Report on the outcomes of a Short-Term Scientific Mission[[1]](#footnote-1)

Action number: CA18232

Grantee name: Gilad Sofer

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| **Details of the STSM**  Title: Semester visit to Potsdam University  Start and end date: 01/03/2023-16/09/2023 |
| **Description of the work carried out during the STSM**  Description of the activities carried out during the STSM. Any deviations from the initial working plan shall also be described in this section. |
| *(max. 500 words)*  *I visited Potsdam University to work mainly with Ram Band and Siegfried Beckus. The research I conducted focused on the spectral theory of aperiodic quantum graphs. The models we studied were centred around metric graphs whose local geometric structure is determined by aperiodic Sturmian sequences, equipped with the standard Laplacian. These models include infinite lines with quasiperiodic alternating decorations, and radially symmetric trees with changing edge lengths and branching numbers.* |
| **Description of the STSM main achievements and planned follow-up activities**  Description and assessment of whether the STSM achieved its planned goals and expected outcomes, including specific contribution to Action objective and deliverables, or publications resulting from the STSM. Agreed plans for future follow-up collaborations shall also be described in this section.  *(max. 500 words)*  *The STSM has led to substantial progress in our joint work. We were able to prove that the models we study exhibit many spectral characteristics which are in common with the analogous discrete one-dimensional Schrodinger operators, as we suggested in the original STSM proposal. These include things like the existence of periodic approximations, Lebesgue measure of the spectrum, and spectral types. We were also able to identify and study some unexpected spectral phenomena which occur exclusively in the metric graph setting and developed some new tools to study these phenomena, such as the secular manifold associated with almost periodic graphs.*  *One aspect which we developed partially but did not yet understand completely is the so called combinatorial spectral structure of the periodic approximations for these aperiodic graphs. We have proven that such a combinatorial structure is exhibited for certain energy ranges, but we currently do not have a proof for all energies (although numerically it seems true). In the future, we aim to proceed in studying the combinatorial spectral structure and prove the general case. We also aim to better understand the integrated density of states for these systems.* |

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. [↑](#footnote-ref-1)