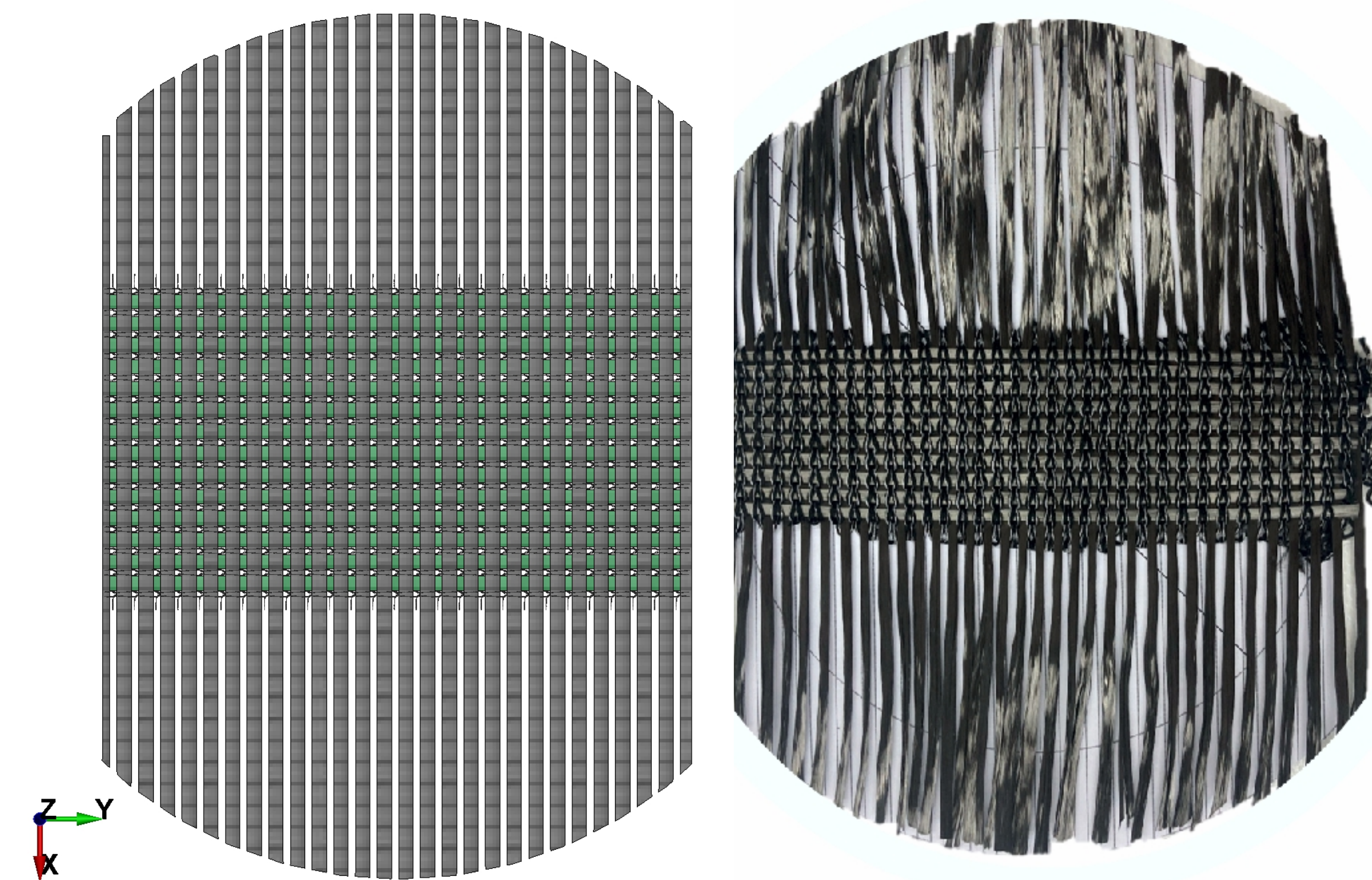


Robot assisted repair process chain for fiber-reinforced plastics

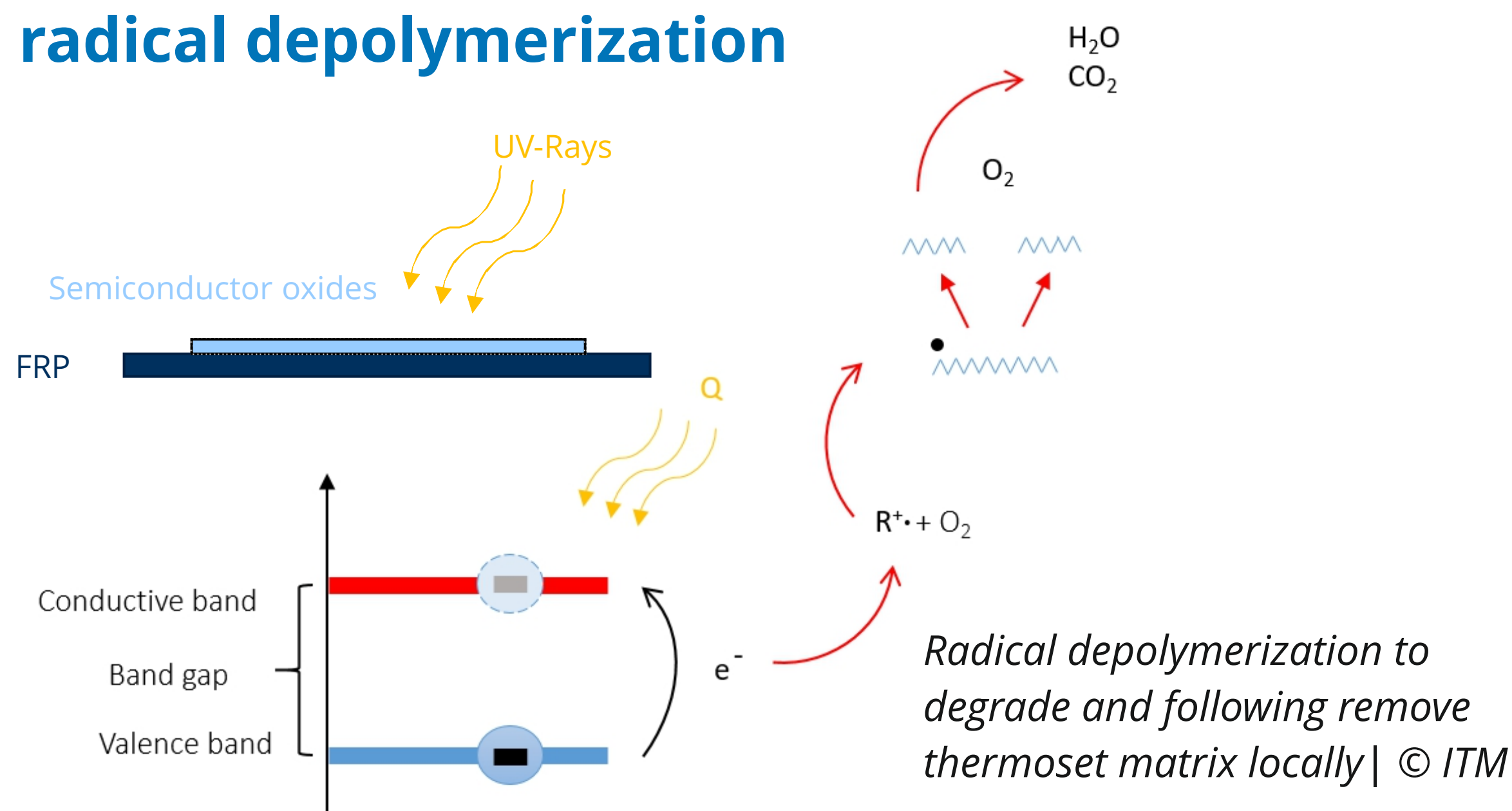


Development and realized repair patches with free thread ends | © ITM

Objective

The aim of the research project IGF 21985BR is the realisation of a new robot assisted repair process for fibre-reinforced plastics. The design of the repair area and a suitable textile repair patch is simulation-based. The preparation of the repair area is based on UV radiation-induced radical depolymerisation of the matrix. The implementation of an exactly fitting textile patch with free thread ends for the connection on the textile level is carried out with the help of flat knitting technology, which is being further developed with regard to the insertion of free thread ends. The developed process chain for the repair of fibre-reinforced plastics is to be completely robot-assisted in the future.

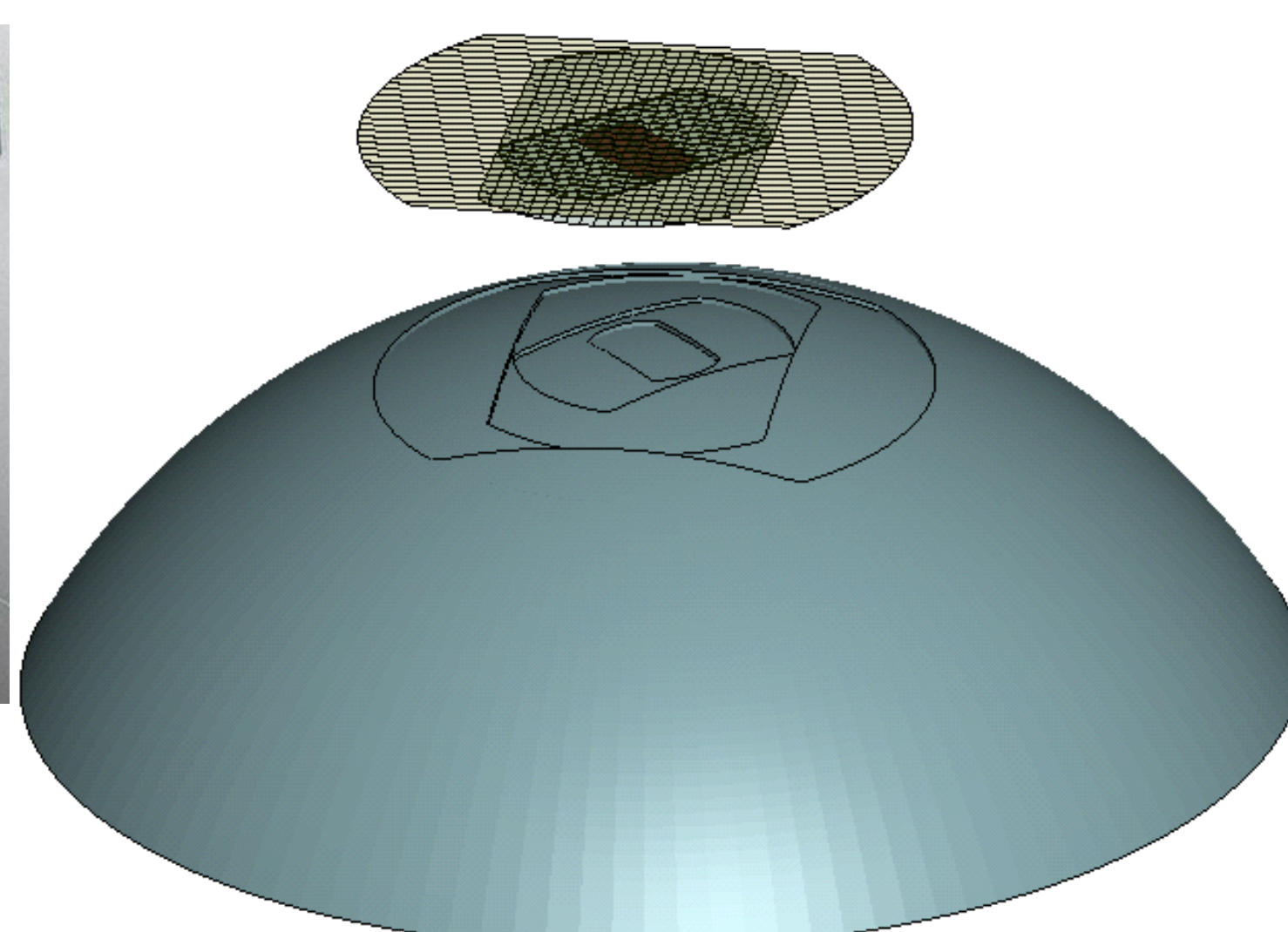
Local matrix removal by UV radiation-induced radical depolymerization



Demonstrator

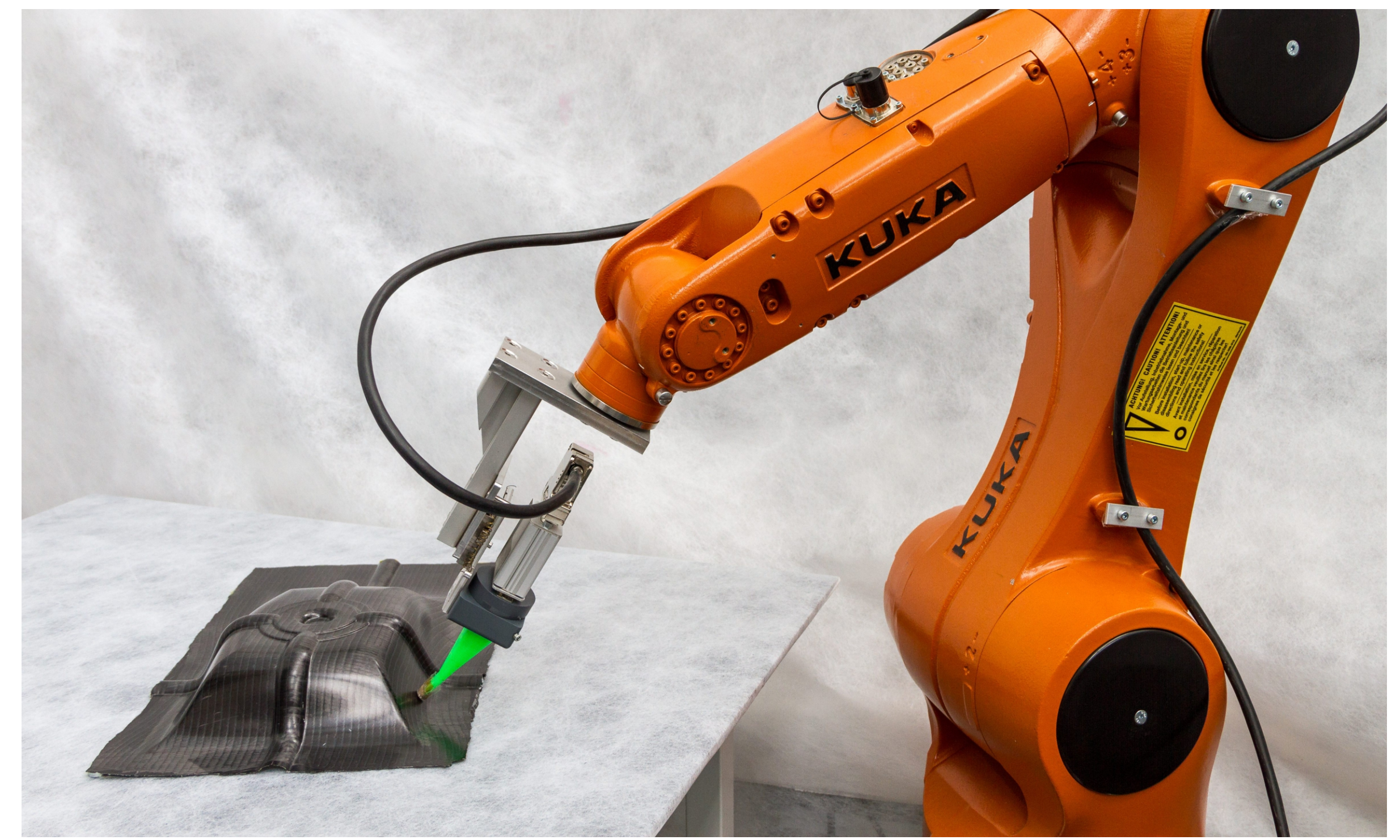


Radome after a hail strike |
© Simon Hradecky,
Aviation Herald



Simulated patch application on exposed
repare site of FRP component | © ITM

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Robot-assisted defect detection by eddy current NDT device with subsequent robot-assisted repair process, realized by a changeable actuator on the robot | © ITM

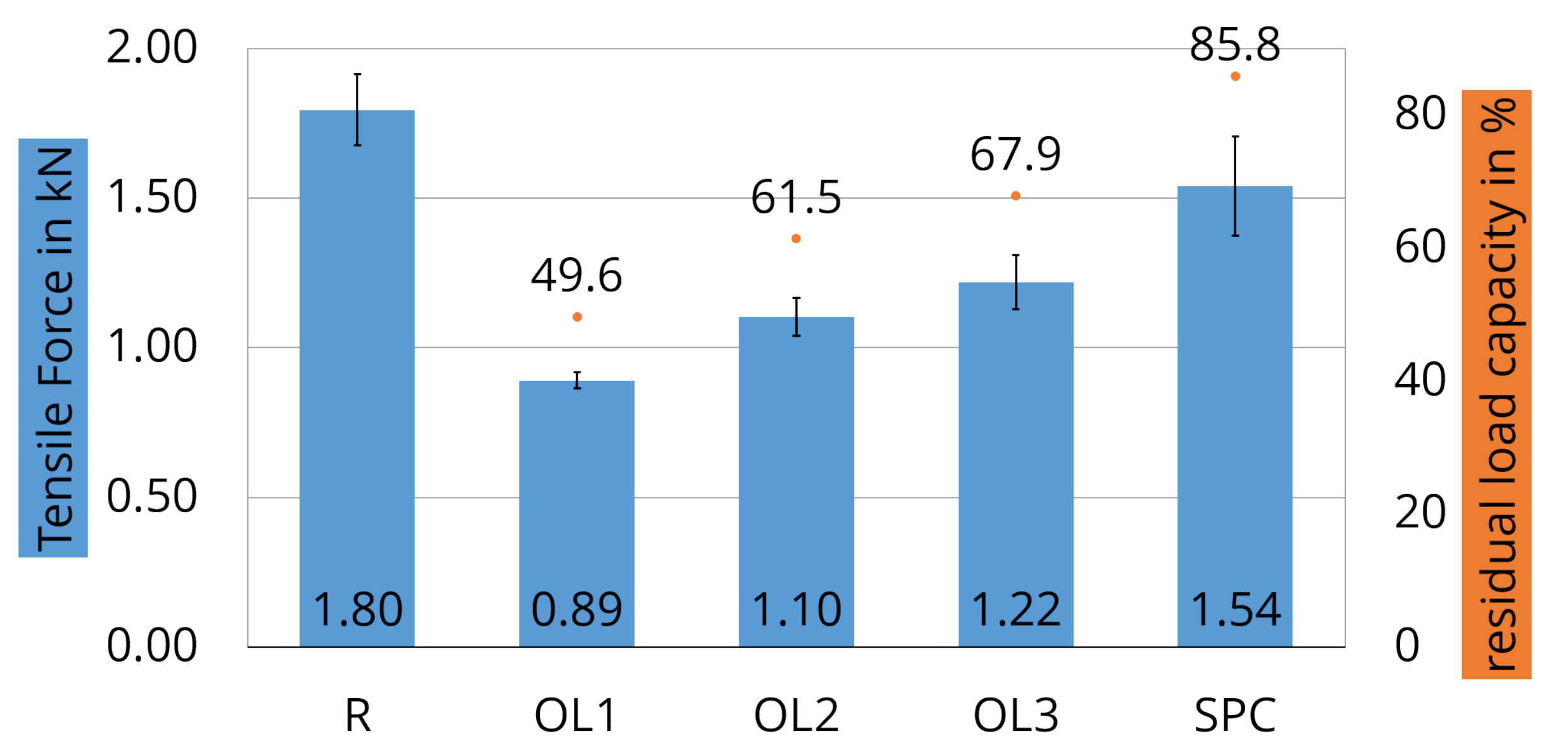
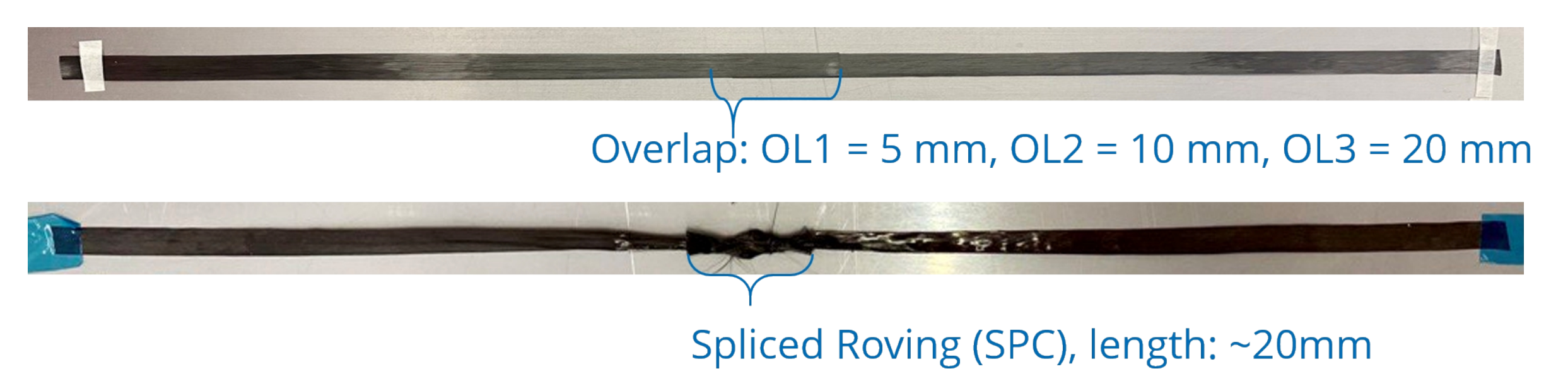
Methods/results

The robot assisted repair process chain includes the following steps:

- ▶ Simulatively design of repair area and area-fitting textile repair patch
- ▶ Textile fabrication of area-fitting textile repair patch with free thread ends using weft-knitting
- ▶ Robot-assisted exposure of the repair site by UV radiation-induced radical depolymerization of the matrix with the aid of metallic semiconductor oxides.
- ▶ Robot-assisted integration and binding of the textile patch via the help of the free thread ends of the patch and the repair area, matrix reinfiltration and consolidation of the repair area

Bindingprinciple of Fiber-Fiber-coupling

- ▶ Analytical determination of fiber-fiber- binding effectiveness for FRP repair based on dry textile patches
- ▶ Usage of idealized material setup - parent material and the repair patch were fitted together in their dry fabric state, and manufactured as one component, binding by overlap (State of the art) vs. textile binding by splicing



Results of Tensile Test of overlapped Roving-specimen. R: Reference.

OL1: 5 mm overlap. OL2: 10 mm overlap. OL3: 20 mm overlap. SPC: Spliced specimens.

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