

# Simplified Vehicle Compliance with CAVA and LiteCar

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SHAPING THE FUTURE OF PRODUCT CREATION



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# Simplified Vehicle Compliance Process with CAVA and LiteCar

## Agenda

- CAVA Overview and Releases
- What's New in CAVA 1.33.1
- Live Demo CAVA 1.33.1 – New Use Cases
- Overview and What's New in LiteCar
- Roadmap - Round Table Feedback/Input

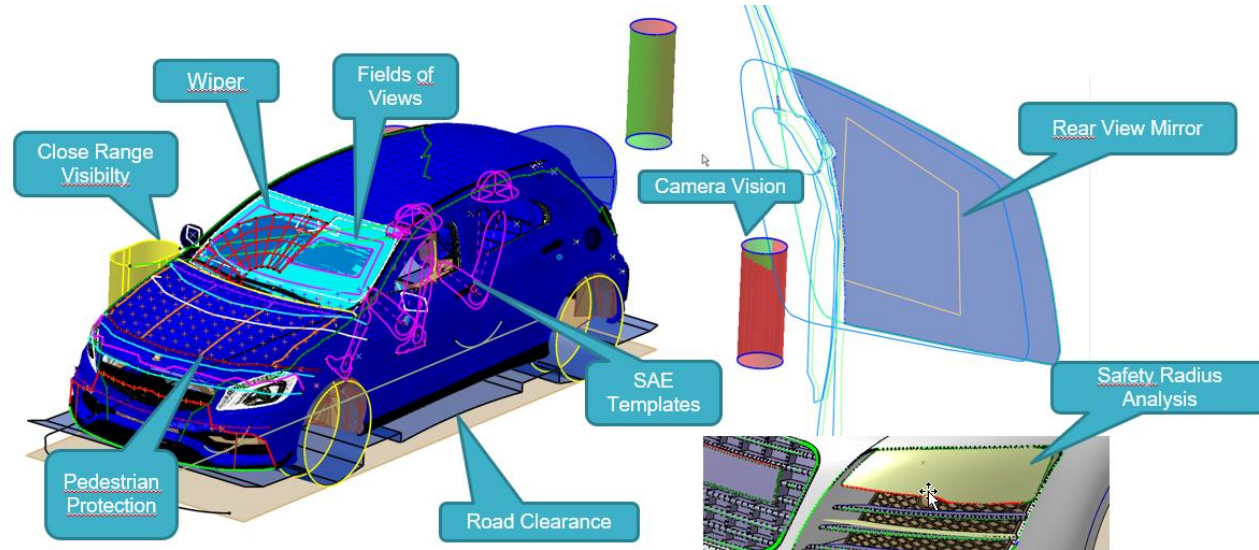


# Simplified Vehicle Compliance Process with CAVA



CAVA – TECHNIA’s solution for legal compliance in automotive design

- Validates the Compliance of the Product Design to legal Standards
- Provides a set of legal Standards and Guidelines for Vehicle Concept and Design as Features within the CAD System
- Deeply integrated into CATIA

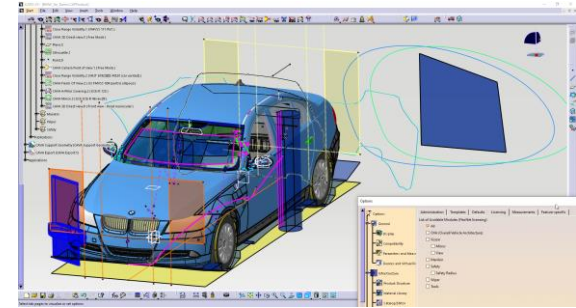


# Simplified Vehicle Compliance Process with CAVA



## Benefits of Validating Vehicle Compliance with CAVA

- Complete Reliable Solution for Legal Compliance
- Integrated in CATIA/3DEXperience Client
- Operational Time & Cost Savings
- Standardized Methodology
- Open and Configurable



CAVA is available as a complete product or as individual sub products for specific application areas

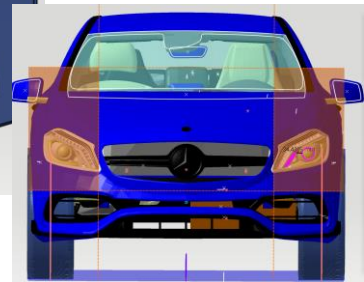
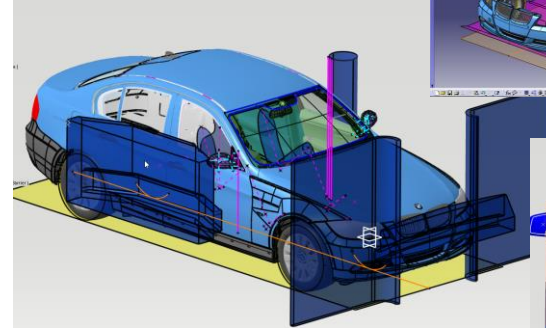
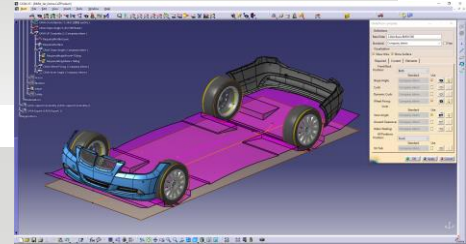
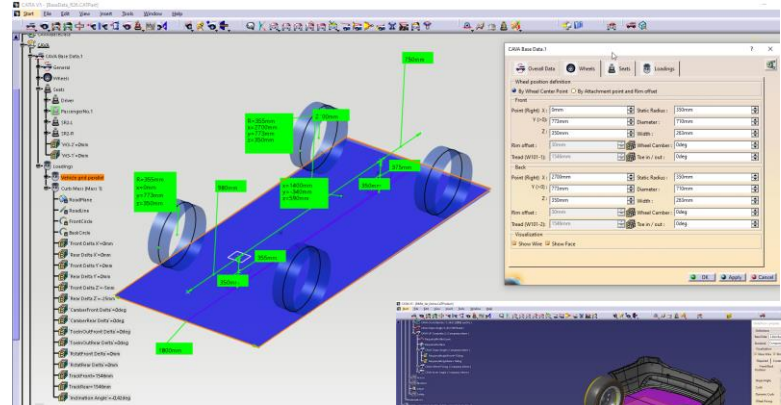
- CAVA OVA
- CAVA Manikin
- CAVA Vision
- CAVA Safety
- CAVA Wiper
- CAVA Tools

## CAVA OVA - User Benefits

- Supports your complete vehicle design process from concept to homologation.
- Keeps the key design parameters and analysis features integrated in the design data during complete development cycle

## Key Features:

- Base Data Concept – to define vehicle size, seat and wheel parameters and different loading states
- Measure ramp, approach and departure angles
- Create the overall ground clearance surface
- Calculate first contact points of barriers to the loaded vehicle. Available for front, side and rear impact
- Get guidance and verification about lamp types and their required absolute and relative positions

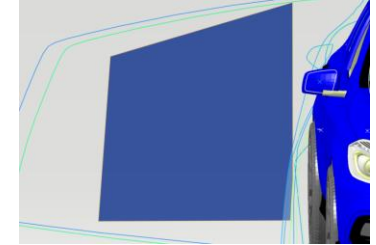
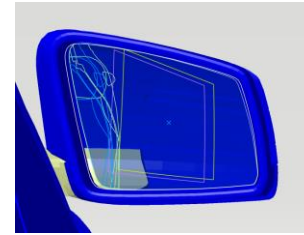
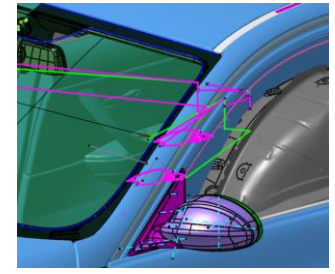
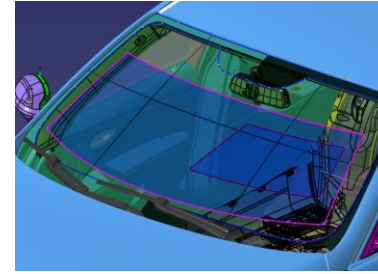


# Simplified Vehicle Compliance Process with CAVA



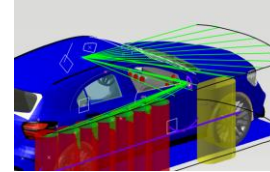
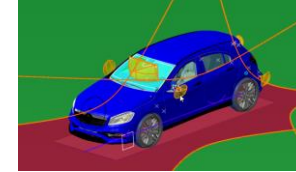
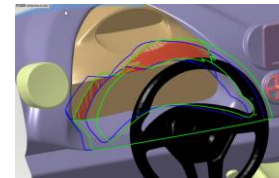
## CAVA Vision - User Benefits

- Fulfill Legal Requirements for the Vision of the Driver
- Supports Virtual Homologation of the Rear-View Mirror
- Ergonomic Aspects of Vision and Assisted Driving Support



## Key Features:

- Create Fields of View on the windshield
- Calculate A-Pillar obstructions (UNECE-R 125).
- Analyze Indirect Vision of the Driver Through Rear-View Mirror
- Analyze Direct Vision, Camera Vision and Close Range Vision



# Simplified Vehicle Compliance Process with CAVA

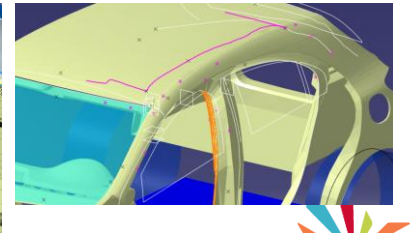
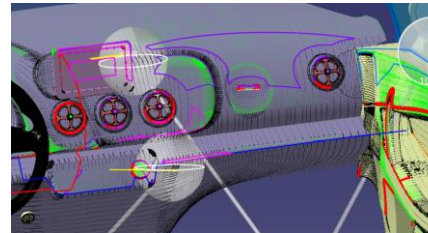
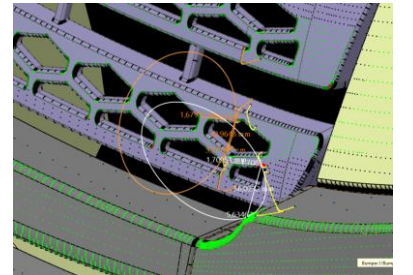
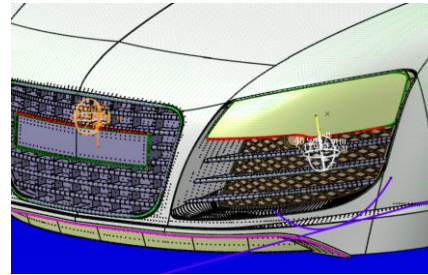
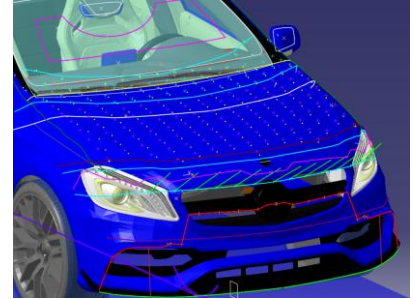
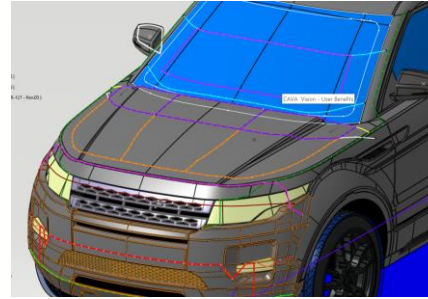


## CAVA Safety - User Benefits

- Enables you to verify the requirements for the Safety of Pedestrians and Occupants.
- Safe time locating minimum radius violations in the Design
- Prepare the Crash Simulation on the Digital Model according to legal Requirements and Consumer Protection Guidelines.

## Key Features:

- Safety Radius Analysis on Exterior (ECE-R 26)
- Safety Radius Analysis on Interior (ECE R-21)
- Pedestrian Protection (EURO NCAP, ECE-R 127)
- Head Impact (FMVSS 201U)
- Projection Measurement



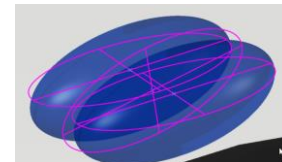
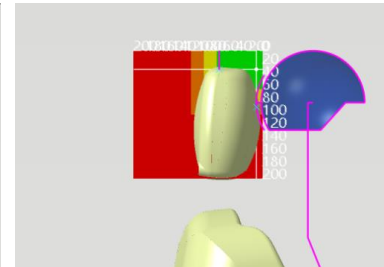
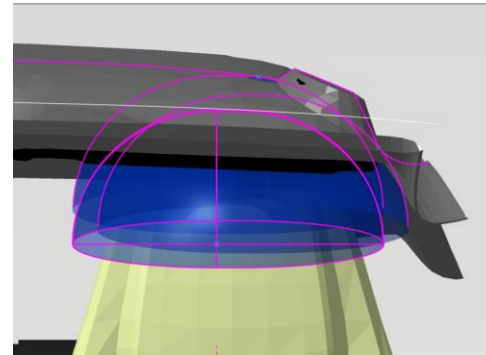
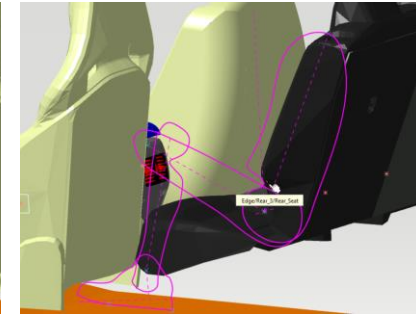
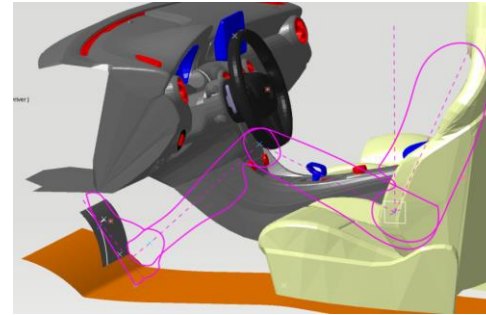


## CAVA Manikin - User Benefits

- Save time determining correct seating positions of Driver and Occupants
- Easily create standard eyepoint and eye ellipses to be used in vision analysis
- Quickly measure key parameters for head room clearance and headrests safety qualities

### Key Features:

- Provide practical positioning methods for specific purposes as described in SAE J826 standard
- Define the Seating Reference point, Heel point and Ball of Foot point based on vehicle geometry
- Creates the eye ellipses according to SAE J941 as required for FMVSS Vision checks
- Calculate the headroom clearance to the roof in vertical and diagonal directions according to SAE J1052



# Simplified Vehicle Compliance Process with CAVA

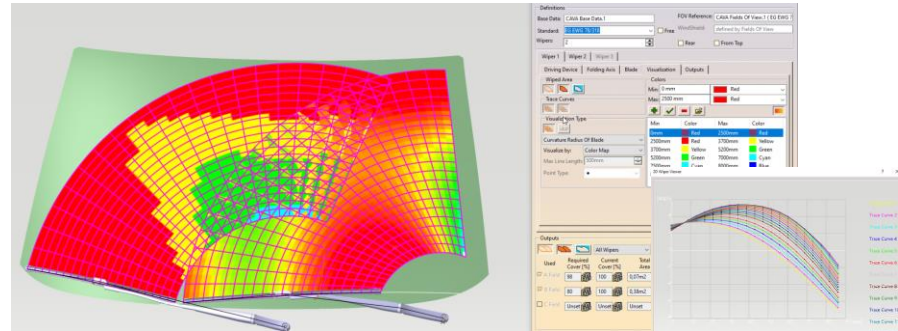
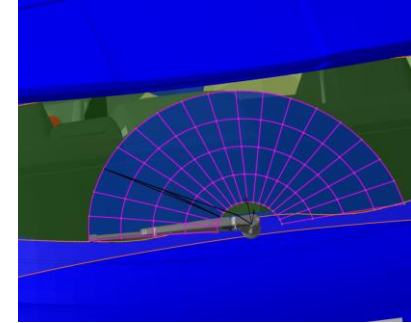
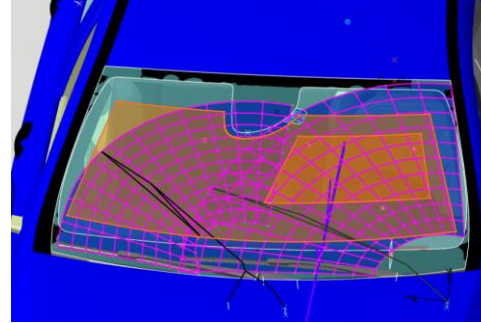


## CAVA Wiper - User Benefits

- Optimize Wiped Area
- Fulfill Legal Requirements of Wiped Area on the Windshield
- Optimize Quality of Wiping Operation

### Key Features:

- Define a wiper system with up to 3 wipers.
- Supports three wiper types: Standard, Parallel and trapezoid.
- Use any wiper arrangement: bottom/top mounted, clockwise/anti-clockwise rotation, butterfly, front and rear.
- Calculate the wiped area on the windshield.
- Check fulfillment of legal requirements acc. UNECE-R 43 or FMVSS 104 on the wiped area



# CAVA – Updates Releases



## CAVA – New Releases

- CAVA is available for **CATIA V5** and **3DExperience**
- **V5:** R27, R28, R29, R30,R31
- **3DExp:** 2018x, 2019x, 2020x,2021x, 2022x
- **Planned:** 3DExp 2022x on **Cloud**

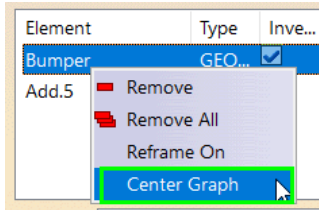
| Releases   | CAVA V5 | CAVA 3DExperience              |
|------------|---------|--------------------------------|
| May-6 2021 | 1.32.5  | 1.8.2                          |
| Oct 2021   | 1.33.1  |                                |
| Nov 2021   |         | 1.8.2<br>(for 2022x on Cloud ) |
| Dec 2022   |         | 1.9.1                          |



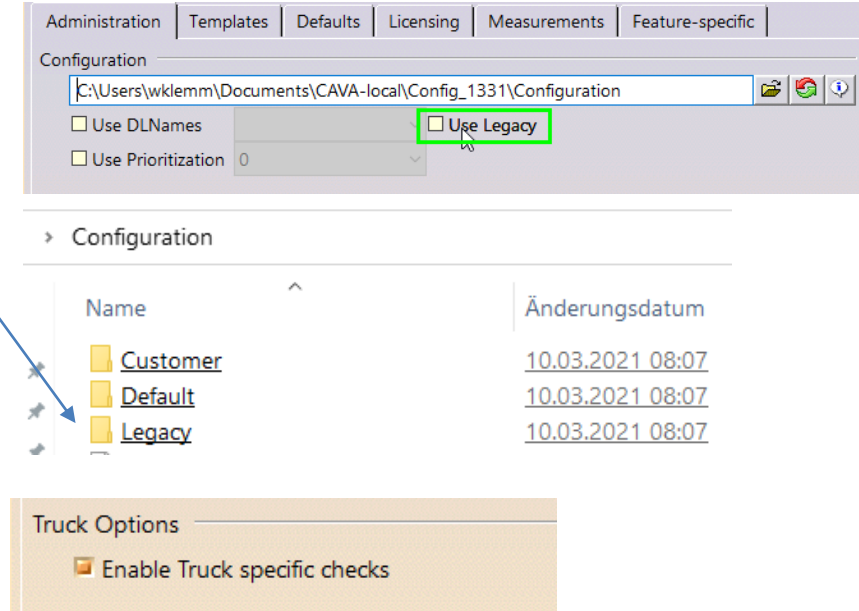


# What's New

- Legacy Standards
  - Outdated standards now in separate configuration folder. These are not shown by default.
  - Option to activate/show legacy standards
  - Truck mirrors loaded if truck specific checks are enabled
- New center graph option in selection lists



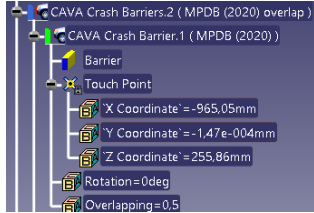
- Report creation
  - Capability to select screenshots for excel reports



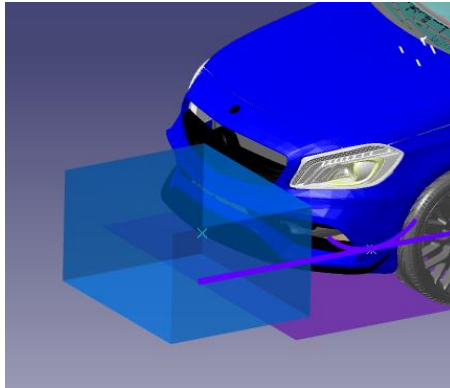
# CAVA 1.33.1 – OVA –Crash Barriers



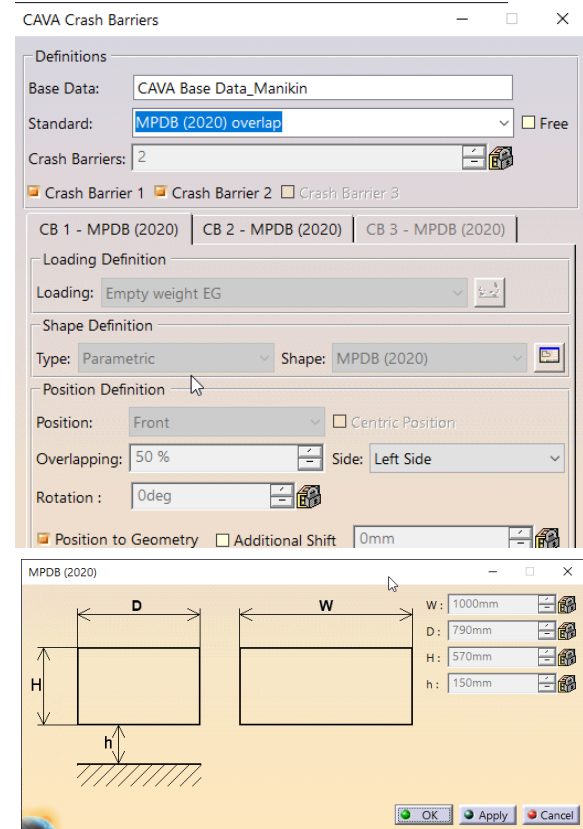
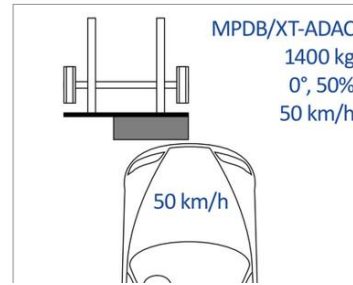
- General: Added contact points to the feature tree



- Added Standard: MPDB 2020 overlap



MPDB 50%, 50 km/h (Euro NCAP, from 2020)

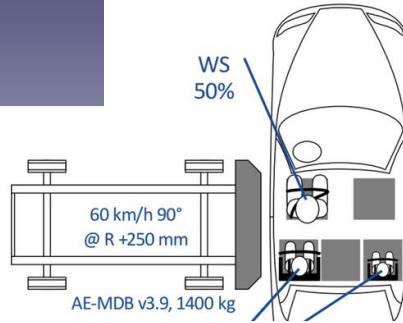
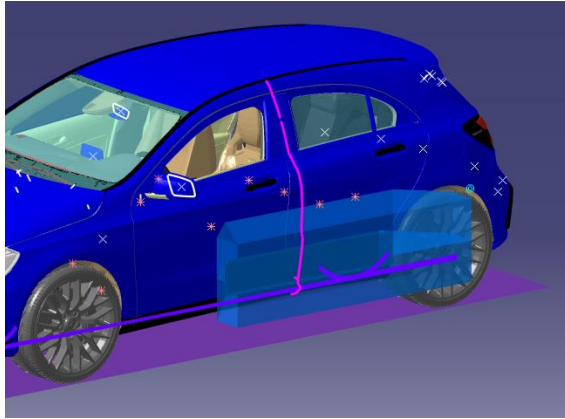


# CAVA 1.33.1 – OVA – Side Impact



## Updated Standards

- Added Standard: AE-MDB Euro NCAP 2015



CAVA Side Impact

Definitions

Base Data: CAVA Base Data\_Manikin

Standard: Euro NCAP (2015) - Advanced European Moving Deformable Barrier  Free

Loading: Curb Mass (Mass 1)

R-Point

R-Point: Offset: 250mm

Settings

Impact Angle: 90deg Car Side: Left Side

Position to Geometr  Additional Shift: 5mm

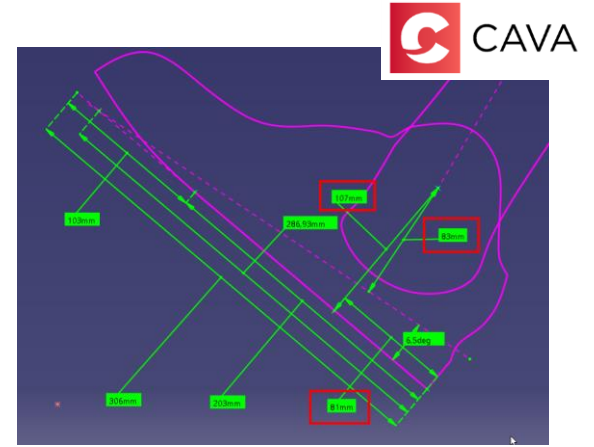
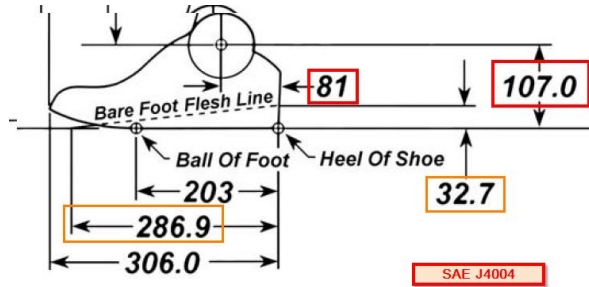
Euro NCAP (2015) - Advanced European Moving Deformable Barrier

| Definition       | Value  |
|------------------|--------|
| I - Start Limit: | 300mm  |
| H - Height:      | 500mm  |
| H1 - Height1:    | 50mm   |
| H2 - Height2:    | 200mm  |
| W - Width:       | 1700mm |
| W1 - Width1:     | 600mm  |
| D - Depth:       | 500mm  |
| D1 - Depth1:     | 60mm   |
| D2 - Depth2:     | 150mm  |
| D3 - Depth3:     | 200mm  |
| A - Angle:       | 45deg  |
| T - Thickness:   | 3mm    |

# CAVA 1.33.1 – Manikin



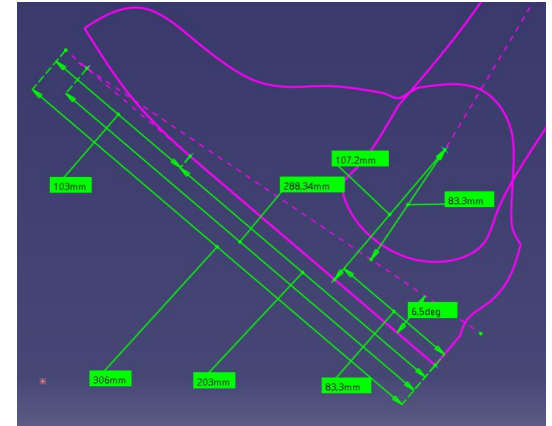
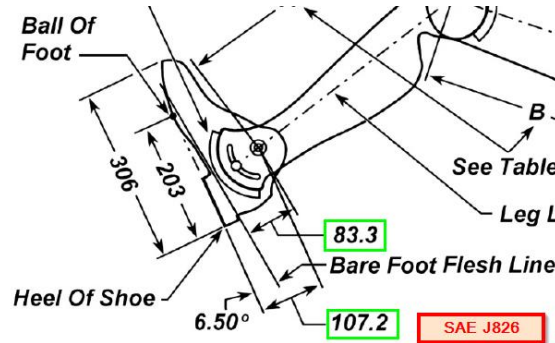
- Manikin Template
  - Additional parametrization of horizontal heel point distance (as in SAE J4004) for the shoe
  - Additional new standards “SAE J826 2015, Foot SAE J4004)”



Standard: SAE J826 (2015, Foot SAE J4004, Vehicle grid parallel)

| Human Measures           |         |
|--------------------------|---------|
| Torso Length :           | 563mm   |
| Femoral Length :         | 455,7mm |
| Lower Leg Length :       | 458,7mm |
| Foot Length :            | 306mm   |
| Foot Vertical Offset :   | 107mm   |
| Foot Horizontal Offset : | 81mm    |
| Bar Foot Line Offset :   | 83mm    |
| Foot Flesh Angle :       | 6,5deg  |

OK Cancel

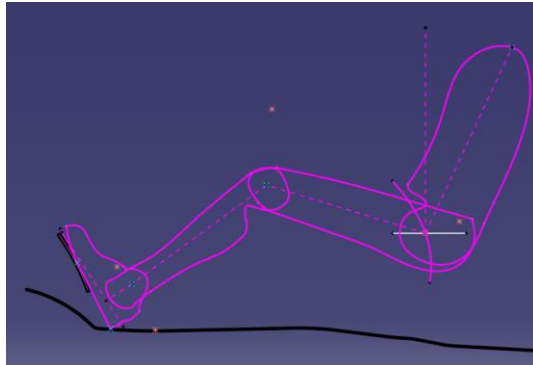




# CAVA 1.33.1 – Manikin



- Manikin Template
  - New iterative positioning option to determine SRP, Heel Point and Ball of Foot Point.
  - Input:
    - Pedal, floor, seat travel line geometry
    - SRP location curve is calculated internally acc. to referenced standard and “moving” heel point
  - Output:
    - Heel Point on Floor, Ball of Foot Point on Pedal
    - SRP on intersection of seat travel line and SRP location curve

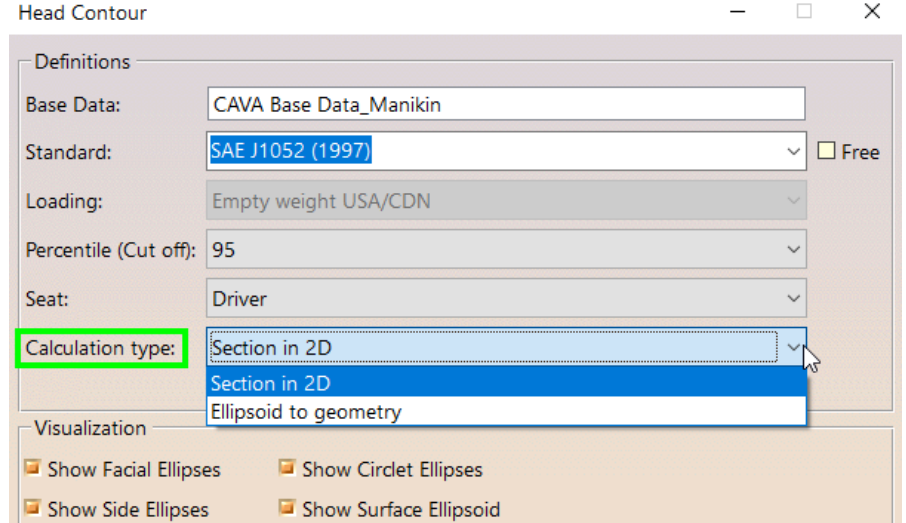
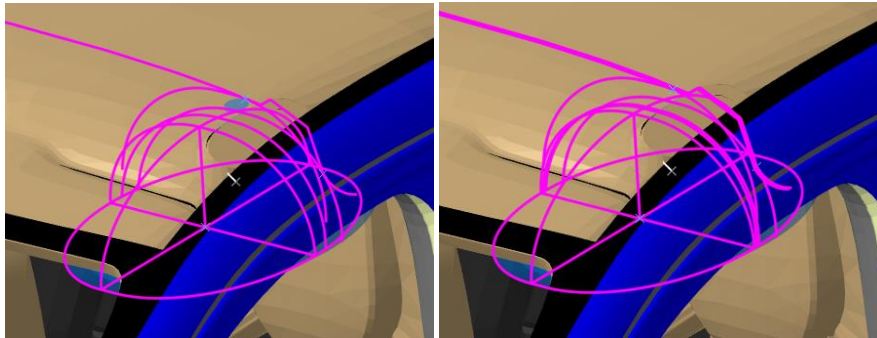


2D Manikin Template

| Definitions   |   |   |
|---|---|---|
| Base Data:  | CAVA Base Data_B  |   |
| Standard:   | SAE J826 (2015)   | <input type="checkbox"/> Free   |
| Loading:  | Empty weight USA/CDN                                    |   |
| Position:   | Pos.19 (Floor, Pedal, Seat-travel-line, Location Curve) |   |
| Percentile:   | 95  | <input type="button" value="↑"/> <input type="button" value="↓"/>           |
| Seat:   | Driver  |   |
| Options   |   |   |
| <input type="checkbox"/> Show Front                         | <input type="checkbox"/> Use Torso Angle to show Front  |   |
| <input type="checkbox"/> Create Fill Surfaces               | <input type="checkbox"/> Do not show perpendicular line |   |
| <input checked="" type="checkbox"/> Create flat shoe bottom |   |   |
| Position Parameters   |   |   |
| Torso Angle :   | 25deg   | <input type="button" value="↺"/> <input type="button" value="↻"/> Base Data |
| Hip Angle :   | 98,16deg  | <input type="button" value="↺"/> <input type="button" value="↻"/> Output    |
| SRP :   | 1446,34mm -340mm 602mm                                  | <input type="button" value="↺"/> <input type="button" value="↻"/> Output    |
| Leg Room : (+ 254mm)  | 1072mm  | <input type="button" value="↺"/> <input type="button" value="↻"/> Output    |
| Knee Angle :  | 126,91deg   | <input type="button" value="↺"/> <input type="button" value="↻"/> Output    |
| Foot Angle :  | 87deg   | <input type="button" value="↺"/> <input type="button" value="↻"/> CFG Input |
| Heel Point :  | 582,06mm -340mm 340,11mm                                | <input type="button" value="↺"/> <input type="button" value="↻"/> Output    |
| H30 :   | 261,89mm  | <input type="button" value="↺"/> <input type="button" value="↻"/> Output    |
| Pedal Geometry :  | Translate.1   | User Input  |
| Floor Geometry :  | Carpet-surface  | User Input  |
| Seat travel Line :  | Translate.2   | User Input  |
| Ball of Foot Point :  | 490,68mm -340mm 521,38mm                                | <input type="button" value="↺"/> <input type="button" value="↻"/> Output    |

# CAVA 1.33.1 – Manikin – Head Contour

- New additional option calculation type:
  - Section in 2D  
(existing standard method measuring the distance in a cross-section)
  - New: Ellipsoid to geometry  
(measures the distance with the 3D ellipsoid)



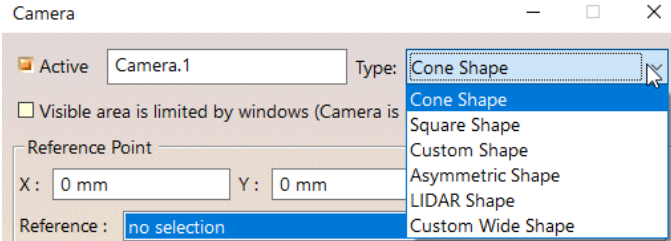
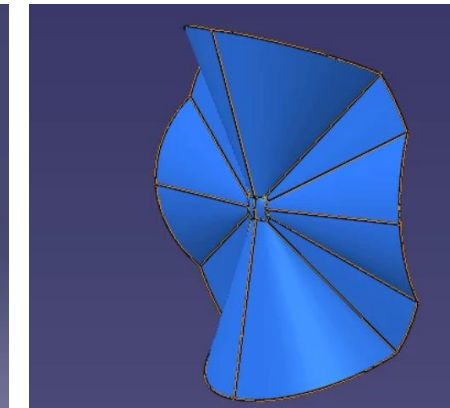
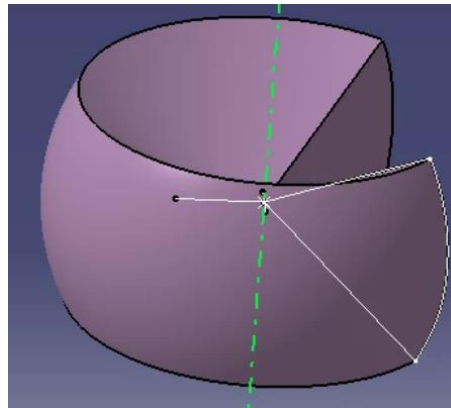
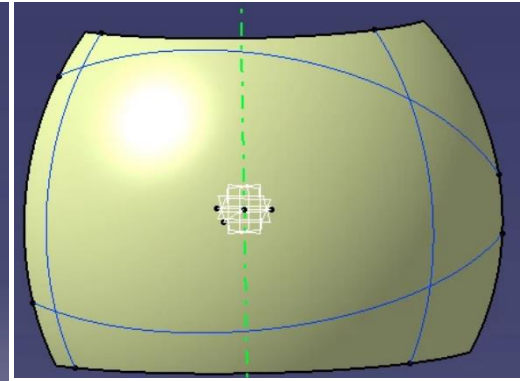
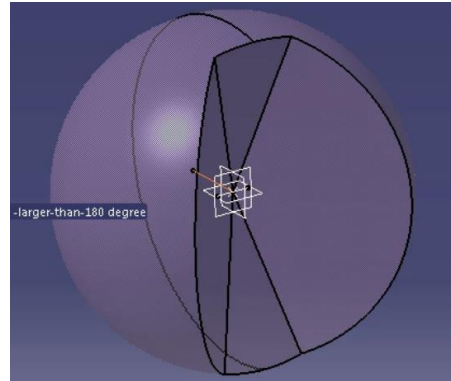
# CAVA 1.33.1 – Vision – Camera Types

## New camera types:


- Wide angle (pyramidal and conical > 180 degree)
- Asymmetrical
- LIDAR (Rotational scan)
- Custom wide shape

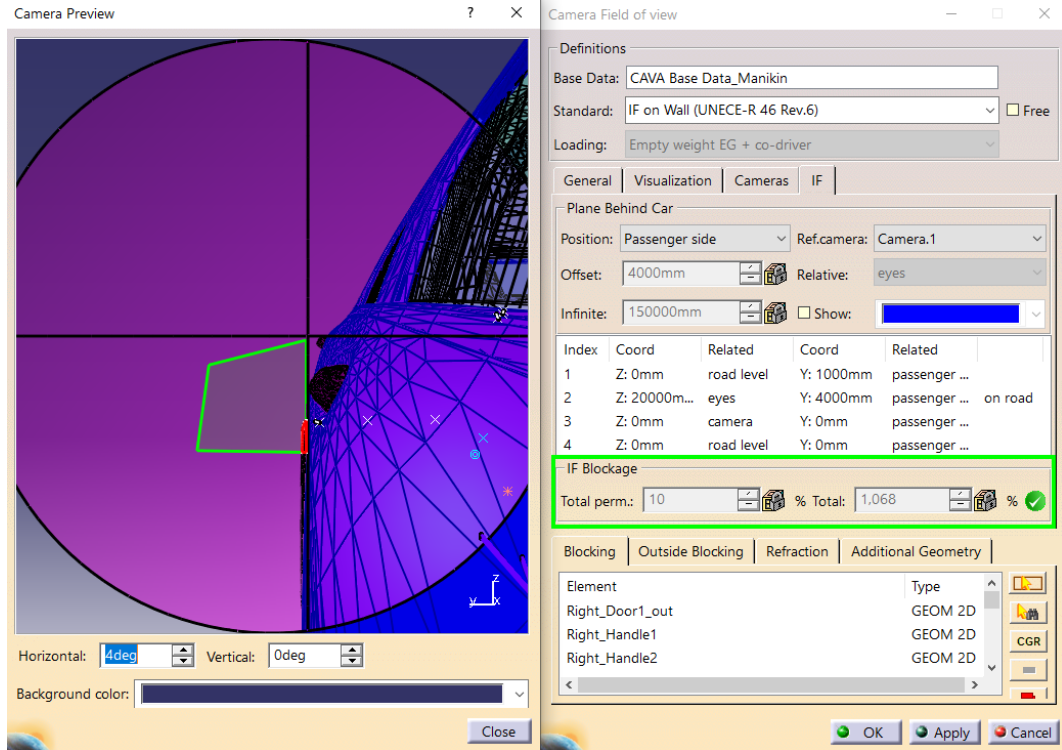
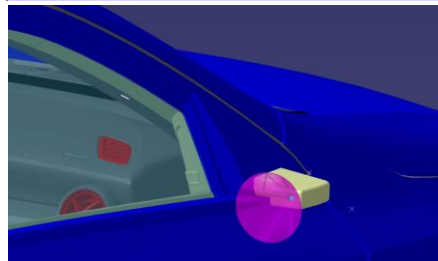
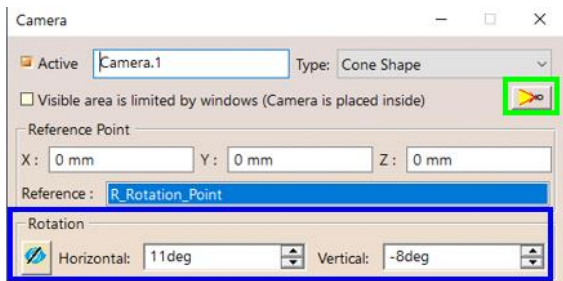
## Available in

- Camera Field of View
- Direct View
- Close Range Visibility



# CAVA 1.33.1 – Vision – Camera Field of View

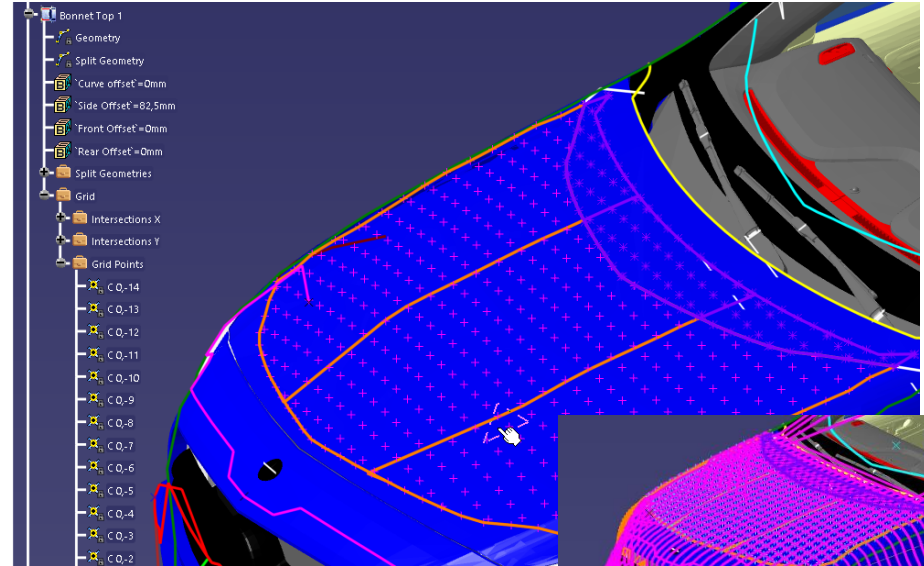
- Camera rotation control
- Camera Preview 
- Indirect vision device standards
  - Check visibility and obstruction for IF defined in ECE-R 46 Rev. 6



# CAVA 1.33.1 – Safety – Pedestrian Protection

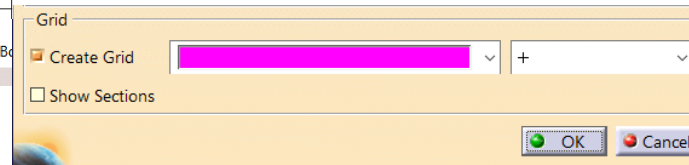
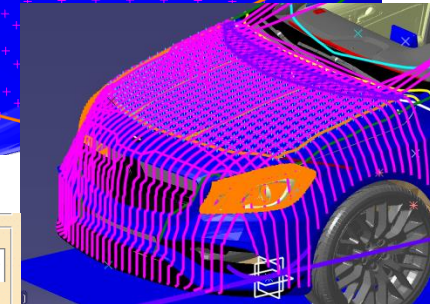


- Optional Grid Points for ECE Standards
- Includes all raster points from the interior within the bonnet top and on the boundaries
- Possibility to create excel report of grid points for downstream processes



|    |    |                            |                             |
|----|----|----------------------------|-----------------------------|
| 71 | 8  |                            | Empty weight EG + co-driver |
| 72 | 9  |                            |                             |
| 73 | 10 | Bonnet Top ECE Grid Report | CAVA Strings konvertieren   |
| 74 | 11 | Step:                      | 0mm                         |
| 75 | 12 |                            |                             |
| 76 | 13 | Bonnet Top ECE Grid:       | Bonnet Top 1                |
| 77 | 14 |                            |                             |
| 78 | 15 |                            |                             |
| 79 | 16 |                            |                             |
| 80 | 17 |                            |                             |
| 81 | 18 |                            |                             |
| 82 | 19 |                            |                             |
| 83 | 20 |                            |                             |
| 84 | 21 |                            |                             |
| 85 | 22 |                            |                             |

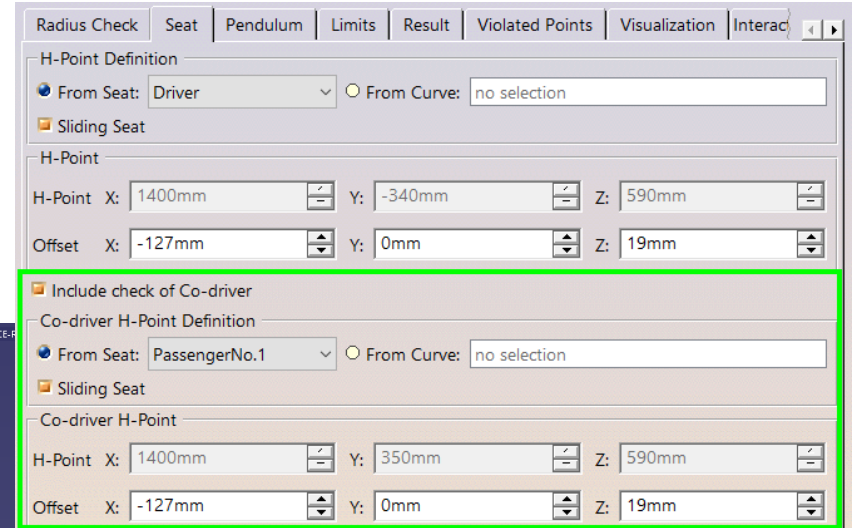
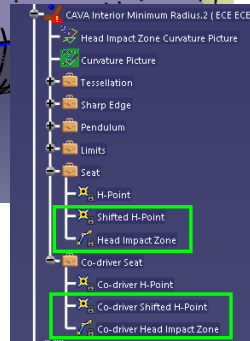
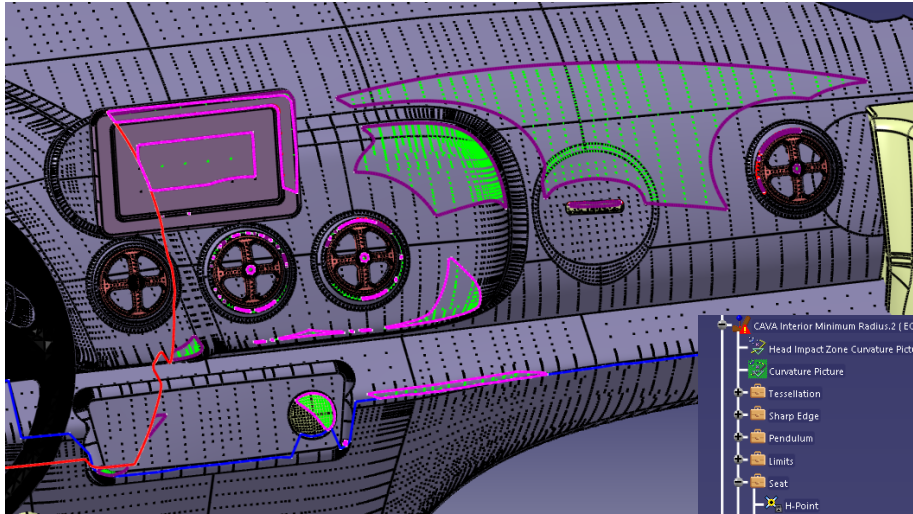
| Row | Column | Grid point X Coord | Grid point Y Coord | Grid point Z Coord |
|-----|--------|--------------------|--------------------|--------------------|
| 0   | 14     | -449.14mm          | -675.77mm          | 896.27mm           |
| 0   | 13     | -467.21mm          | -650mm             | 896.92mm           |
| 0   | 12     | -502.49mm          | -600mm             | 893.16mm           |
| 0   | 11     | -536.43mm          | -550mm             | 889.6mm            |
| 0   | 10     | -572.61mm          | -500mm             | 885.95mm           |
| 0   | 9      | -596.82mm          | -450mm             | 887.64mm           |
| 0   | 8      | -615.06mm          | -400mm             | 890.82mm           |
| 0   | 7      | -631.14mm          | -350mm             | 893.6mm            |



# CAVA 1.33.1 – Safety Radius - Interior



- Possibility to analyze Radius with HI Zone for Driver and Codriver in one analysis

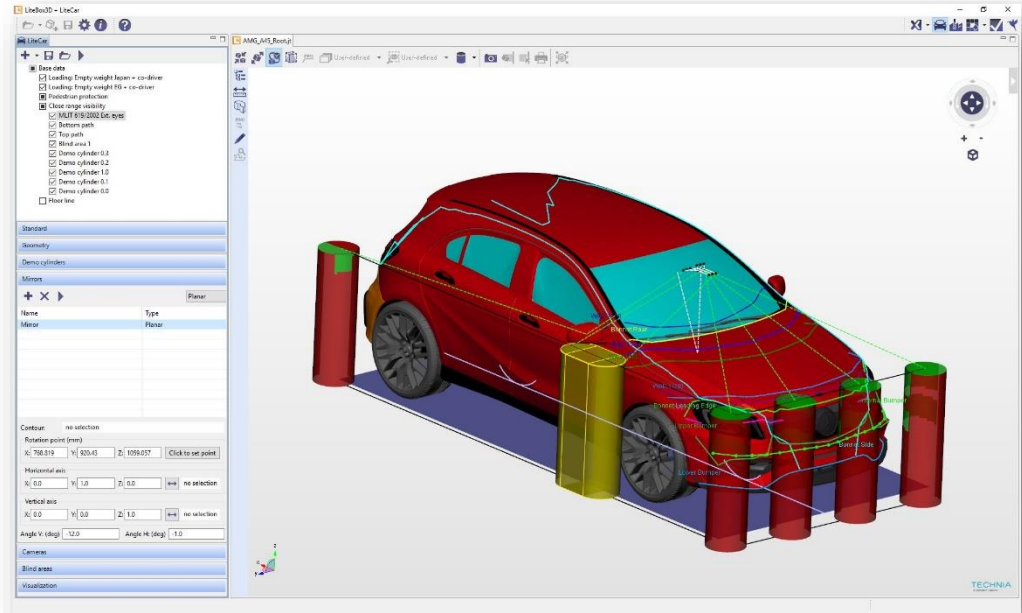




# Demo

Manikin  
Camera Vision  
Safety Radius Interior

- Provide Vehicle Homologation functionality based on JT File format
- Current features:
  - Pedestrian Protection
  - Close Range Visibility
  - Bumpers
  - Side Impact
  - Crash Barriers
  - Floor line
  - Safety Radius for Exterior
- More features like in CAVA will be added over time





# LiteCar – New in Release 1.9.2



The safety radius feature checks the curvature radius of external projections of a vehicle.

Certain areas of the vehicle exterior like bumpers, headlights, grilles and gaps can be checked separately.

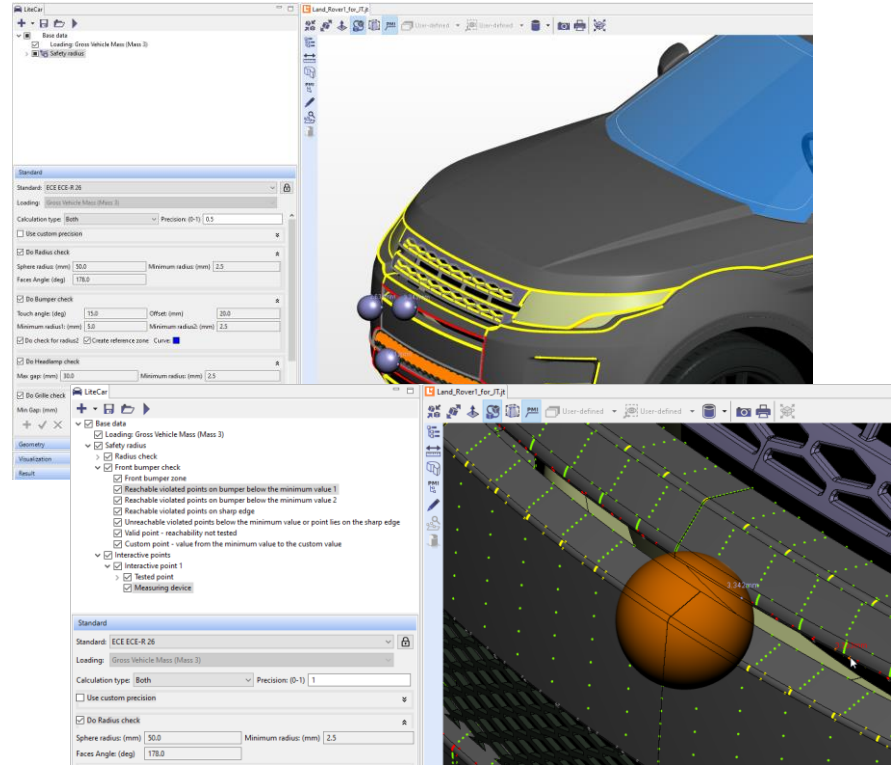
Supported standards: ECE-R26

## Calculations:

- General radius-check
- Bumper check
- Head lamp and grill check
- Consideration of upper limit and floor line

## Results:

- Visualization of grid points by category
- Interactive Contact Sphere creation





# Roadmap

# Simplified Vehicle Compliance Process with CAVA and LiteCar



## Future Ideas for CAVA Roadmap

- **Usability**

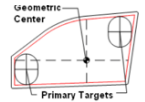
- Simplified User Interface
- Assisted Geometry Selection
- Improved User Guidance
- Simplified Report Generation

- **Performance Improvements**

- Support Batch Processing for long running Analysis (i.e. Safety Radius Analysis)
- Support Multi-threaded calculation for Analysis (i.e. Direct Vision Analysis, Pedestrian Protection, Bumper Positioning)

- **New Capabilities**

- Manikin: Handreach Zones SAE J2007
- Vision: Glazing Shade bands SAE J100
- Safety: Ejection Mitigation FMVSS 226
- „Human Builder“ Connector



- **Special Vehicle Standards**

- Standards specific for trucks and commercial vehicles
- Standards for Motorbikes
- Standards for industrial Trucks (fork lifts, excavators, ..)
- Aerospace specific analysis





Thanks for joining and providing  
your inputs!

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**SHAPING THE FUTURE OF PRODUCT CREATION**