WP 3: Rotor Structure and Materials

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WP 3: Rotor Structure and Materials

WP 3 is subdivided into three Tasks:

- Task 3.1: Applied (phenomenological) material model (WMC) (based on experiments)
- Task 3.2: Micro-mechanics based material model (RISØ) (based on fibre/ply modelling)
- Task 3.3: Damage tolerant design concept (UP) (Based on FEM with properties damaged materials)

Partners of WP 3 (16 from 12 countries)

RISØ/DTU

WMC

CRES

UP

GEGR-E

ECN

ISM

IITB

Gamesa

VTT

LTU

STFC

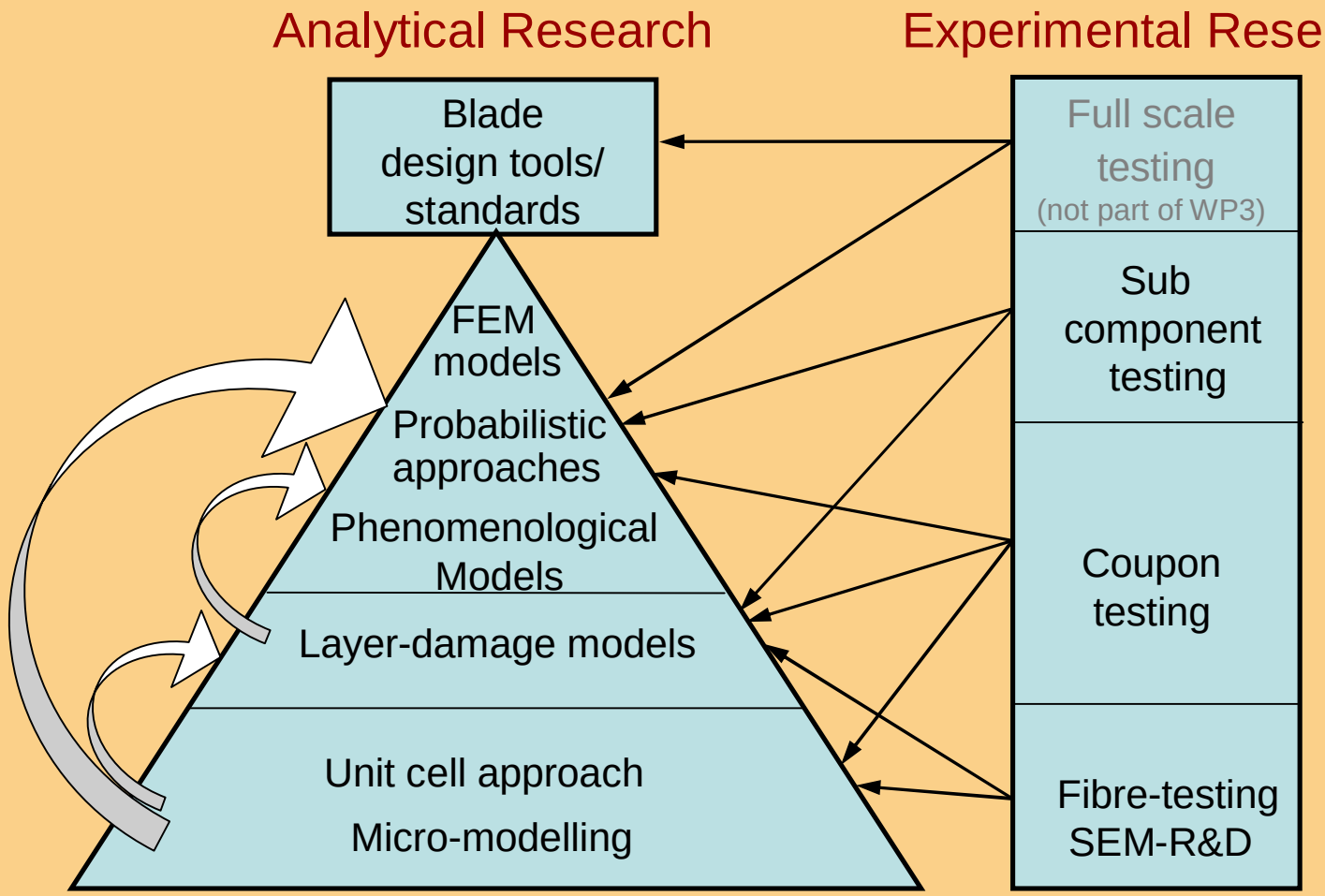
VUB

CENER

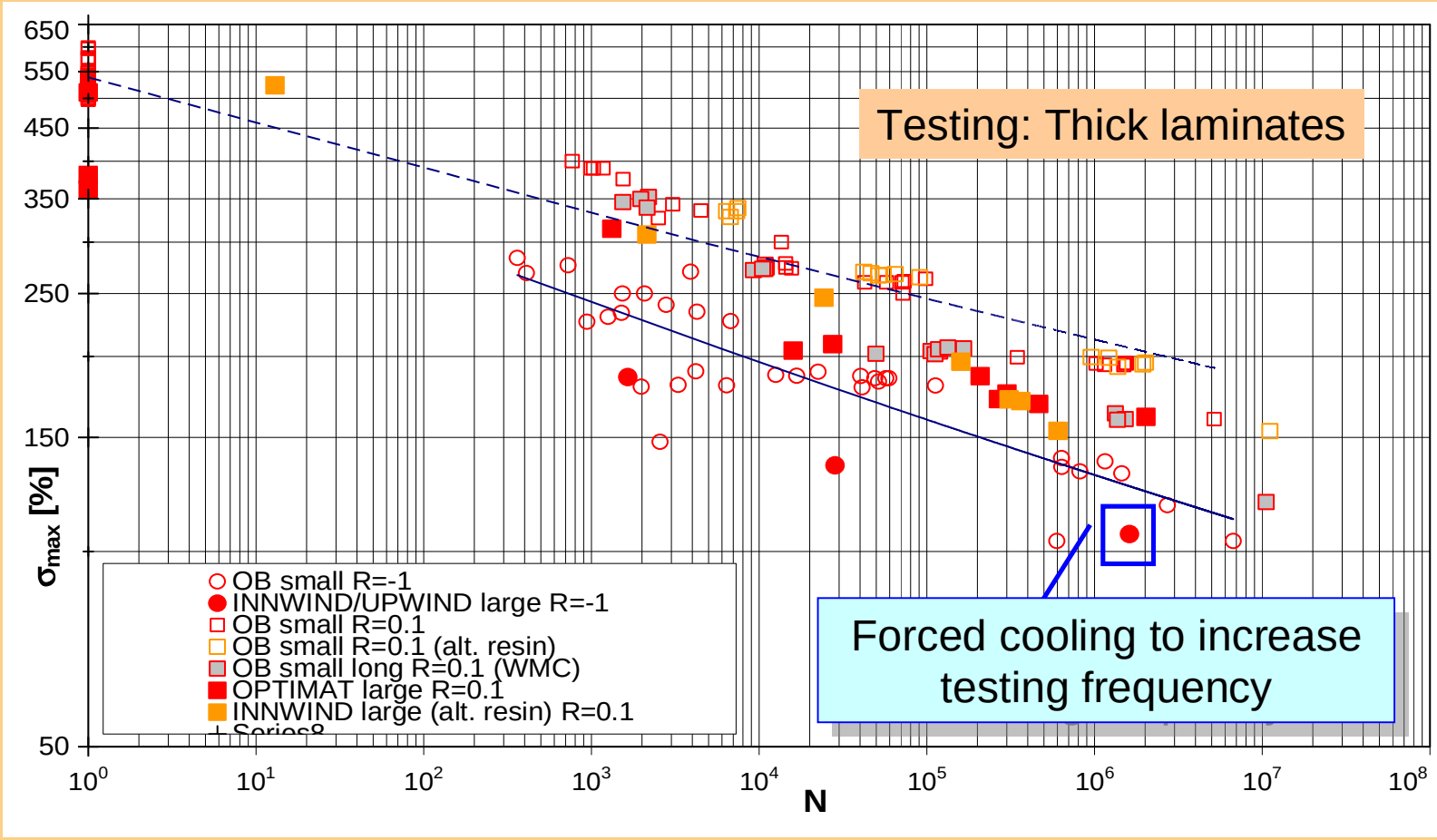
CUMTB

CWMT

Coherence of work within WP3



Task 1: Phenomenological Modelling



Task 1: Phenomenological Modelling

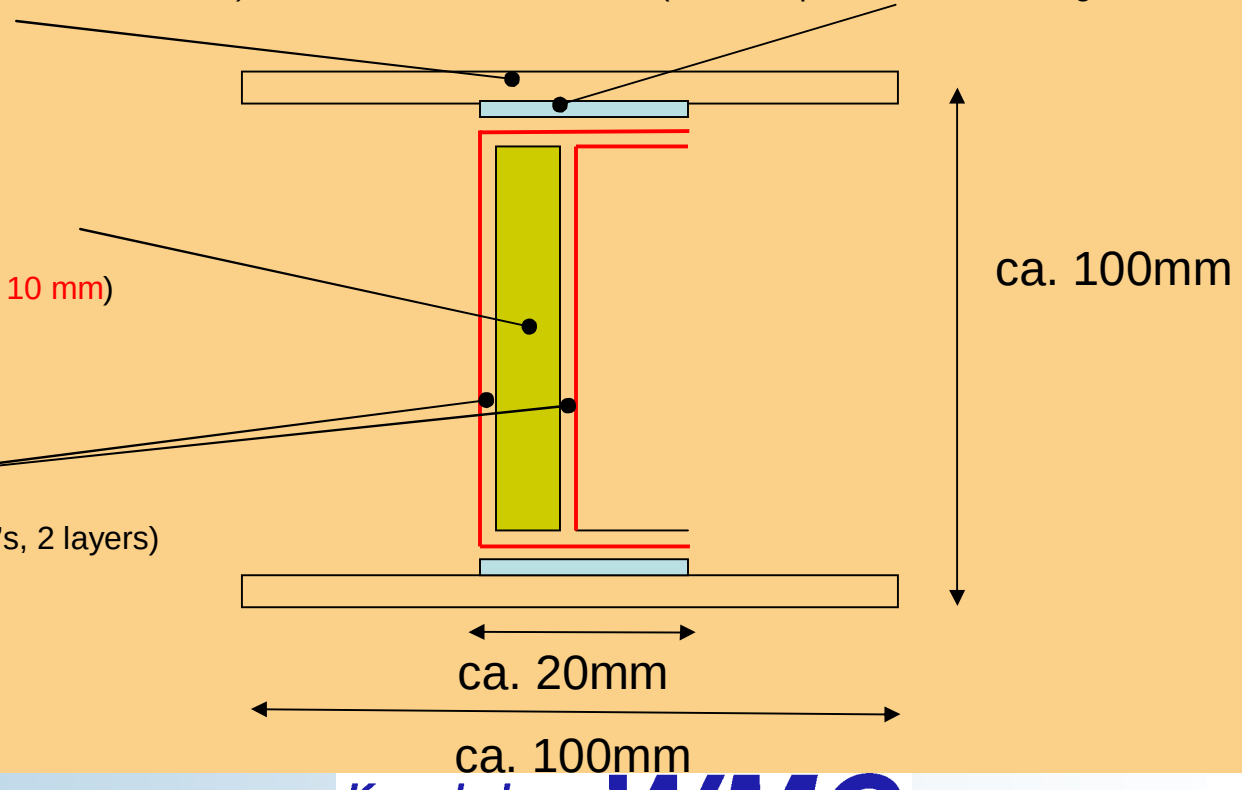
I-Beam Testing

(±45°, $0°_6$', ±45°)

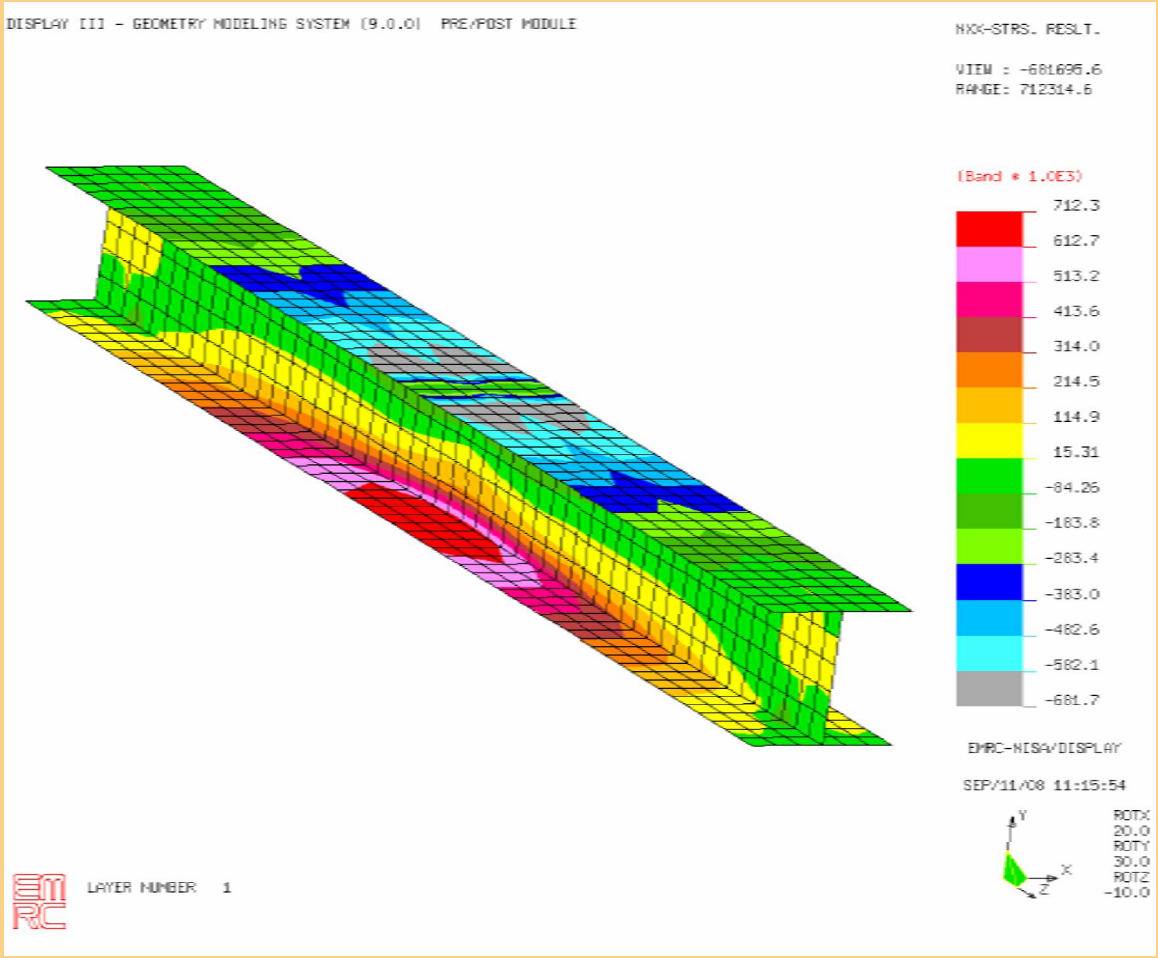
(reference laminate GF/RIM 135 + biax)

Bonding paste

(Hexion Epikote MGS Bonding Paste Resin 135/G3)



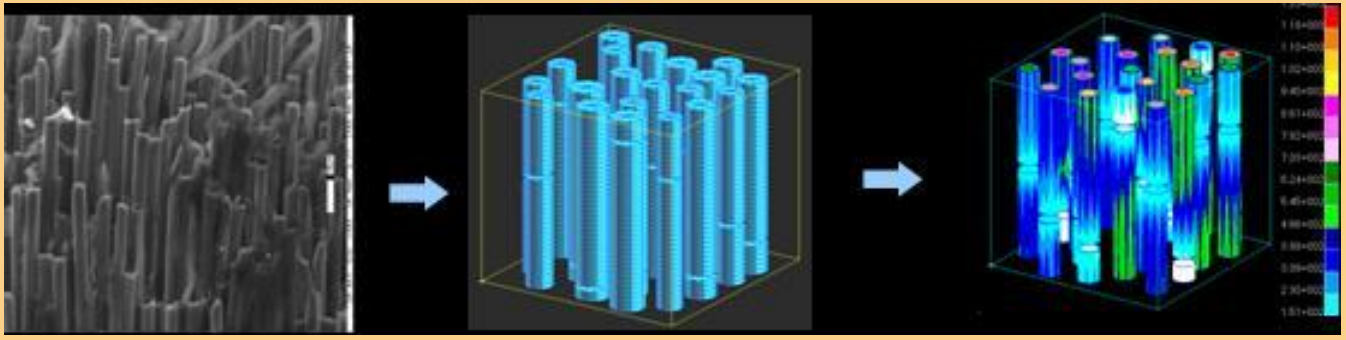
Task 1: Phenomenological Modelling

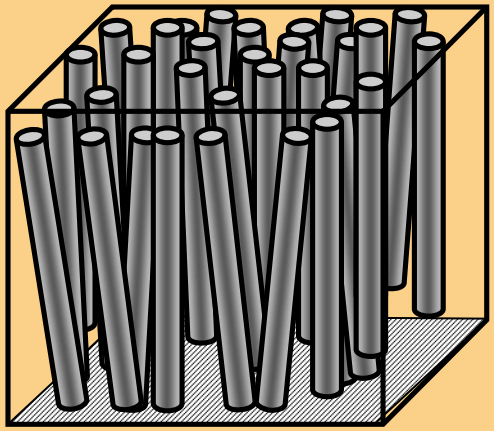


3D I-Beam analyses
3-point bending

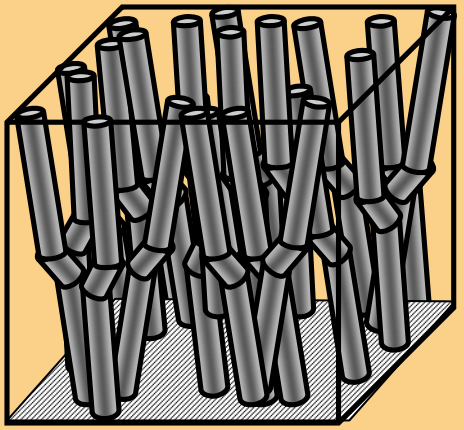
Task 3.2 - Micro modeling

FE modeling of cracked fibers



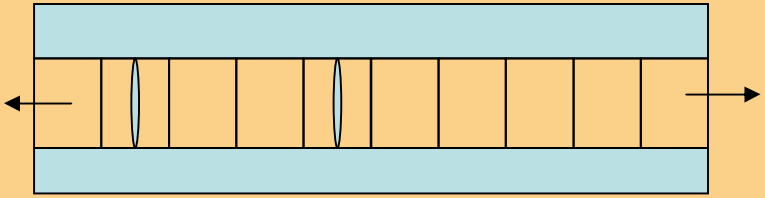


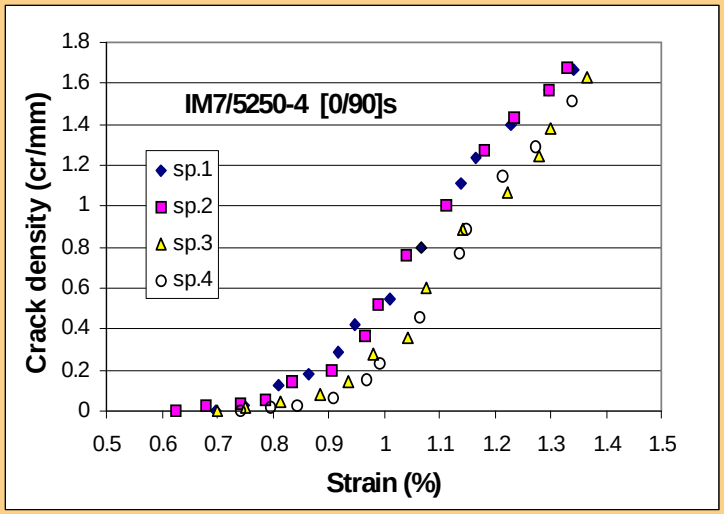
High compressive loading leads to kinking



Task 3.2 - Micro modeling

Damage development in quasi-static tension





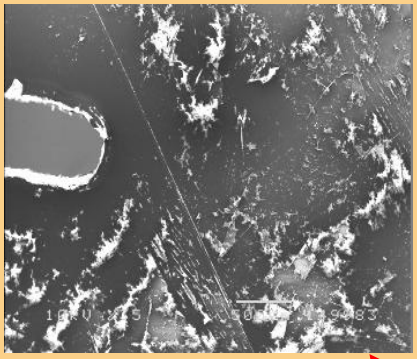
Questions:

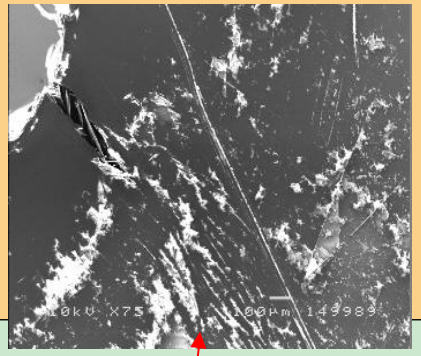
- Degradation of fracture "resistance"?
- Modification of the probabilistic approach to account for the degradation?

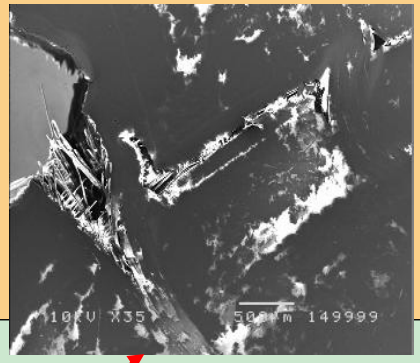
Examples:

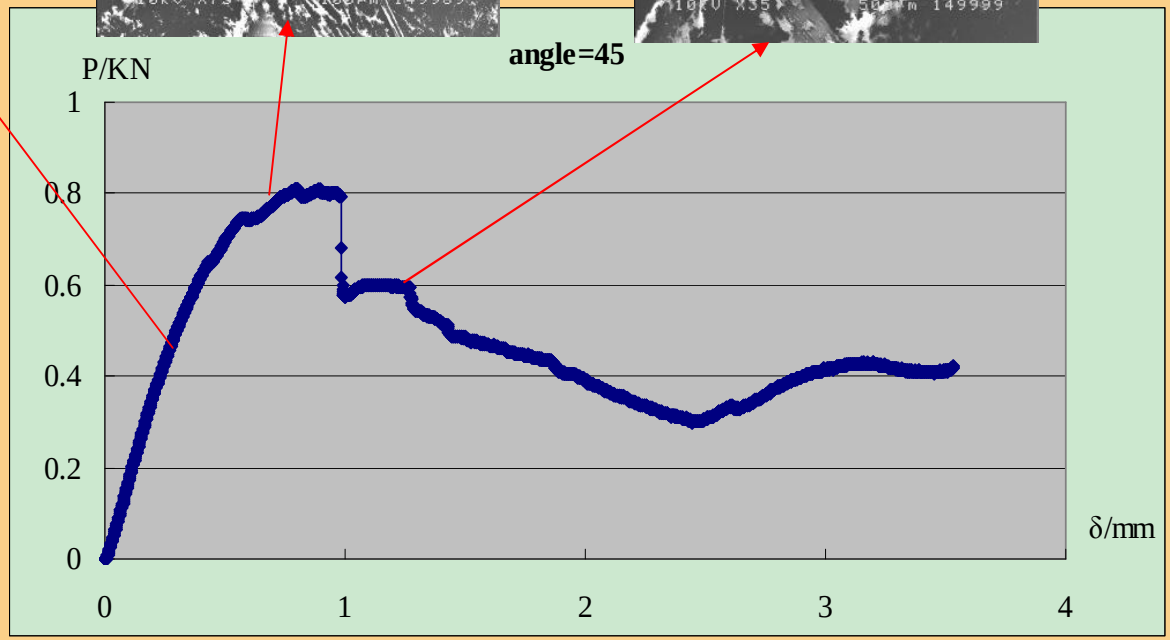
- Thermal aging and cycling tests

Task 2: Micro modelling:





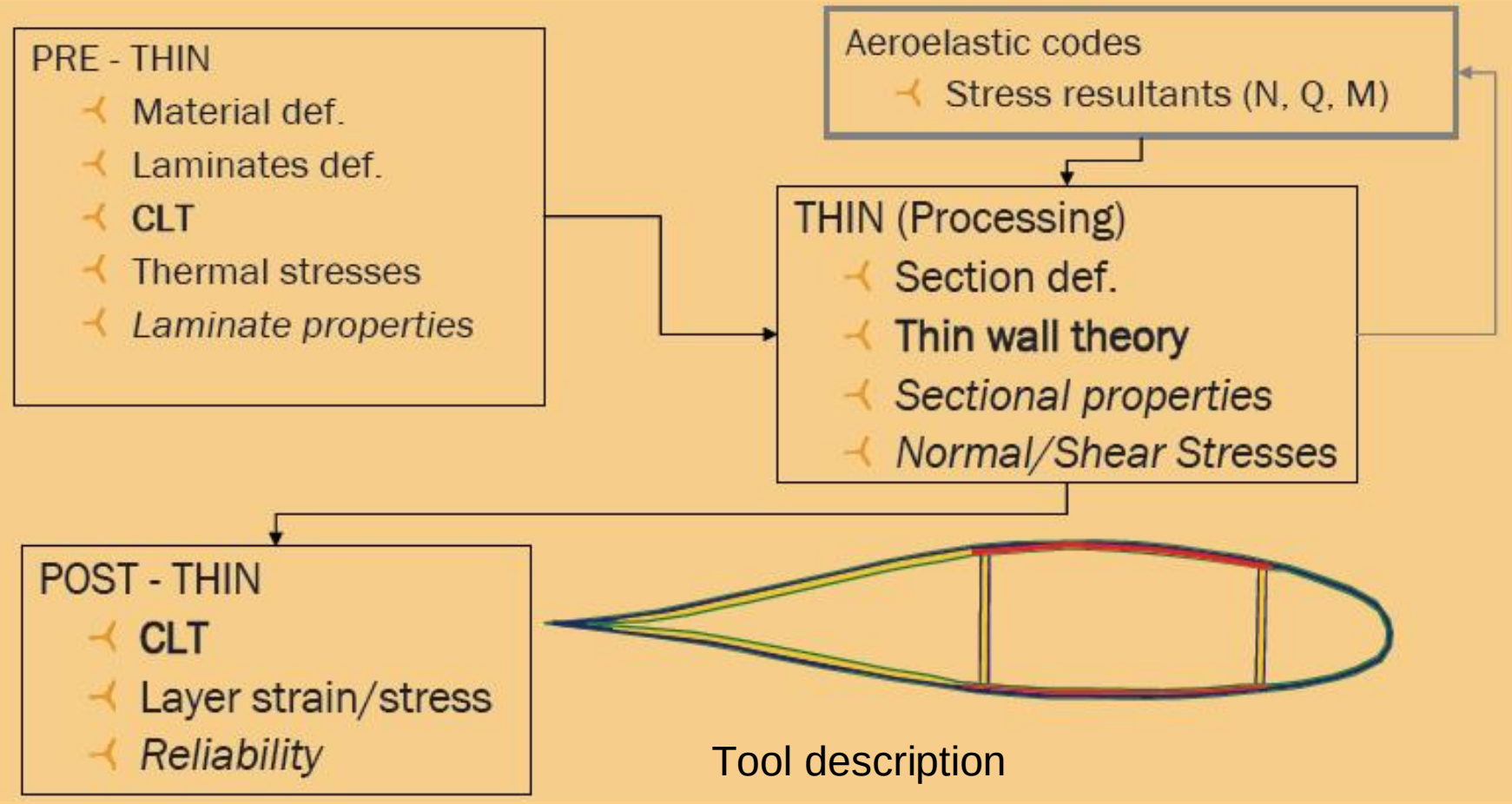




Three point bend test in SEM at CUMTB:

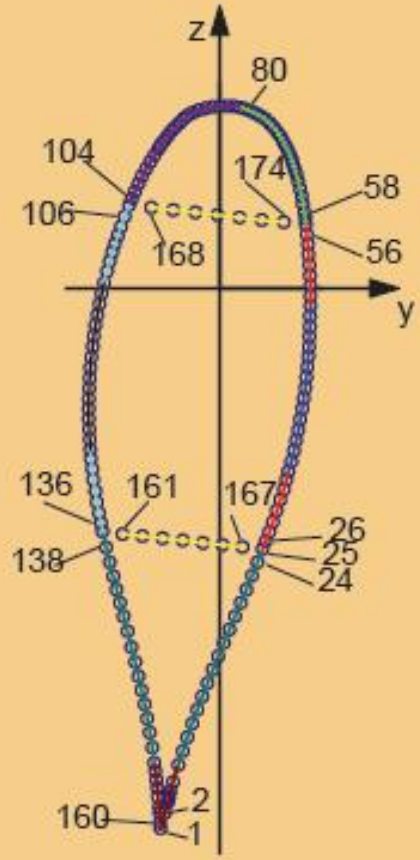
Load-deformation curve and SEM photos

Task 3:Damage tolerant design

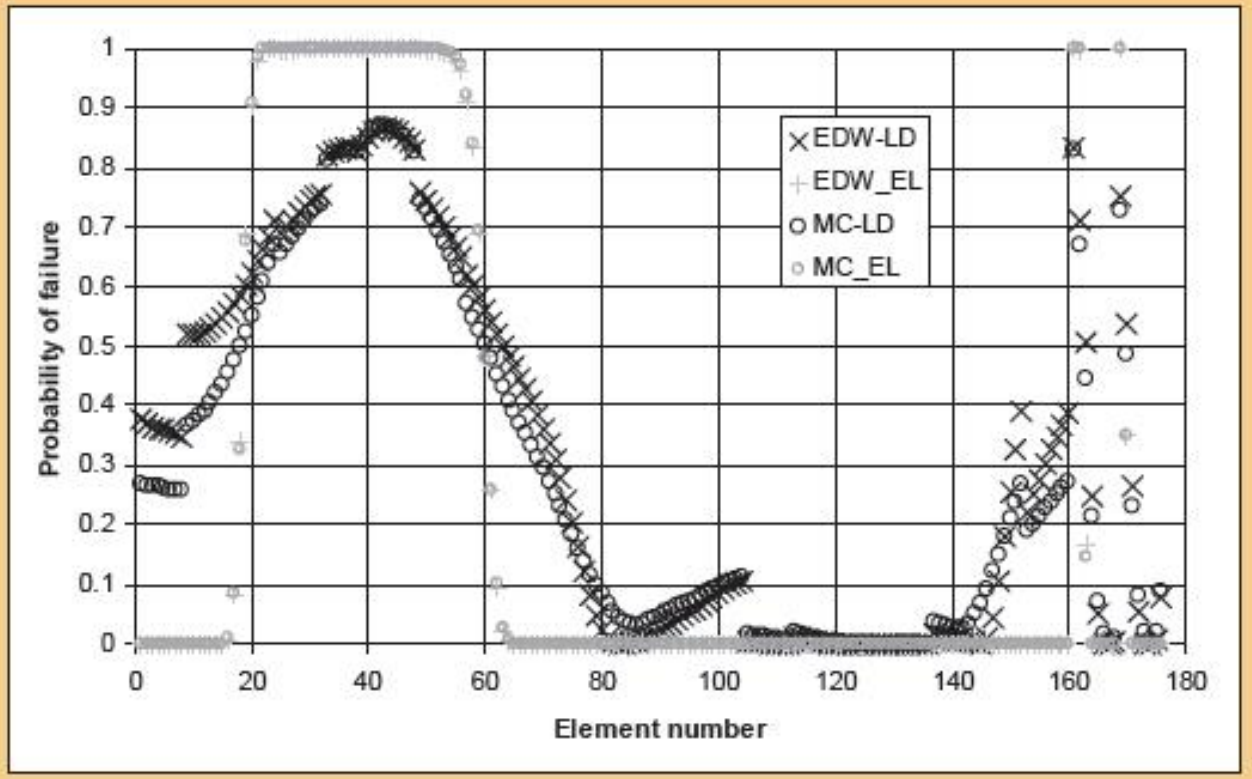


Tool description

Task 3:Damage tolerant design

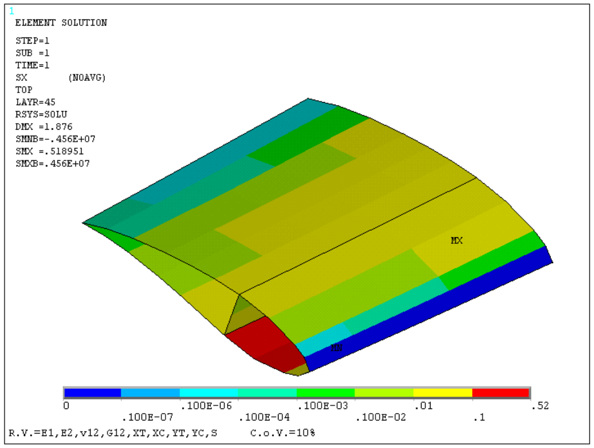


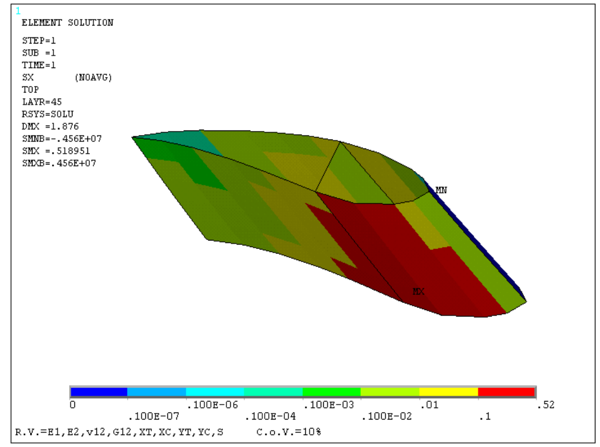
Probability of failure



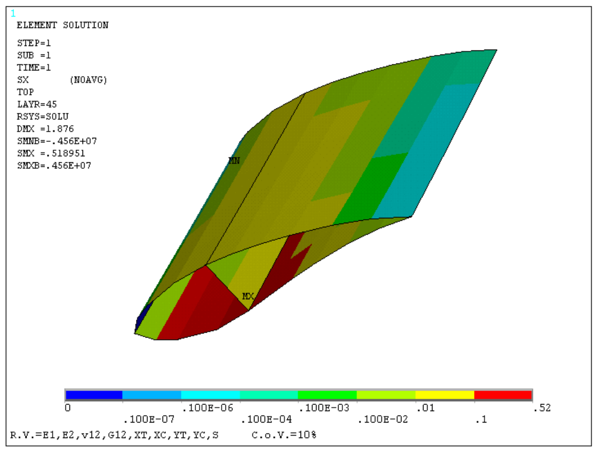
Task 3:Damage tolerant design

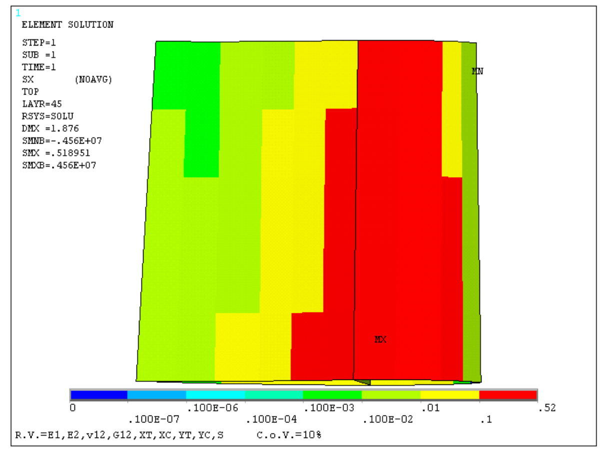
Implementation of RSM in rotor blades





COV=10%





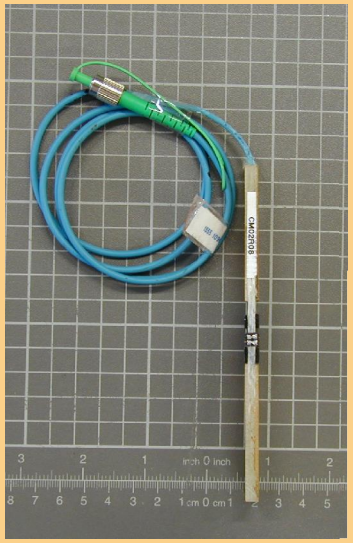
Integration

Integrating activities:

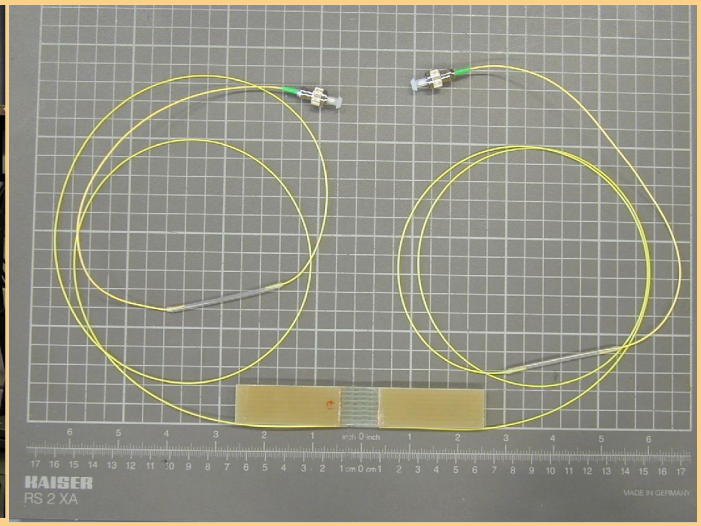
- Fatigue testing of Fiber optical sensors (ongoing)
- Testing of material related to1B1, Innoblade (starting)
- Questions on material aspects in relation with upscaling. 1B4: Upscale (to start)
- New: IEC-TC88 Working Group on Material Testing

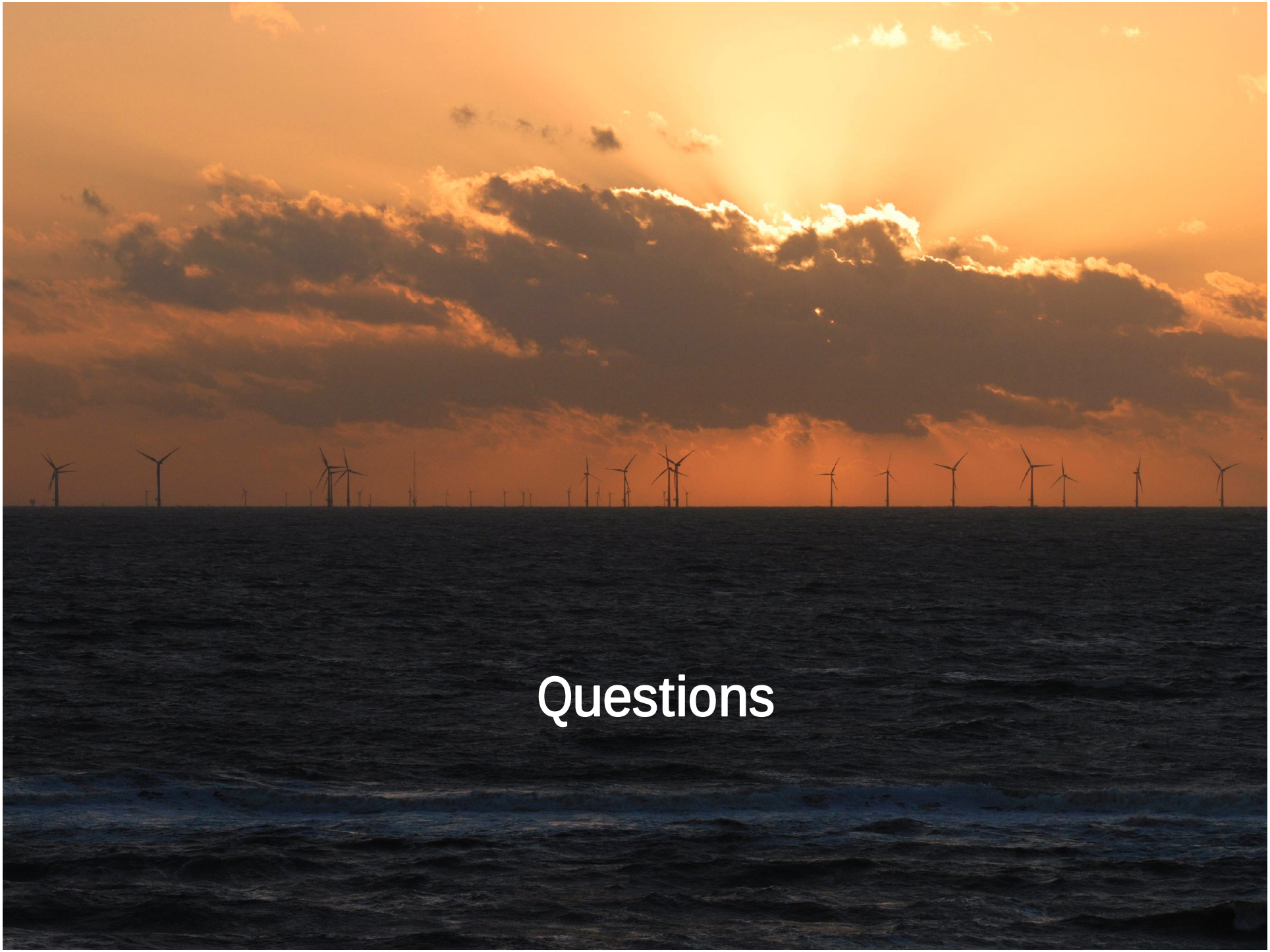
Interaction WP 7 UPWIND

Optical fiber embedding performance



- No negative effects on fatigue performance noted
- Good measurement performance




Questions