P3-025

Measuring Cylindrical Cell's expansion by Stereo Camera Based Methods

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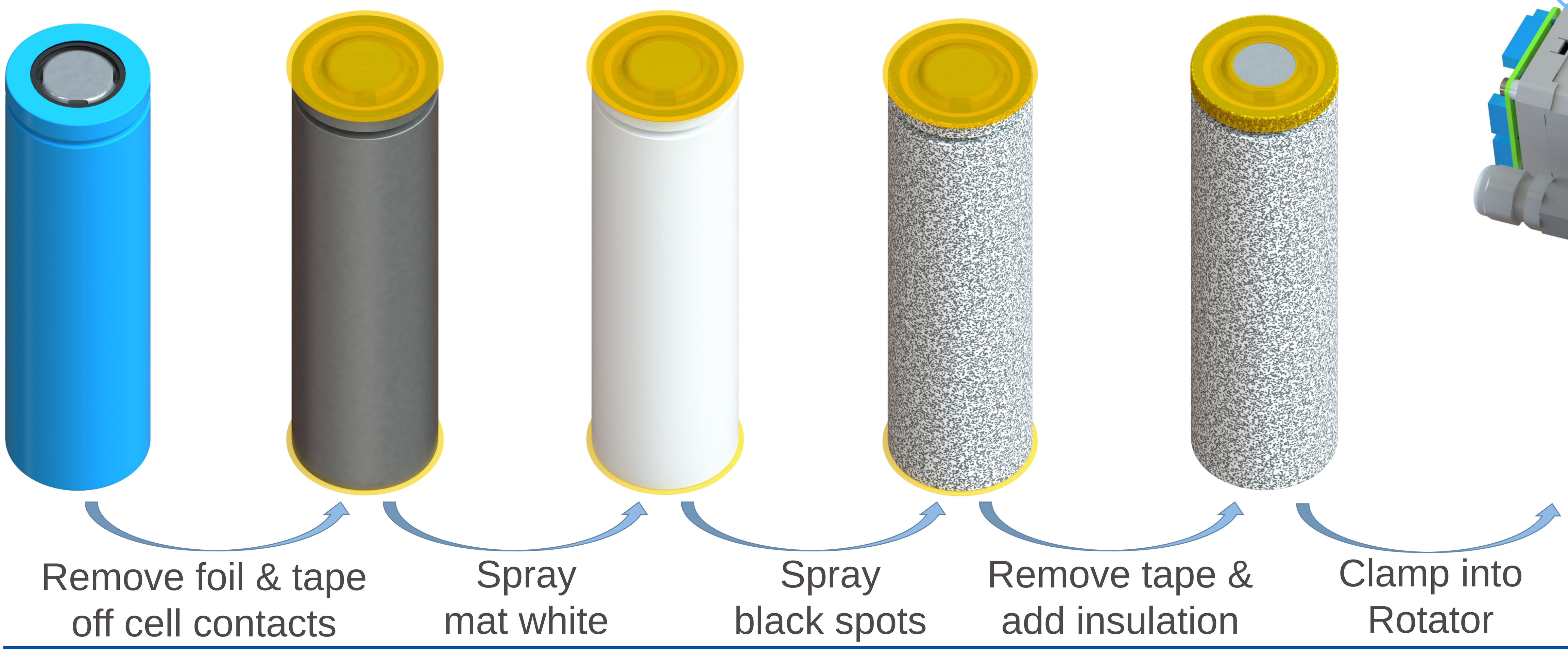
Abstract

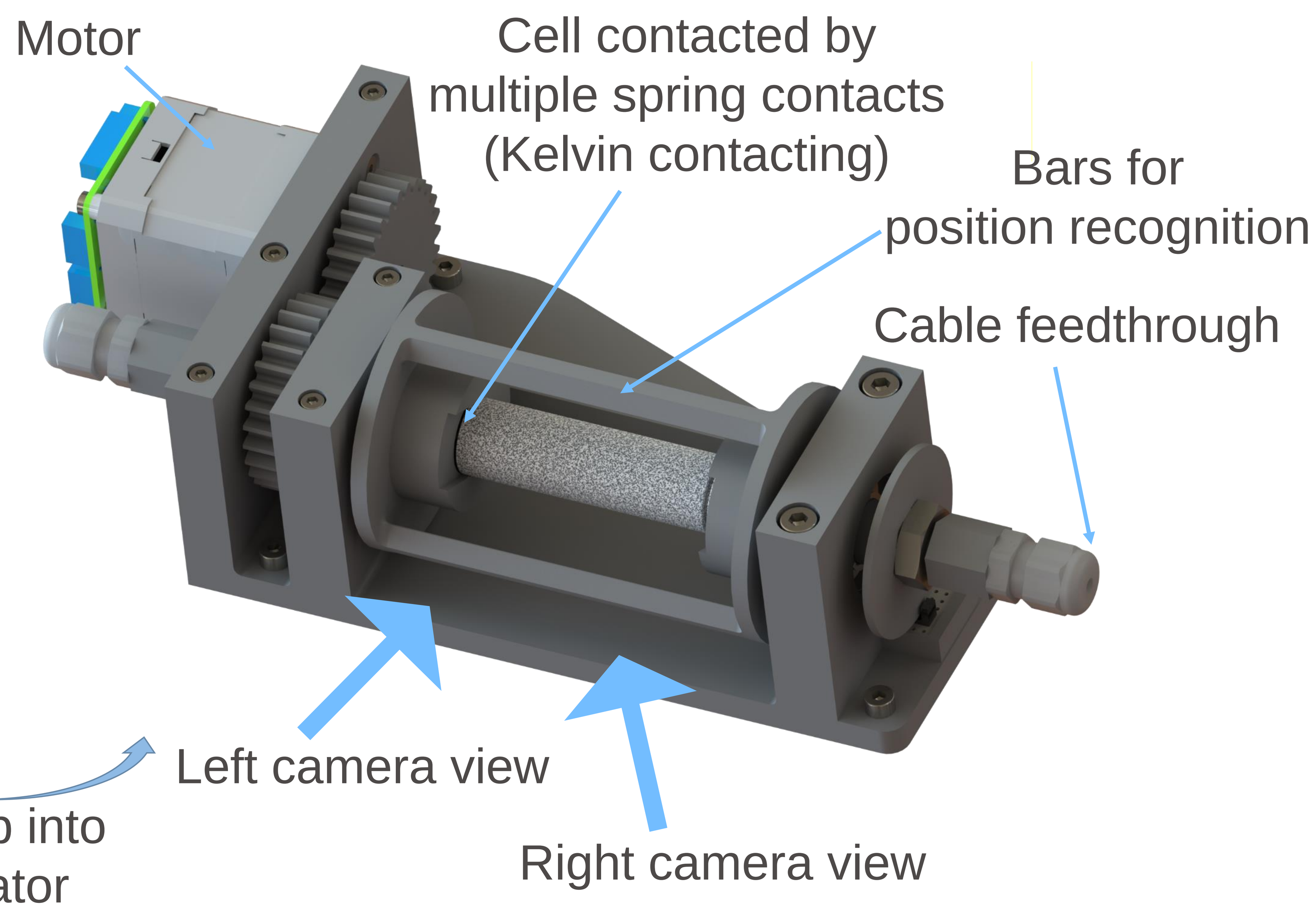
Most mechanical alterations inside cells, which can indicate safety-critical states of operation, are accompanied by a change of volume. In previous research on cylindrical cells, the average azimuthal strain of the cell's outside shell was used to proxy for the cell's volume change. Here, the cell's expansion is measured with a stereo camera-based approach, giving more profound insight into the cell's inhomogeneous expansion.

Conclusion

The presented set-up based on the commercially available stereo camera system GOM ARAMIS can measure the inhomogeneous expansion of an LG INR18650 MJ1 cylindrical cell in a quasi-operando fashion. Future research will use these optical techniques to validate the results obtained by strain gages.

Cell Preparation and Set-Up





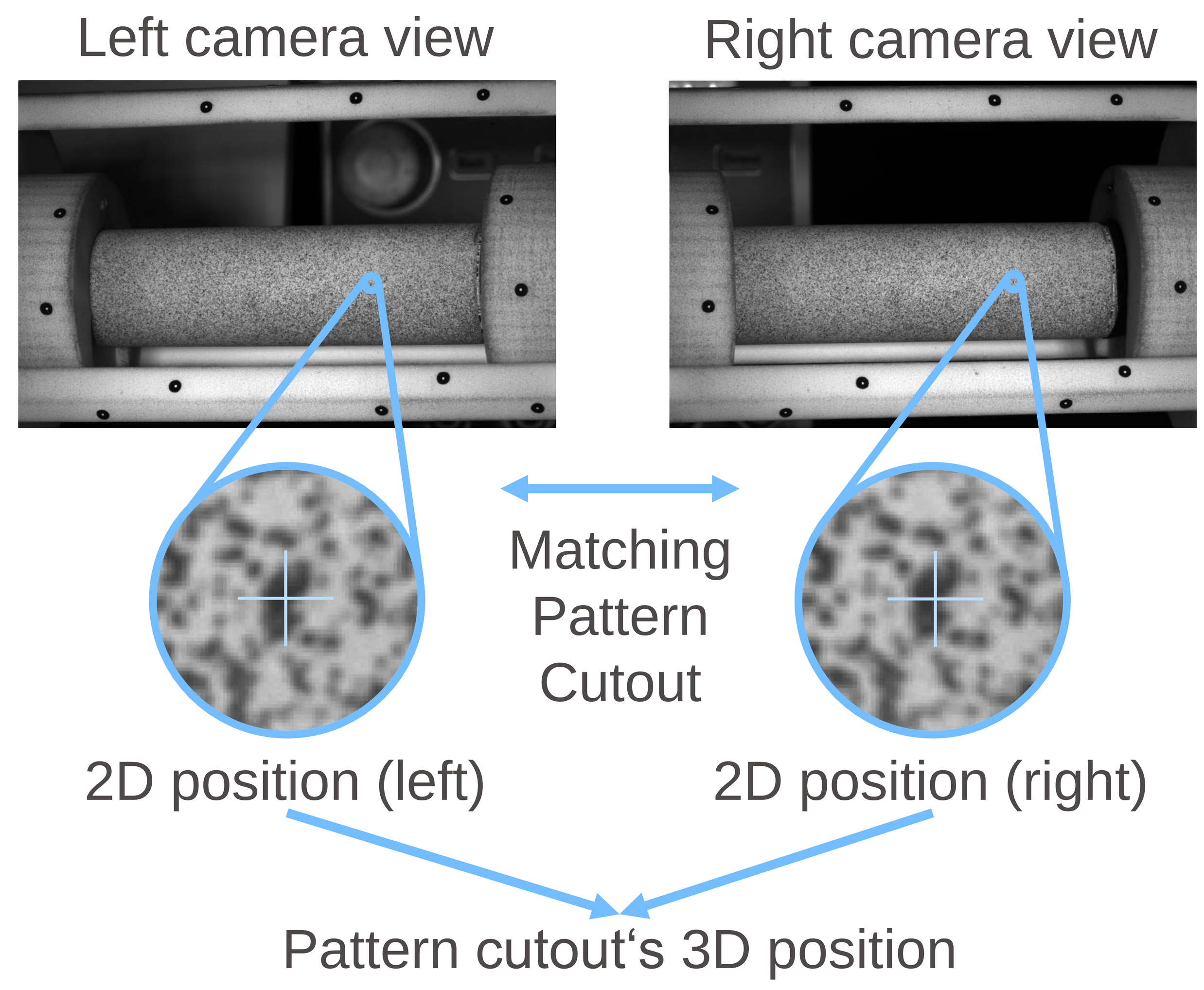
Measuring Principle and Procedure

Due to the random nature of the sprayed-on pattern, every pattern cutout is unique and can be recognized in both the left and right camera. Therefore, from their 2D position and the cameras' relative arrangement, the cutout's 3D position is computed.

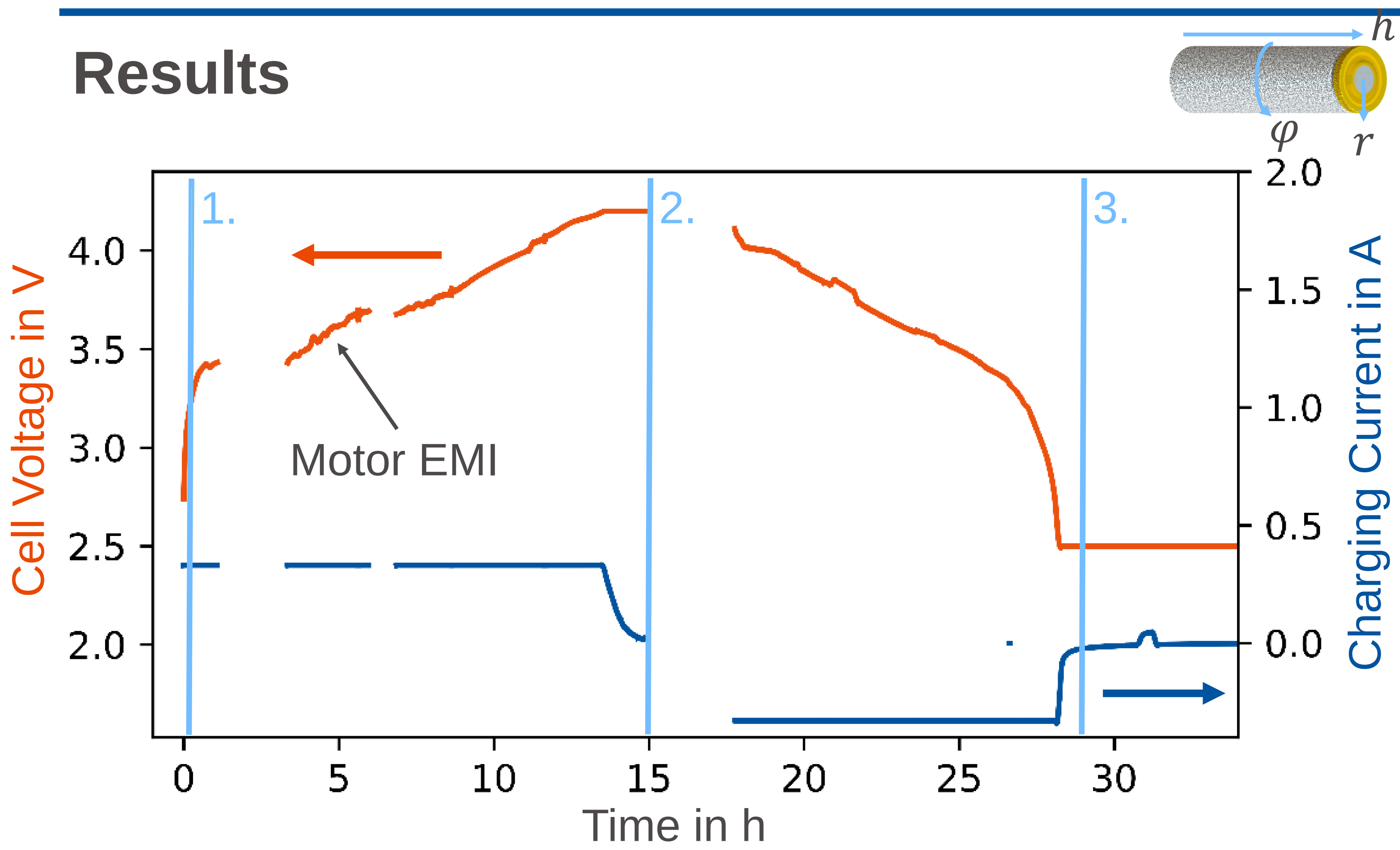
Taking the images, computing the 3D surface, and further analysis was conducted inside the GOM Correlate software.

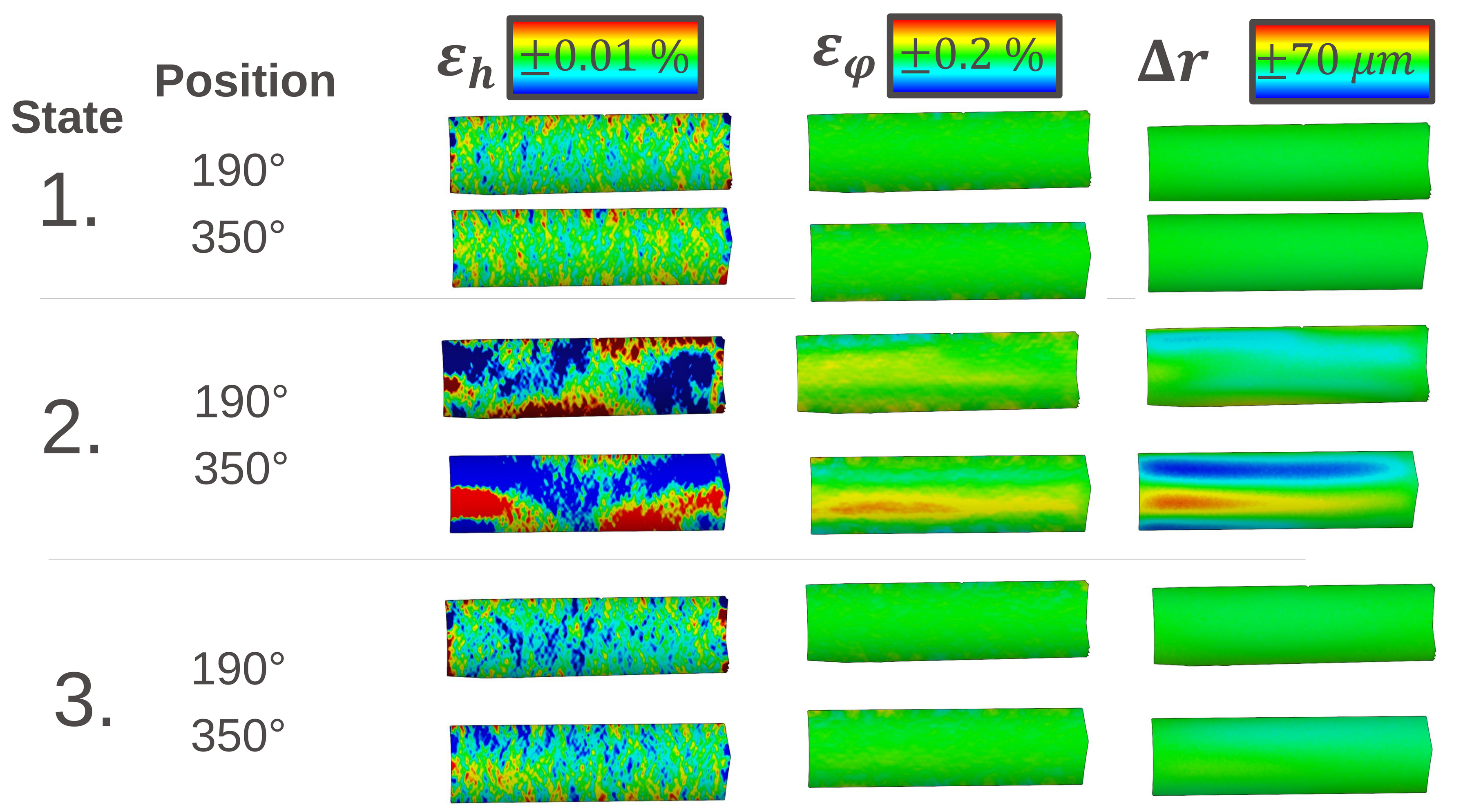
A complete scan of the cell's lateral takes about one minute, as the motor approaches six different rotation positions (70°, 110°, 190°, 230°, 310° and 350°), and a high exposure time is needed for optimal depth definition.

During the experiment, the cylindrical cell (LG INR18650 MJ1, 3.5 Ah) is (dis-) charged in a constant-current constant-voltage fashion with C/10 current rate.



Results





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