

# SUBJECTIVE ASSESSMENT OF CUSTOMER-ORIENTED FUNCTIONS BY ENRICHING FINITE ELEMENT SIMULATION TECHNOLOGY WITH VIRTUAL REALITY FEATURES.

BETA 8TH BEFORE REALITY CONFERENCE



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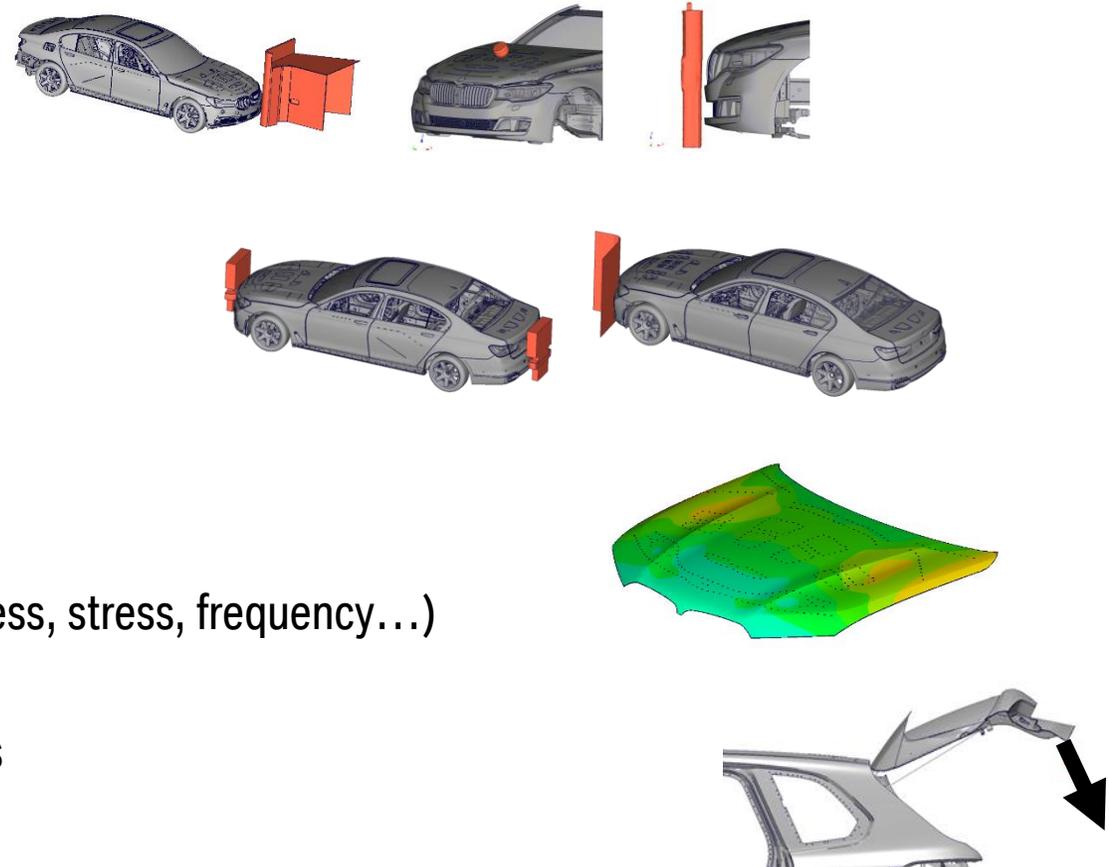
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# INTRODUCTION. OVERVIEW REQUIREMENTS.

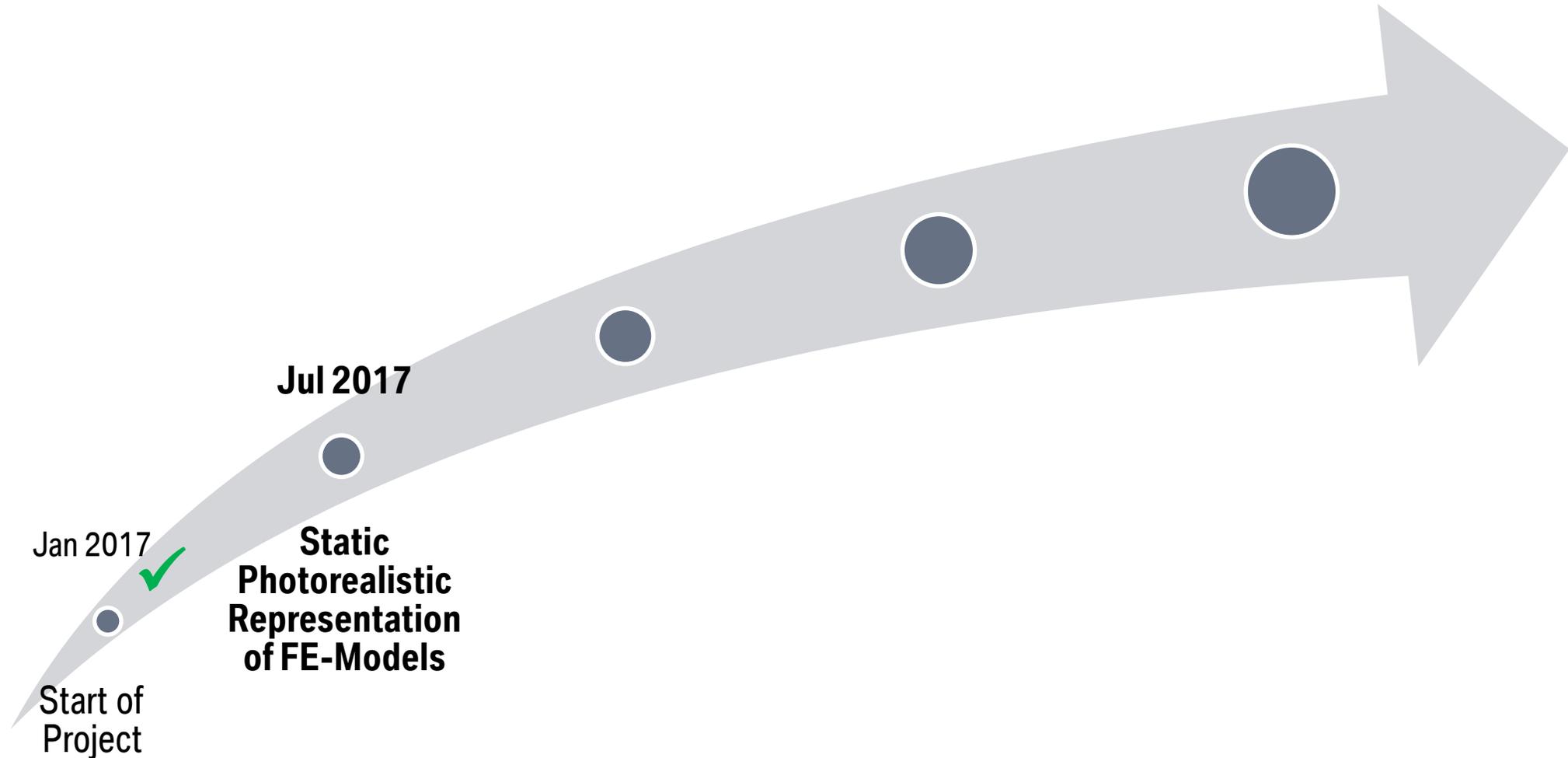
Classification of load cases according to requirements:

- Legal
- Consumer Rating
- Quality
  - Design, Premium appearance
  - Assembly process
  - Customer oriented functions
  - Objective measurement categories (displacements, stiffness, stress, frequency...)
  - Open issue:
    - Certain functions cannot be assessed by measurements
    - Subjective judgement only on hardware



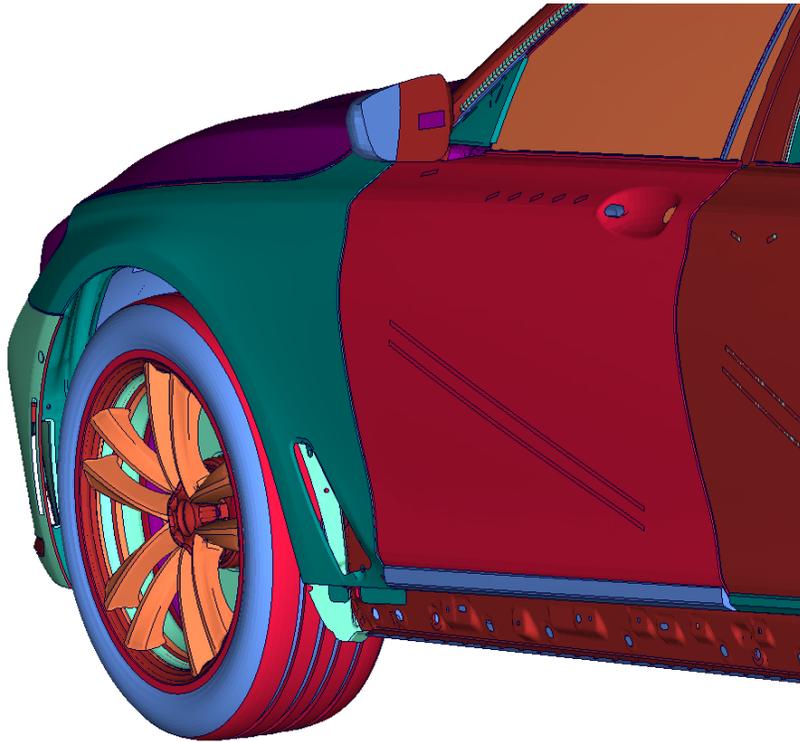
**Target:**            **Enabling subjective assessments by means of virtual reality features in the early phase of the design process.**

# STATIC PHOTOREALISTIC REPRESENTATION OF FE-MODELS.

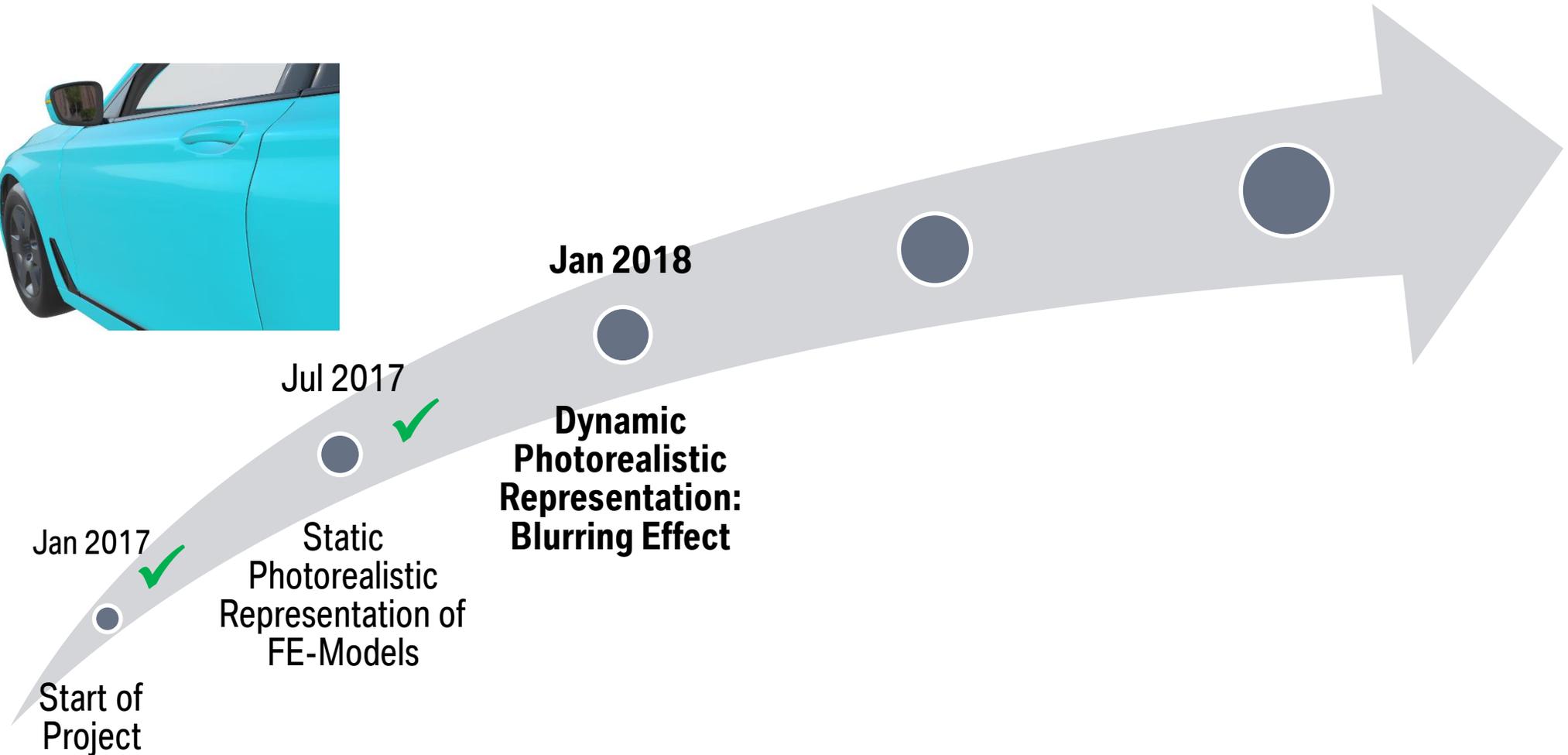


# STATIC PHOTOREALISTIC REPRESENTATION OF FE-MODELS.

- Photorealistic representation for subjective assessments required
- PBR-Materials (Physically based rendering)



# DYNAMIC PHOTOREALISTIC REPRESENTATION. BLURRING EFFECT.



# DYNAMIC PHOTOREALISTIC REPRESENTATION. BLURRING EFFECT.

- What means Blurring Effect?
  - Vibrations with frequency  $>10\text{Hz}$
  - Human eye not able to follow the motion  
→ Auto correction
- Example: Tuning Fork



$f < 10\text{Hz}$

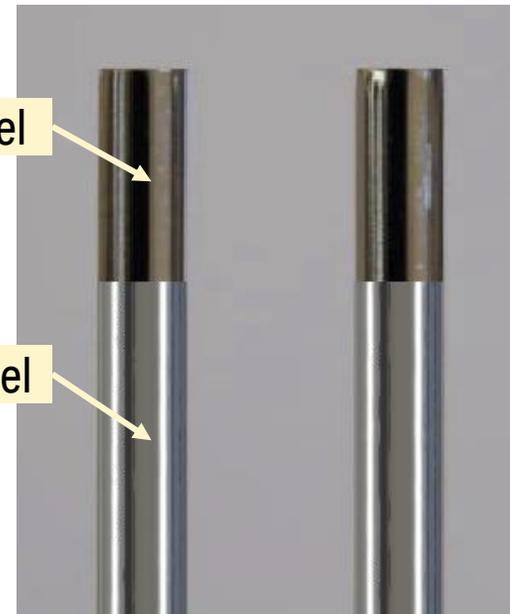


$f > 10\text{Hz}$

- Implementation

Test Model

Simulation Model



Motion Blur

# DYNAMIC PHOTOREALISTIC REPRESENTATION. BLURRING EFFECT.

- Animation Simulation Model / Test Model

→ Realistic display of animations with Blurring Effect!

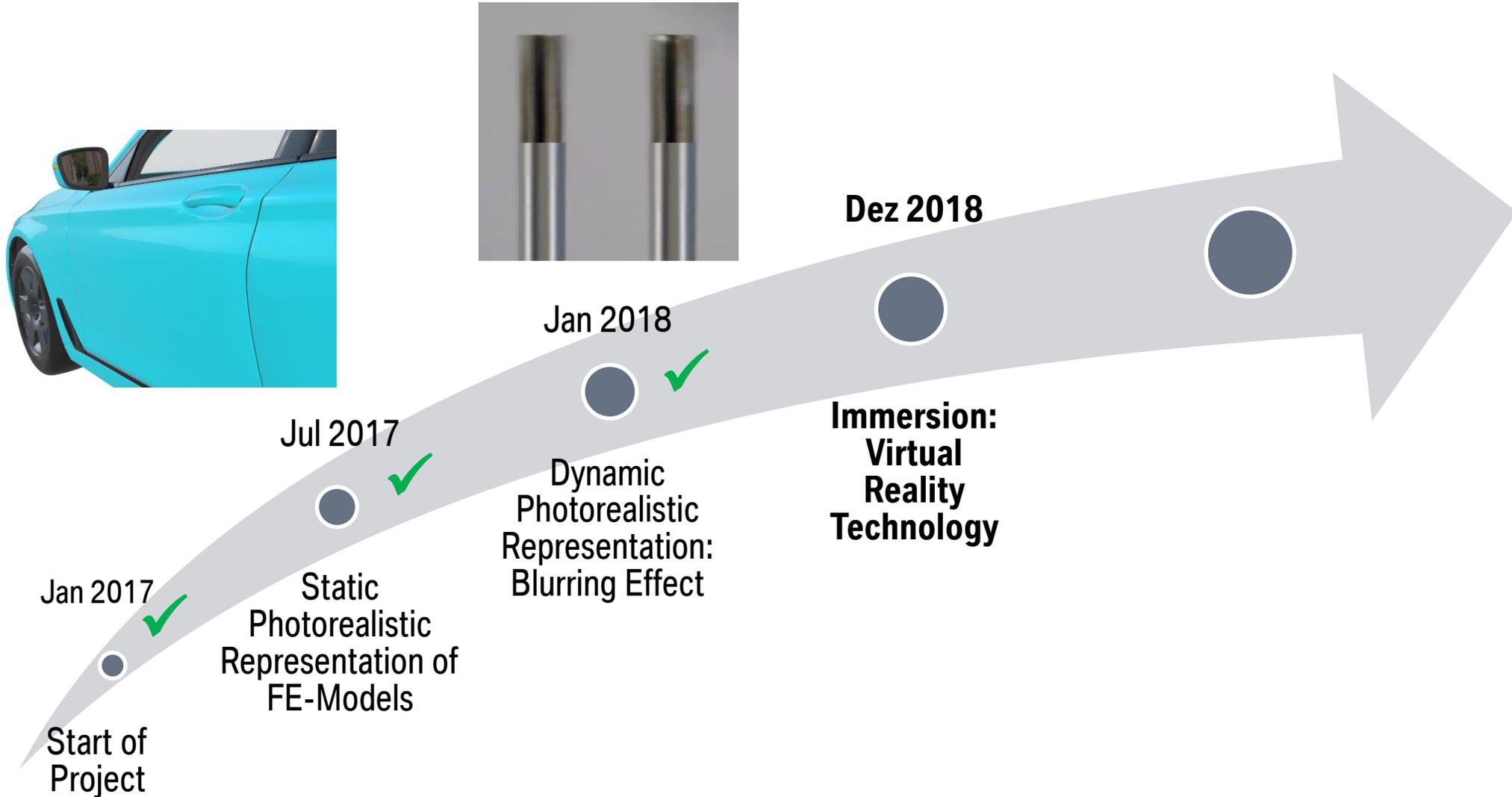


BLUR OFF



BLUR ON

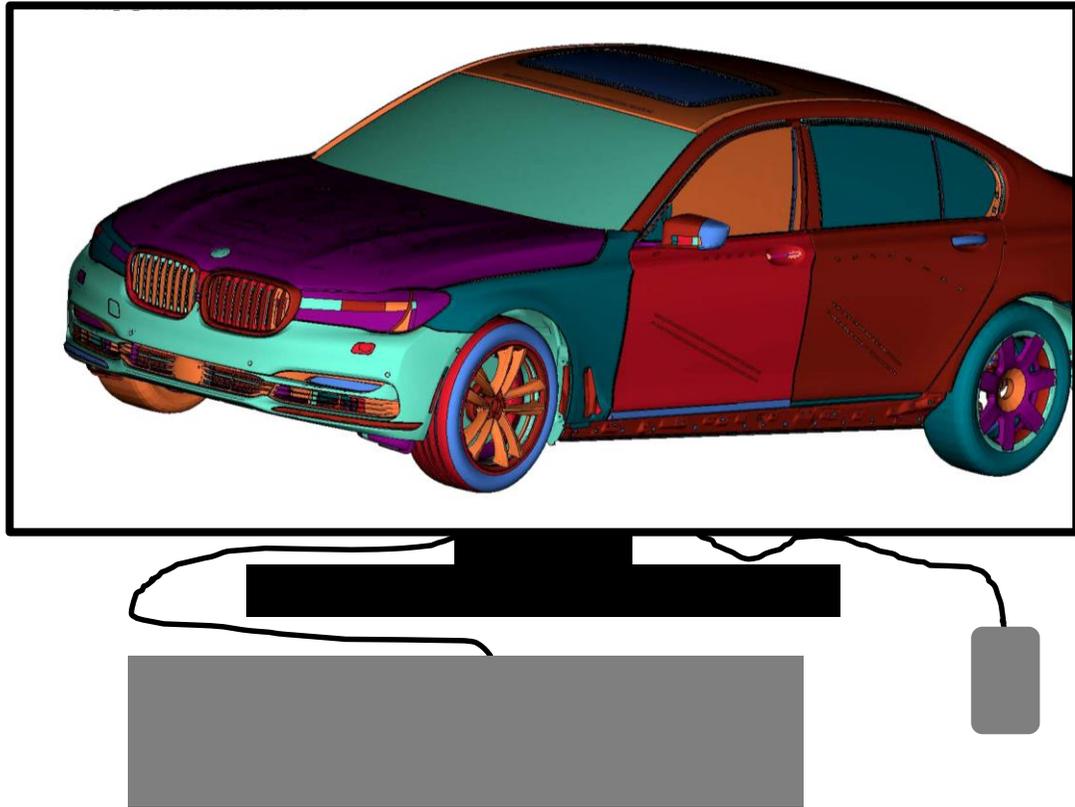
# IMMERSIVE ENVIRONMENT. VR TECHNOLOGY.



# IMMERSIVE ENVIRONMENT. VR TECHNOLOGY.

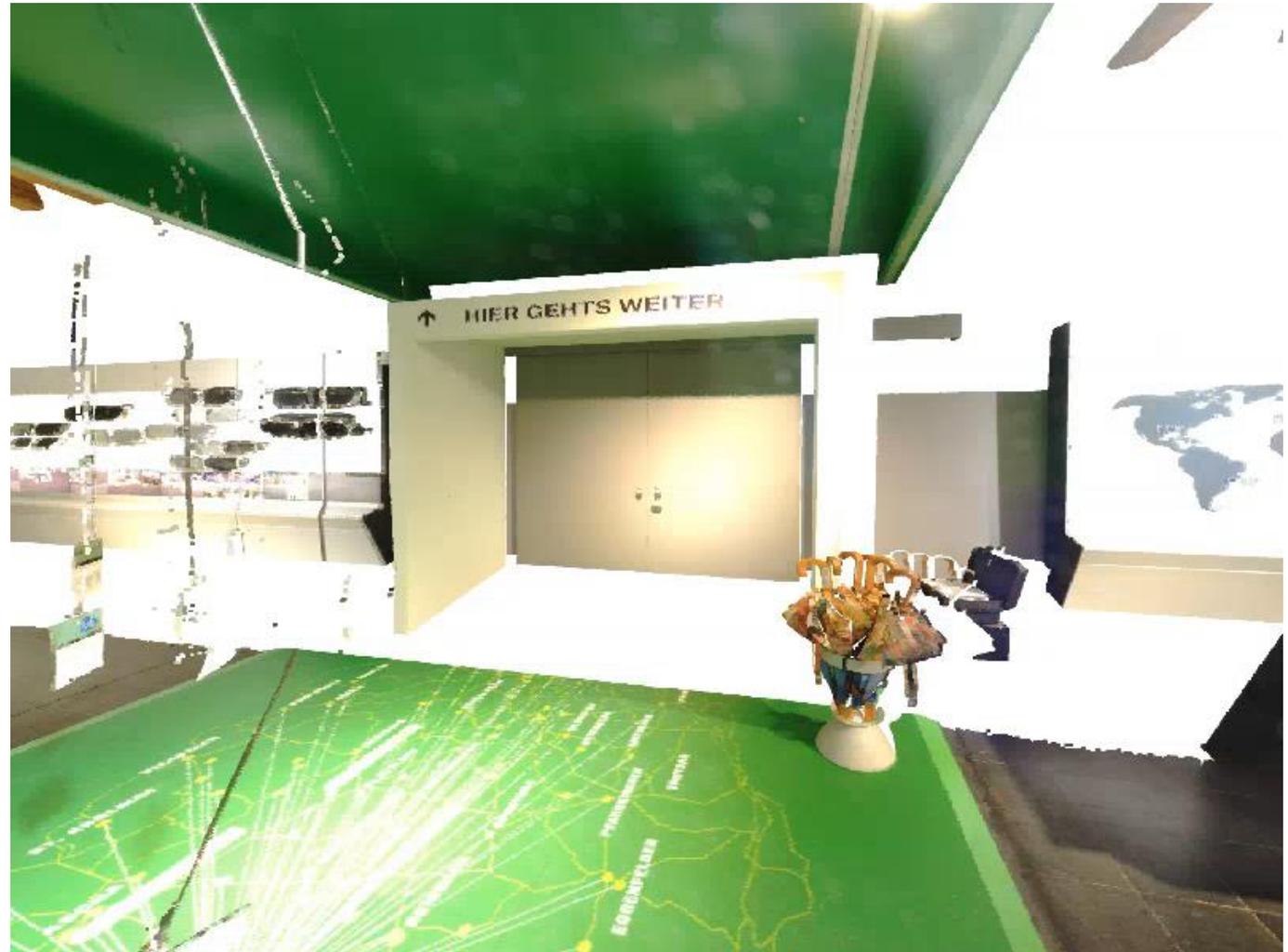
- What is Immersion?
    - Virtual environment is sensed as real environment
  - High grade of immersion needed for subjective judgements
  - Coupling of high-end FEM simulations with representation in an immersive environment
- Development of an Virtual Reality Environment including Virtual Reality Mask, Tracker, Motion Detection

# IMMERSIVE ENVIRONMENT. VR TECHNOLOGY.

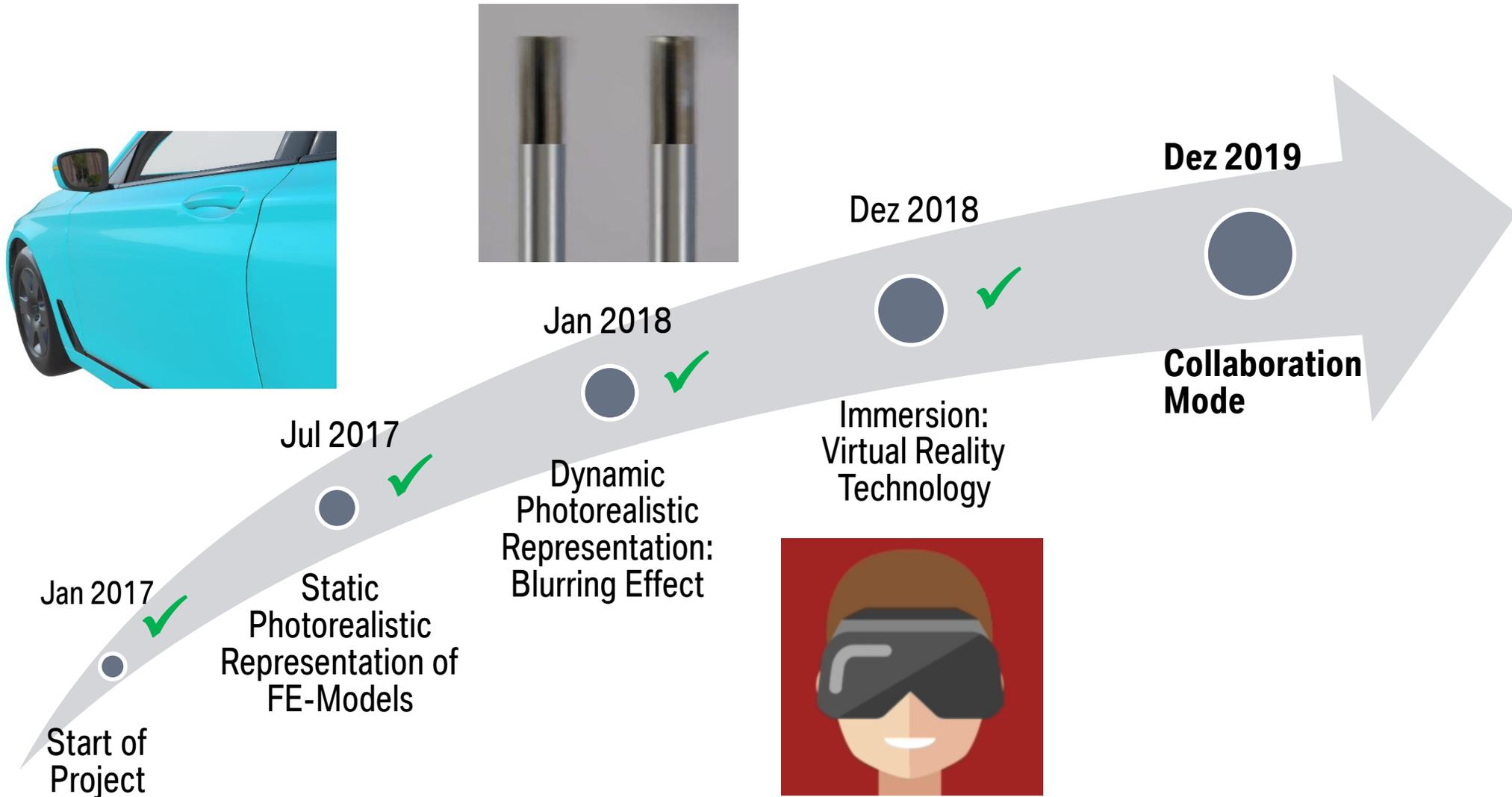


# IMMERSIVE ENVIRONMENT. SURROUNDING.

- Integration of surroundings
- VR sceneries such as point clouds, fbx- or obj-format including textures

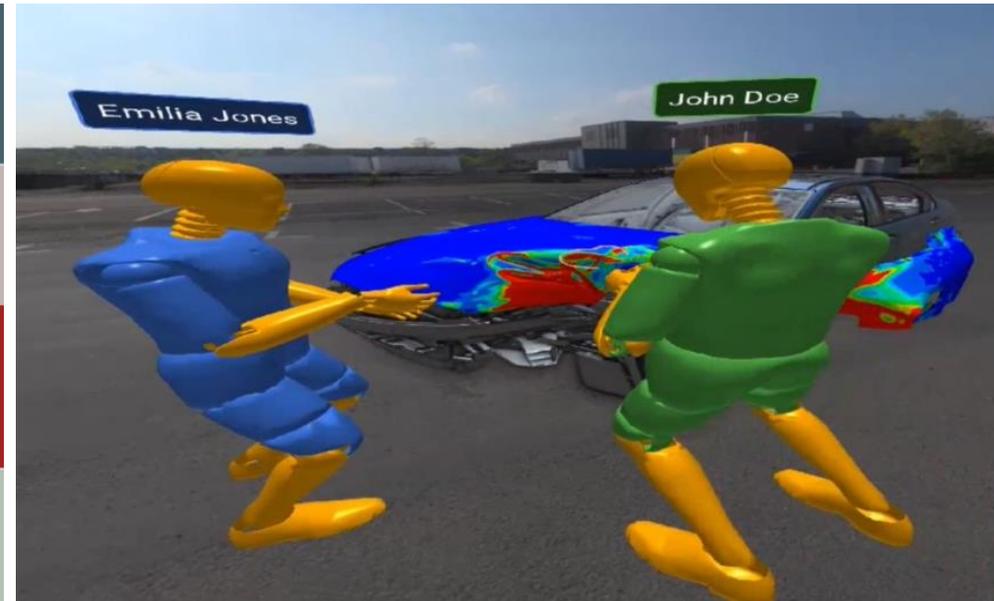


# COLLABORATION MODE.



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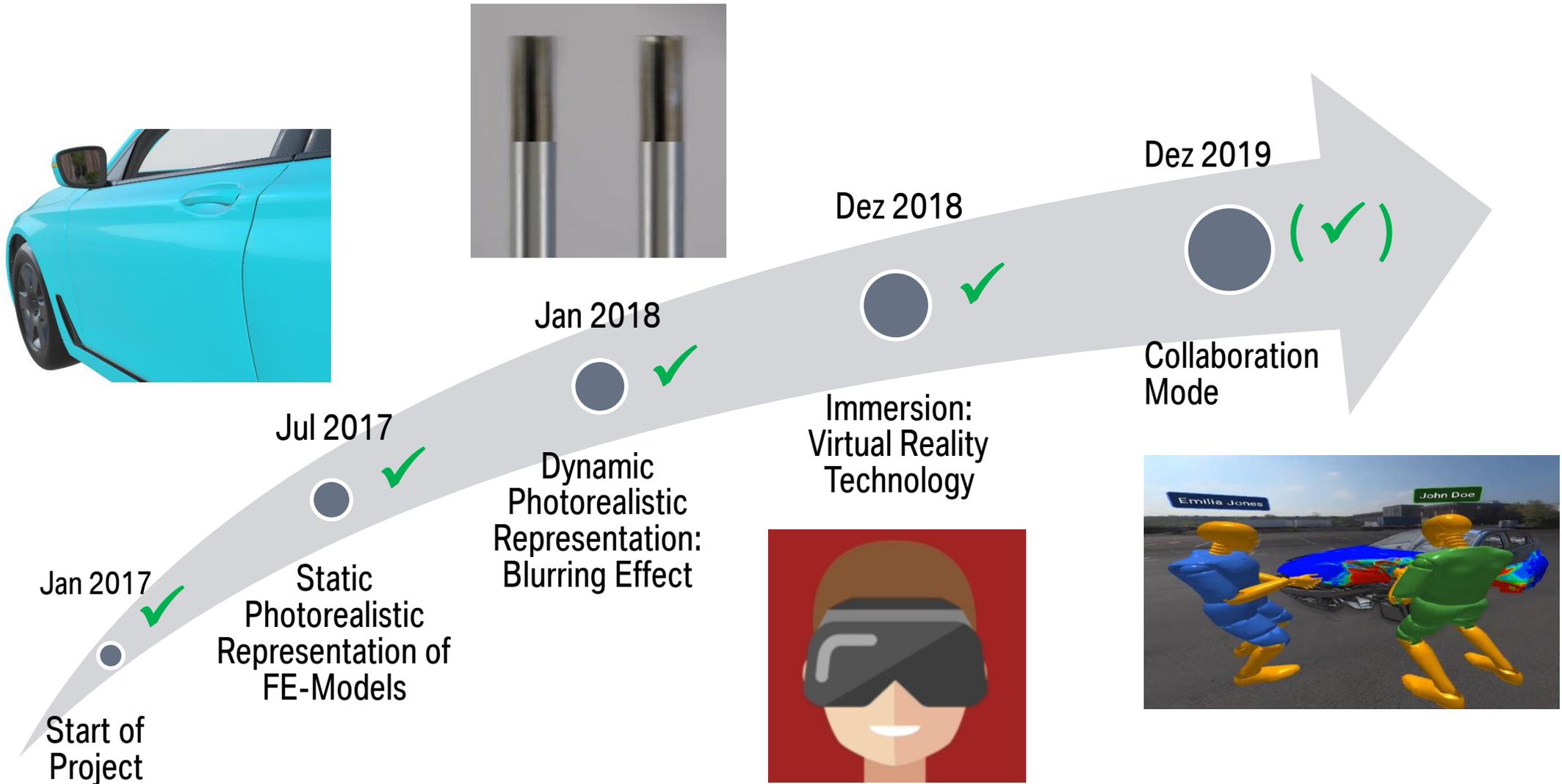
- Meetings in virtual rooms without physical attendance



# COLLABORATION MODE.



# CONCLUSION.



# CONCLUSION.

## ■ Functions realized:

- Static and dynamic photorealistic representation ✓
- Immersive environment ✓
- Collaboration mode (✓)

## ■ Current limitations:

- Number of reflections limited
- Resolution Glasses
- Immersion/Motion Detection: limited to glasses and trackers only
- Immersion self awareness
- Interaction
- Post processing only

