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

Action number: CA18232

Grantee name: Ivica Nakić

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| **Details of the STSM**  Title: Topics in spectral theory of quantum graphs  Start and end date: 17/03/2024 to 21/03/2024 |
| **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)*  The purpose of the STSM was to explore the spectrum of differential operators on finite equilateral graphs where on all edges we have the same operator. In the literature there are several results of this type, but only for very specific differential operators. What my host and me wanted to explore is a way to unify such results and also to generalize them.  During my stay, we devised a strategy for proving such a result and explored it. |
| **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)*  We started with a simple first-order differential operator. We managed to prove a desired result by translating this problem into the setting of systems theory and finding a particular representation of the underlying operator. It is clear that the devised procedure can be used to prove a formula for the spectrum in the case of differential operators on metric graphs, where each vertex of the edge can be designated as input or output “port”. We also started to work on the case when the dynamical processes on the metric graph do not have a natural direction.  The plan is to continue working on the unresolved case and prepare the draft of the paper. We also plan to extend the technique to infinite graphs and use the obtained spectrum characterization in various applications. |

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)