AxiTools - Studying the landscape of axion models and providing software tools for the next generation of axion searches

This project is to extend our knowledge about the landscape of viable axion models. Axions originally emerged as a solution to the strong CP problem and are excellent dark matter candidates, thus providing highly motivated extensions of the Standard Model. The project focuses in particular on models that solve further puzzles, e.g. improving the so-called Peccei-Quinn quality problem. To find such models, it considers QCD axions that are lighter or heavier than the usual benchmark models or axion-like particles from astrophysical sources. Moreover, the next generation of experimental searches need accurate computations that match the expected precision of the experiments. Advancing our understanding of the models and their predictions, and confronting them with experimental data, will require the development of new software codes and possibly new computational techniques. It will further require combining the expertises of the Researcher (phenomenology, statistical analyses) with those of the Supervisor/Host (theoretical computations, model building). Learning about the most viable axion models will not only increase our knowledge but also guide future experimental searches. By making software codes and data sets publicly available, the project will contribute to the sustained growth of this exciting field of research. These tools will provide researchers with a solid basis for ongoing and future research activities in axion physics. In turn, the project can benefit from community feedback on its open-science products, ultimately improving the efficiency and quality of the underlying research.

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