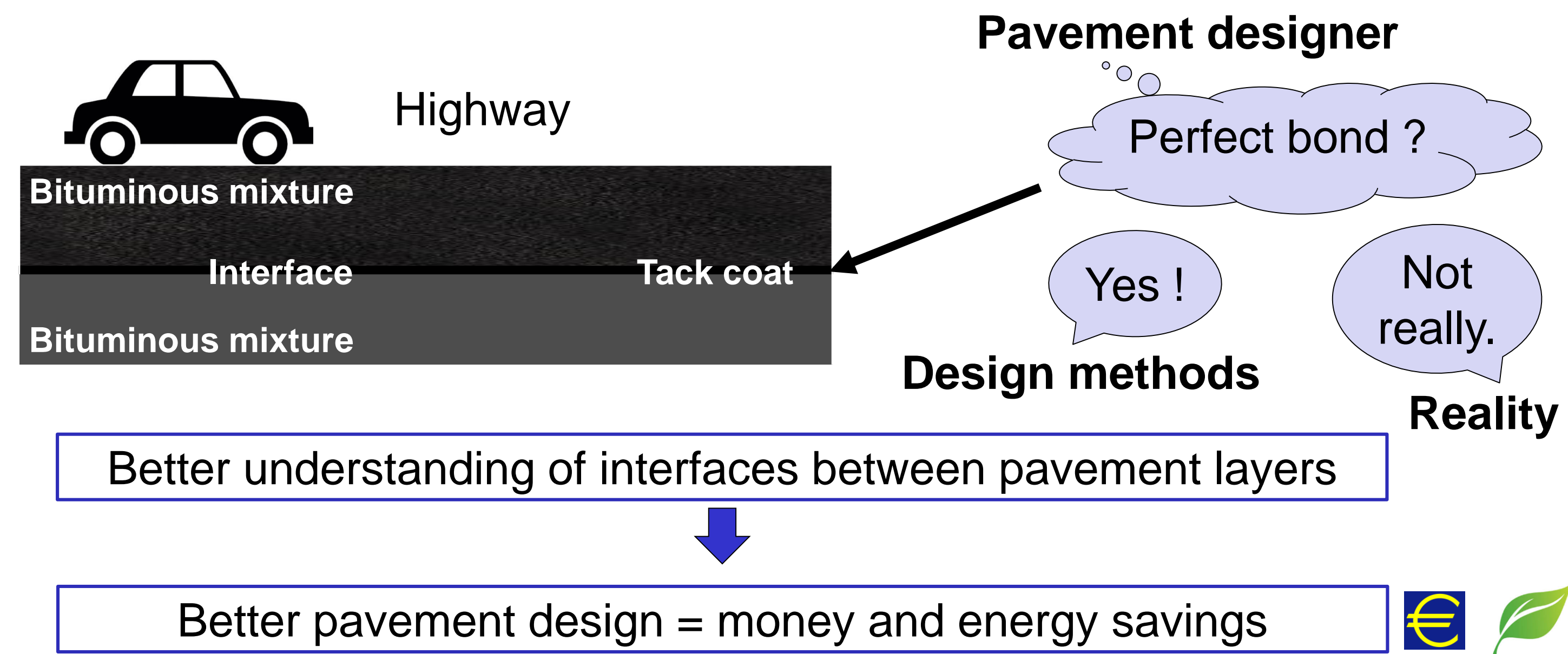


Context and objectives

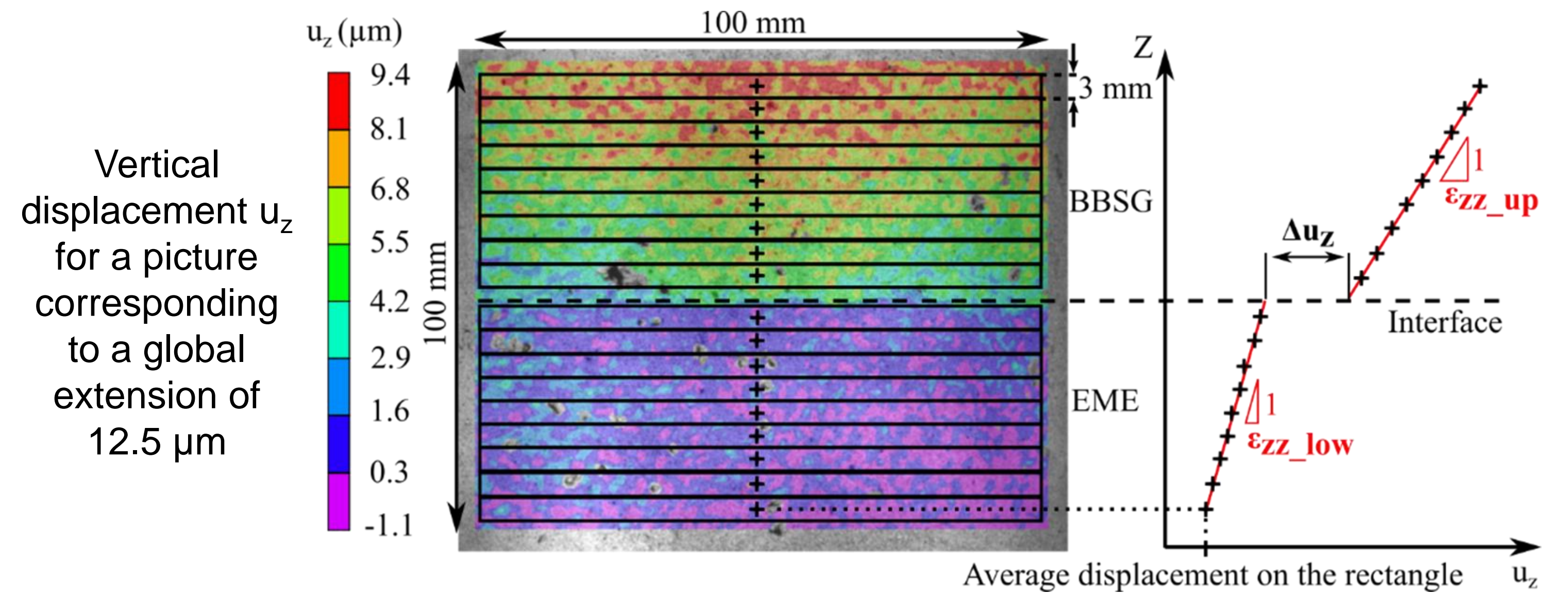
- Collaboration between ENTPE/Uni. of Lyon and Eiffage Infrastructures



- Development of a new device to test the thermo-mechanical behaviour of interfaces

- Optimization of tack coat materials for the interface

Example of 3D-DIC application to the study of vertical displacement

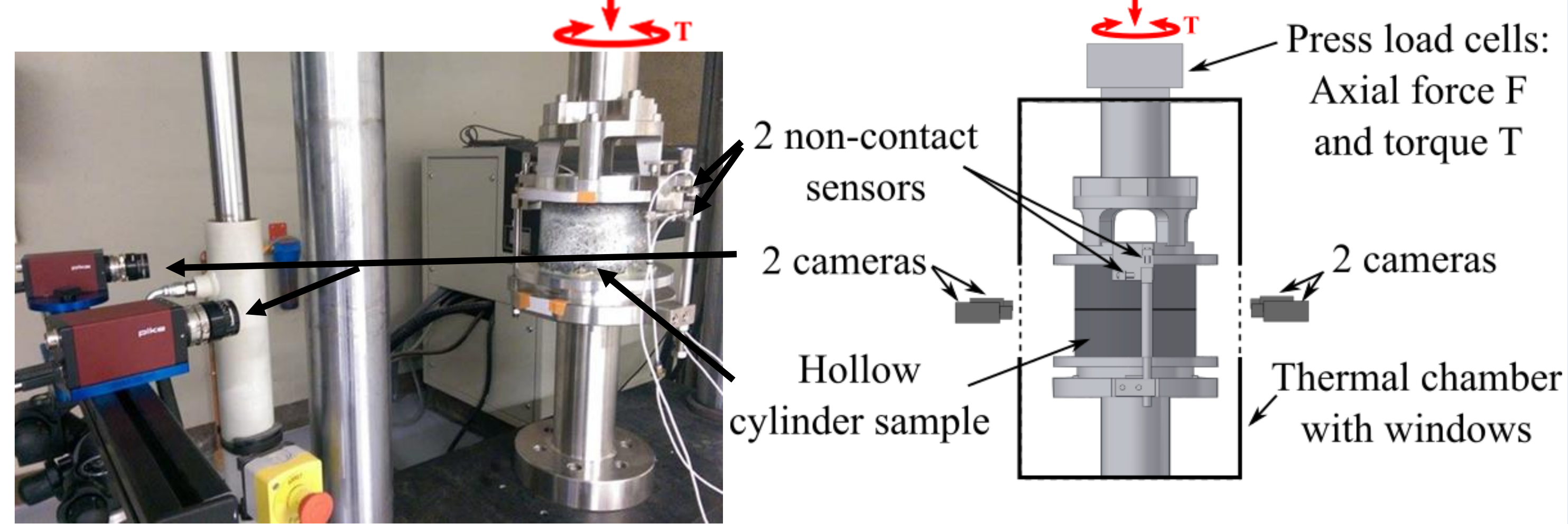


Strain tensor component ϵ_{zz} obtained in both bituminous mixture layers using linear regressions

Displacement gap Δu_z obtained at the interface

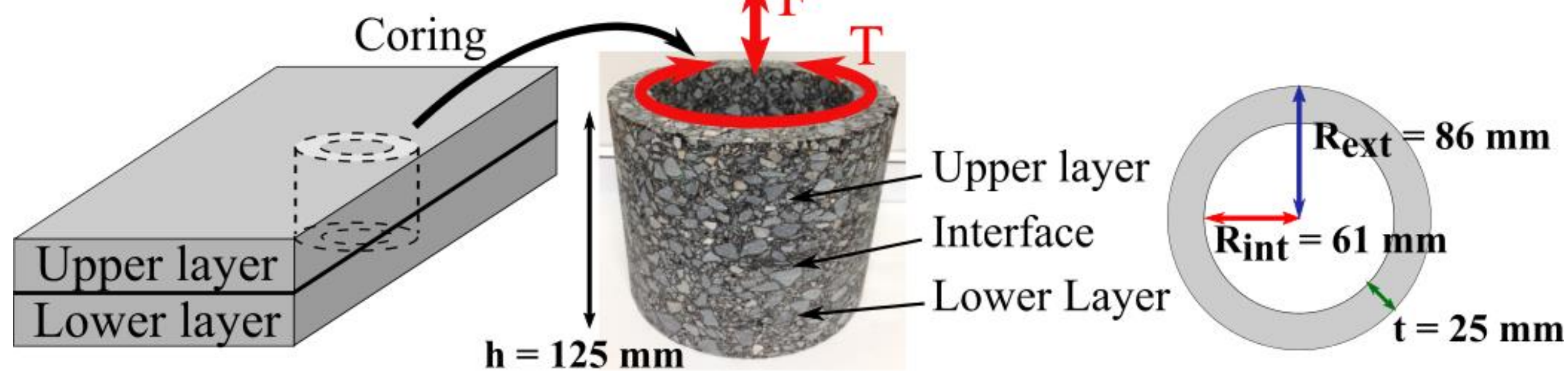
2T3C Hollow Cylinder Apparatus (2T3C HCA)

- Innovative device developed at ENTPE/Uni. of Lyon
- 2T3C HCA applies torsion & tension/compression on hollow cylinder samples



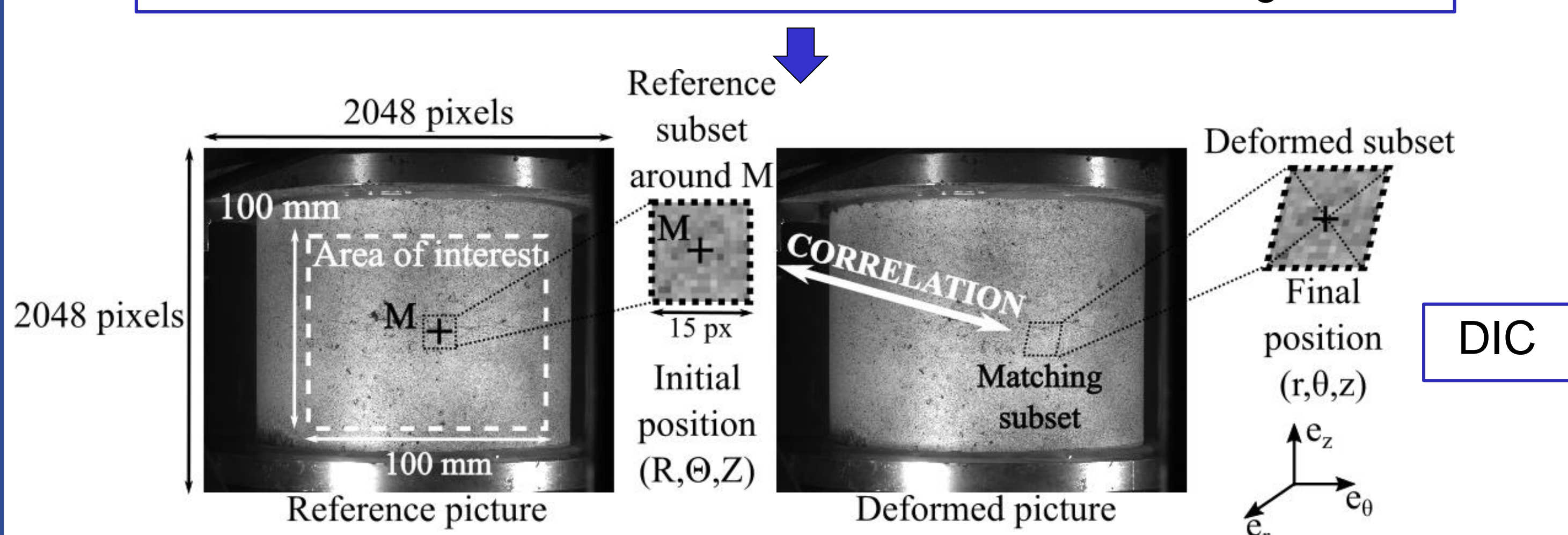
- Advantages
 - Homogeneous stress field in the sample
 - Broad testing possibilities
 - Complex modulus tests (shear or tension/compression)
 - Failure tests (monotonic shear failure up to 2 MPa with or without normal stress, monotonic tension failure up to 17 MPa)
 - Fatigue tests (shear, axial)
 - Digital Image Correlation, a powerful optical measurement technique

- Hollow cylinder samples made of two bituminous mixture layers with or without a tack coat at the interface



3D Digital Image Correlation (3D-DIC)

Pictures taken at different levels of deformation during a test



3D displacements (u_r, u_θ, u_z) of points on the chosen surface of the sample during loading

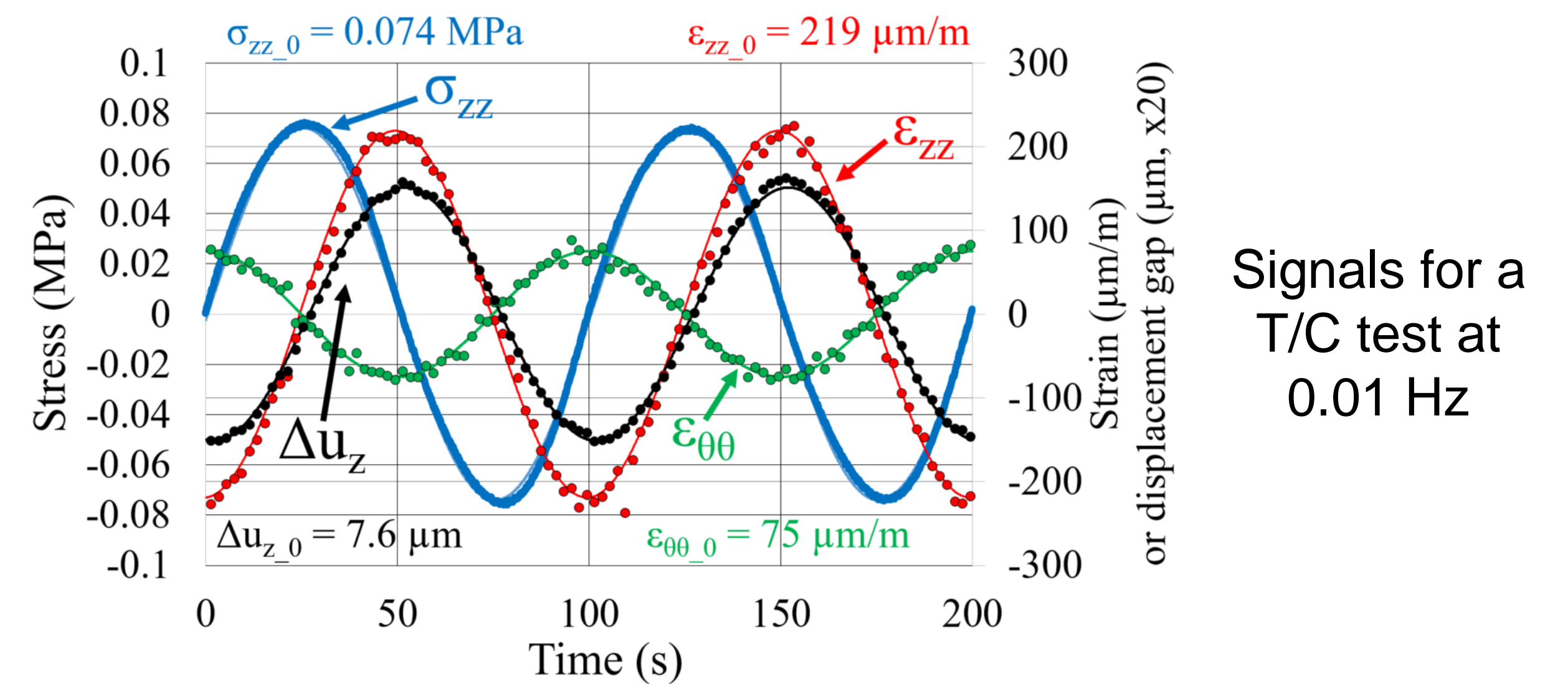
Characterization of the linear viscoelastic behaviour of bituminous mixtures and interface

- Tested material: BBSG, EME2, Tack coat: pure bitumen emulsion (350 g/m²)
- Complex modulus tests: T/C test, Shear test

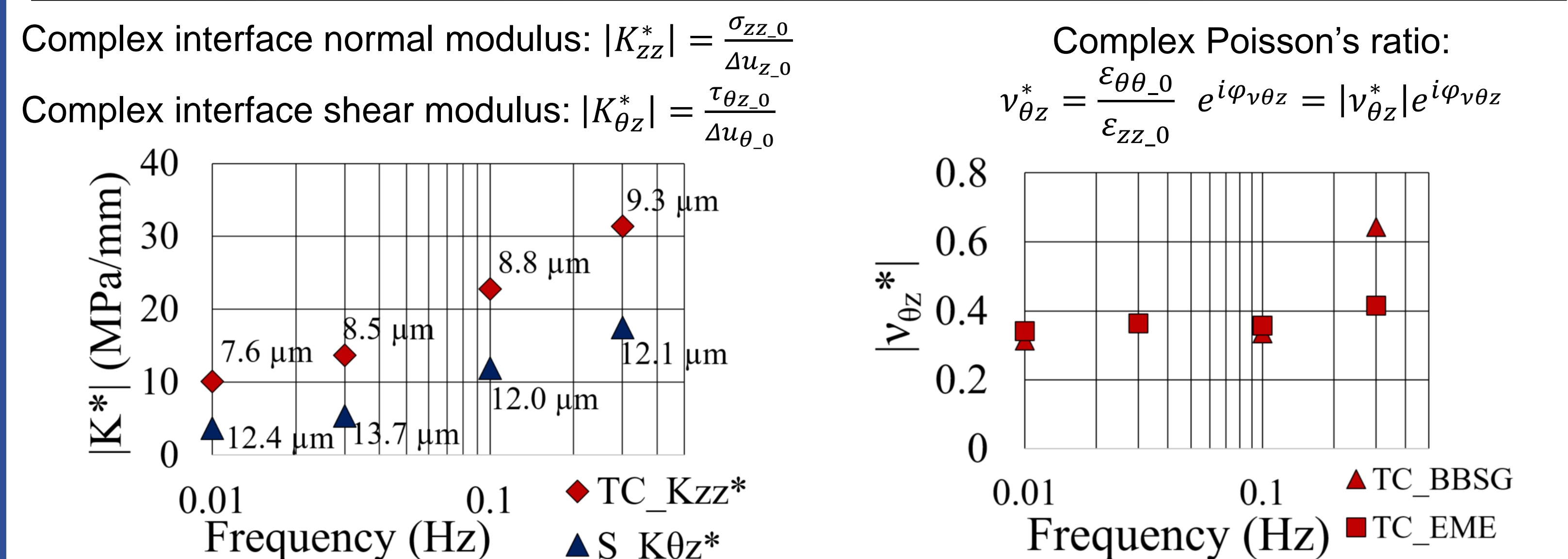
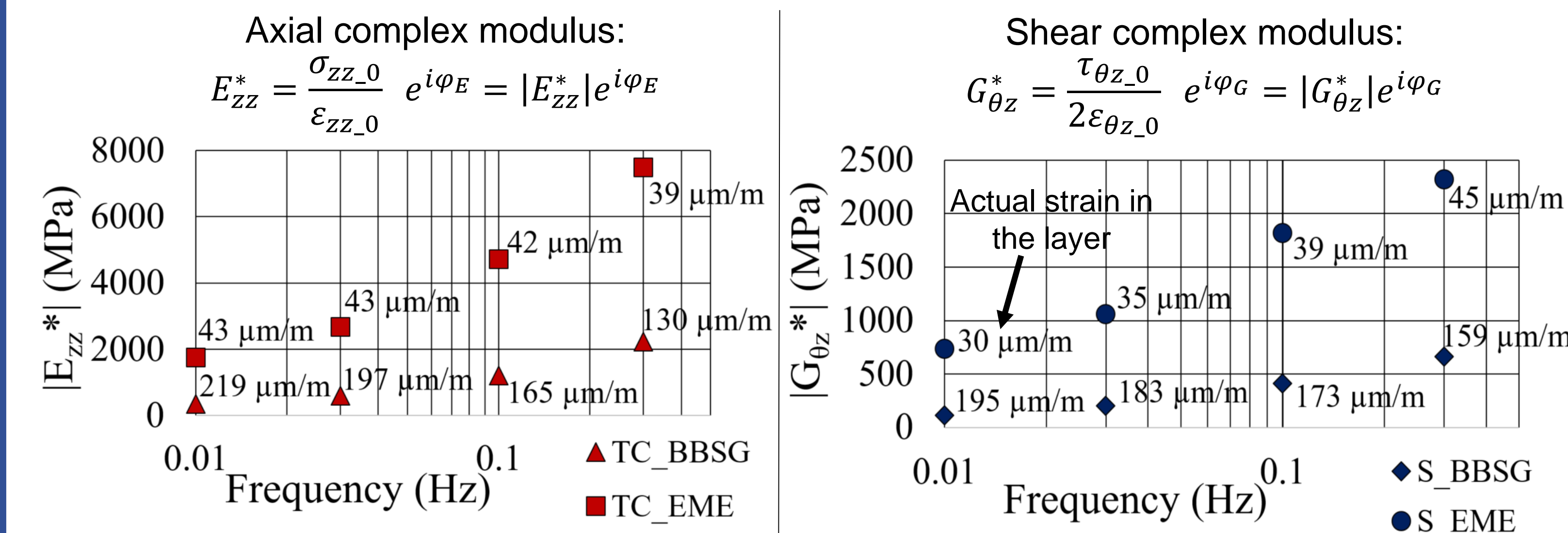
Amplitude: 250 $\mu\text{m}/\text{m}$ of global vertical strain $\epsilon_{zz,g}$, Zero torque

4 frequencies: 0.01 Hz, 0.03 Hz, 0.1 Hz, 0.3 Hz

Amplitude: 250 $\mu\text{m}/\text{m}$ of global shear strain $\epsilon_{\theta z,g}$, Zero axial force



- Results at 20 °C



Conclusions

- Innovative and powerful prototype developed to characterize interfaces
- Strain obtained with a resolution of some $\mu\text{m}/\text{m}$ and displacement gaps at the interface with a resolution of some μm using DIC