

Report on the outcomes of a Short-Term Scientific Mission¹

Action number: CA20129

Grantee name: Xinyang Li

Details of the STSM

Title: Influence of radiation damage on the long-term stability of DNA origami nanostructures

Start and end date: 25/08/2025 to 29/08/2025

Description of the work carried out during the STSM

(max. 500 words)

The STSM was carried out at the J. Heyrovský Institute in Prague in collaboration with Dr. Leo Sala. The main objective was to investigate how high-energy electron irradiation affects the structural integrity and long-term stability of DNA origami rectangles. To ensure sample freshness and avoid degradation during transport, the DNA origami structures were assembled on-site at the host institution.

Irradiation experiments were conducted at the MT25 Microtron facility of the Institute of Nuclear Physics. Four different electron doses were selected: 100 Gy, 500 Gy, 1000 Gy, and 5000 Gy, covering a wide range of expected damage. A non-irradiated control group was also prepared. All samples were irradiated in 1.5 mL Eppendorf tubes and properly labeled for further analysis.

Initial structural assessments were performed on selected samples via AFM imaging at the host laboratory. In addition, UV-Vis absorbance spectra of the origami solutions were measured after irradiation. The spectral peaks showed dose-dependent changes, further confirming the structural damage induced by electron beam exposure. The remaining samples were transported back to Paderborn for further stability analysis. No significant deviations from the original working plan occurred during the mission.

Description of the STSM main achievements and planned follow-up activities

(max. 500 words)

The mission successfully fulfilled its main goals. A complete set of irradiated DNA origami samples was obtained, with clearly defined dose groups and appropriate controls. The collaboration with the Prague

¹ This report is submitted by the grantee to the Action MC for approval and for claiming payment of the awarded grant. The Grant Awarding Coordinator coordinates the evaluation of this report on behalf of the Action MC and instructs the GH for payment of the Grant.

team ensured precise control over the irradiation process, including energy, dose rate, and sample handling. Initial results from AFM and gel electrophoresis suggest dose-dependent structural damage. These findings will be further investigated through accelerated aging tests, which we will perform in Paderborn. This follow-up work will help determine how irradiation influences the degradation kinetics and thermal stability of DNA nanostructures. The STSM contributed directly to the scientific goals of COST Action CA20129, particularly in WG1 and WG4. It also laid the foundation for ongoing collaboration between the Paderborn DNA nanotechnology group and the Prague irradiation research team.

Further activities may include co-authored publications based on the irradiation–degradation relationship and potential joint proposals or STSMs focused on advanced DNA nanostructure characterization.