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Subject: Letter of support for the grant proposal: 'Foundations of Directed Type Theory'

I am writing to express my sincere support for the grant proposal on “Foundations of Directed Type Theory”, submitted to EPSRC by Altenkirch, Buchholtz and Kraus.

Myself, I work in algebraic topology (homotopy theory, higher category theory) and mathematical physics, with a keen interest in homotopy type theory. I believe my habilitation thesis and related publications on cohesive modalities in higher topos theory have contributed in the past to the general interest in modal and multi-modal enhancements of (homotopy) type theory, and I have advised PhD theses and written monographs on its application to higher differential geometry with outlook on possible HoTT formalizations of aspects of modern physics in general and quantum physics in particular.

The proposed investigation of foundations of directed versions of (homotopy) type theory is profound and timely, and potentially of immense impact when successful, with particularly intriguing applications possibly to formalizations of modern aspects of theoretical physics, as laid out in the proposal.

My main collaboration would be in the project 'WP7: Applications to Mathematics and Physics', where I see a great chance to develop old and new ideas using a synergy of joint interdisciplinary interest and expertise that has previously been hard to bring about, but which this grant may finally catalyze. While we have not formally collaborated before, I used to have profound discussion in particular with Altenkirch on aspects of type theory in quantum physics/information and with Buchholtz on aspects of HoTT in synthetic homotopy theory, and I expect that once supported by a grant we will collaborate fruitfully.

I intend to spend about 10 days a year on this project, which corresponds to an in-kind contribution of around GBP 5,000.

Looking forward to seeing this remarkable research project being funded,

Urs Schreiber