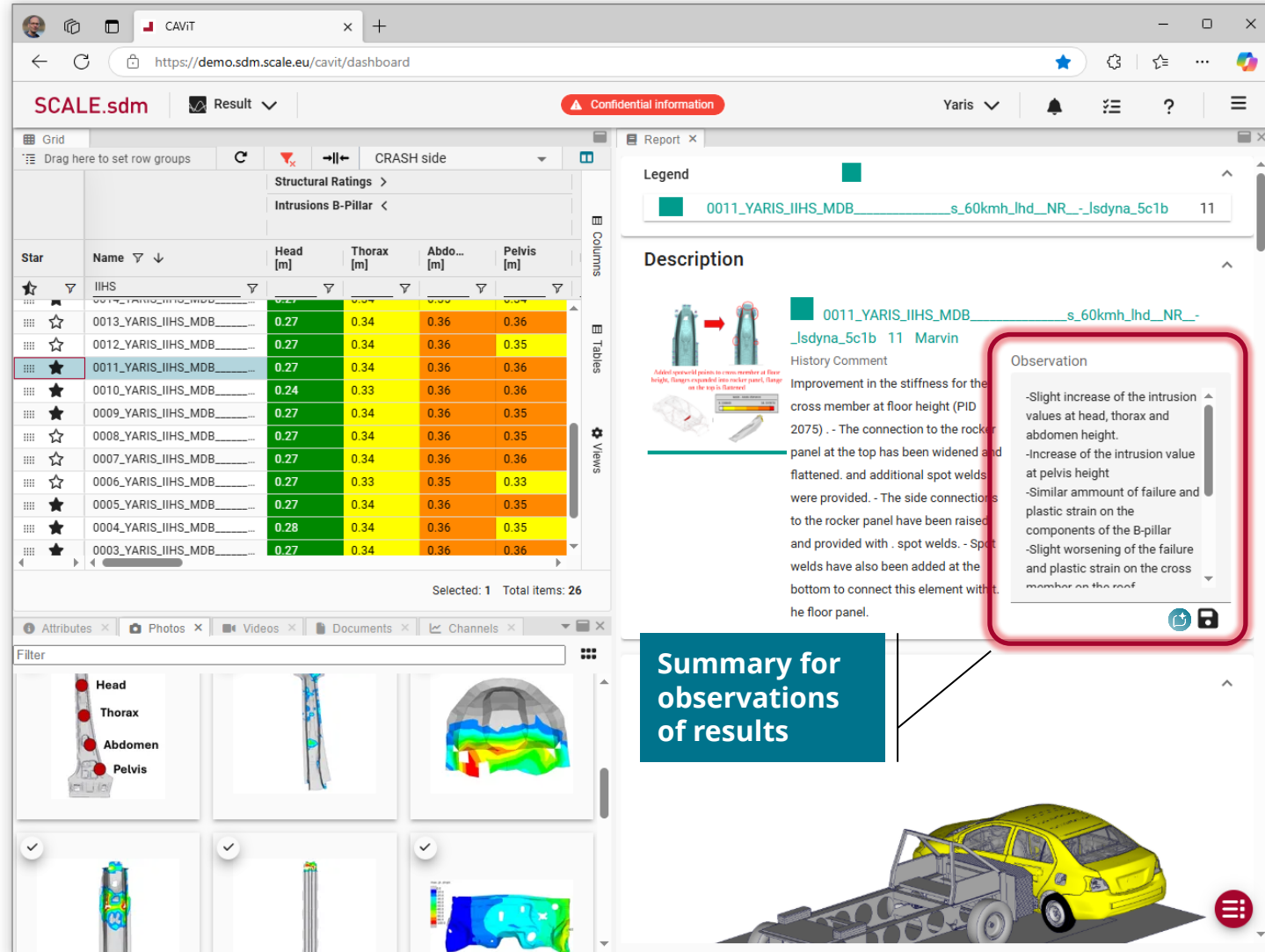
- (1) Model Compare Output
- (2) Context provided by user

## AI-Driven Applications

- Create automatic summaries for results  
Retrieve data from key results and compare with predecessor  
-> Create prompt to the LLM
- Data Analysis: Learn from Simulation Results  
Predictions, Correlations, Sensitivities, Outliers, Time Series Classifications, etc.
- Future: AI-Models that make recommendations for design changes  
Integrate all change comments and observations (Measure and Effect)

### Conclusion:

LLM based AI will provide new possibilities to facilitate the usage of SDM-Systems and leverage utilization of the knowledge stored in the SDM-System



The screenshot displays the SCALE SDM software interface. The main window shows a table of simulation results for various models. The table has columns for 'Star', 'Name', 'Head [m]', 'Thorax [m]', 'Abdo... [m]', and 'Pelvis [m]'. The data is color-coded by value, with green for higher values and yellow/orange for lower values.

Star	Name	Head [m]	Thorax [m]	Abdo... [m]	Pelvis [m]
☆	0013_YARIS_IHHS_MDB_...	0.27	0.34	0.36	0.36
☆	0012_YARIS_IHHS_MDB_...	0.27	0.34	0.36	0.35
★	0011_YARIS_IHHS_MDB_...	0.27	0.34	0.36	0.36
★	0010_YARIS_IHHS_MDB_...	0.24	0.33	0.36	0.36
★	0009_YARIS_IHHS_MDB_...	0.27	0.34	0.36	0.35
☆	0008_YARIS_IHHS_MDB_...	0.27	0.34	0.36	0.35
☆	0007_YARIS_IHHS_MDB_...	0.27	0.34	0.36	0.36
☆	0006_YARIS_IHHS_MDB_...	0.27	0.33	0.35	0.33
★	0005_YARIS_IHHS_MDB_...	0.27	0.34	0.36	0.35
★	0004_YARIS_IHHS_MDB_...	0.28	0.34	0.36	0.35
★	0003_YARIS_IHHS_MDB_...	0.27	0.34	0.36	0.36

A report window is open on the right, showing a legend and a description of the results. The description includes a history comment and an observation. The observation is highlighted in a red box and contains the following text:

Observation

- Slight increase of the intrusion values at head, thorax and abdomen height.
- Increase of the intrusion value at pelvis height
- Similar amount of failure and plastic strain on the components of the B-pillar
- Slight worsening of the failure and plastic strain on the cross member on the roof

A blue box labeled 'Summary for observations of results' points to the observation text. At the bottom of the interface, there is a 3D model of a yellow car chassis with a red 'X' indicating a failure point.

**Thank You  
for Your Attention**