

## Short-Term Scientific Mission Grant - APPLICATION FORM<sup>1</sup> -

**Action number: CA20111**

**Applicant name: Melanie Taprogge**

### **Details of the STSM**

Title: Computer-Assisted Proof Verification for Higher-Order Automated Reasoning within the Dedukti Framework

Start and end date: Exact dates are flexible, expected: 25/03/2024 to 07/04/2024

### **Goals of the STSM**

Purpose and summary of the STSM.

The goal of the STSM is the development of a tool to translate the proofs produced by the HOL based ATP Leo-III to Dedukti to verify them automatically. This will involve the development of a Dedukti theory representing Extensional Type Theory and the encoding both of the formulas representing the step-by-step TSTP proof outputs and of inference rules applied by Leo-III in the LambdaPi/ Dedukti Syntax. The information provided in the proof certificates currently produced by Leo-III will likely be insufficient and will hence have to be extended.

### **Working Plan**

Description of the work to be carried out by the applicant.

Before the STSM, preliminary work regarding the encodings will be done, the STSM will then offer the opportunity to discuss, refine and extend the translation.

The working plan for the two weeks is structured as follows:

- Day 1-2: Discussion of the Dedukti representation of Extensional Type Theory and proof steps
- Day 3-5: Discussion of the inference rule encodings
- Day 6-7: Extension of the Leo-III proof certificates
- Day 8-14: Automation of the translation process

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<sup>1</sup> This form is part of the application for a grant to visit a host organisation located in a different country than the country of affiliation. It is submitted to the COST Action MC via e-COST. The Grant Awarding Coordinator coordinates the evaluation on behalf of the Action MC and informs the Grant Holder of the result of the evaluation for issuing the Grant Letter.

**Expected outputs and contribution to the Action MoU objectives and deliverables.**

Main expected results and their contribution to the progress towards the Action objectives (either research coordination and/or capacity building objectives) and deliverables.

The development of the translation tool, which is the primary focus of this STSM, will directly contribute both to Research Coordination Objectives 1 (Express new proof systems in the Dedukti logical framework) and 2 (Promote the output of detailed, checkable proofs from automated theorem provers) by extending the proof certificates produced by Leo-III and providing the means to automatically translate them to Dedukti. This will not only enable the verification of Leo-III proofs but also add Leo-III to the list of systems that can be used to produce proofs expressible in the Dedukti framework. The tool will thus also fall under the deliverable D9 (Software for translating proof formats used by automated theorem provers to Dedukti). The project will mainly contribute to WG1.