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Subject: Letter of support for the project proposal "Foundations of Directed Type Theory"

I am writing to express my strong support for the above research proposal submitted to EPSRC by Altenkirch, Buchholtz and Kraus. My research primarily focuses on applying higher category theory to problems in mathematical physics, an area that will directly benefit from the new foundations for Directed Type Theory developed in this project.

The directed nature of higher categorical and algebraic structures is a critical feature in a wide range of physical theories, spanning quantum field theory, quantum computation, and emerging concepts such as non-invertible symmetry. Practitioners in these fields often face significant technical challenges due to the overwhelming combinatorial complexity of coherence conditions in higher category theory and algebra, which can obscure new developments or even lead to errors. Directed Type Theory offers an innovative approach to reasoning about these structures by abstracting away low-level coherence data and also potentially enabling computer-assisted proofs. By shifting the focus from technically cumbersome implementation details to the core concepts of a problem, this framework holds immense potential to unlock new applications of higher category theory in both mathematics and mathematical physics.

My collaboration would naturally align with Work Package 7 of the research proposal, where I believe I can offer valuable guidance to the research team in identifying problems in mathematical physics that would immediately benefit from their new foundations for Directed Type Theory. My proximity at the School of Mathematical Sciences of the University of Nottingham will facilitate regular scientific exchanges and collaborations, allowing me to easily participate in research meetings and project-related seminars.

Overall, I regard this research proposal as exceptional, and I eagerly anticipate collaborating with the research team.

Yours sincerely,

Alexander Schenkel
Nottingham, August 24, 2025