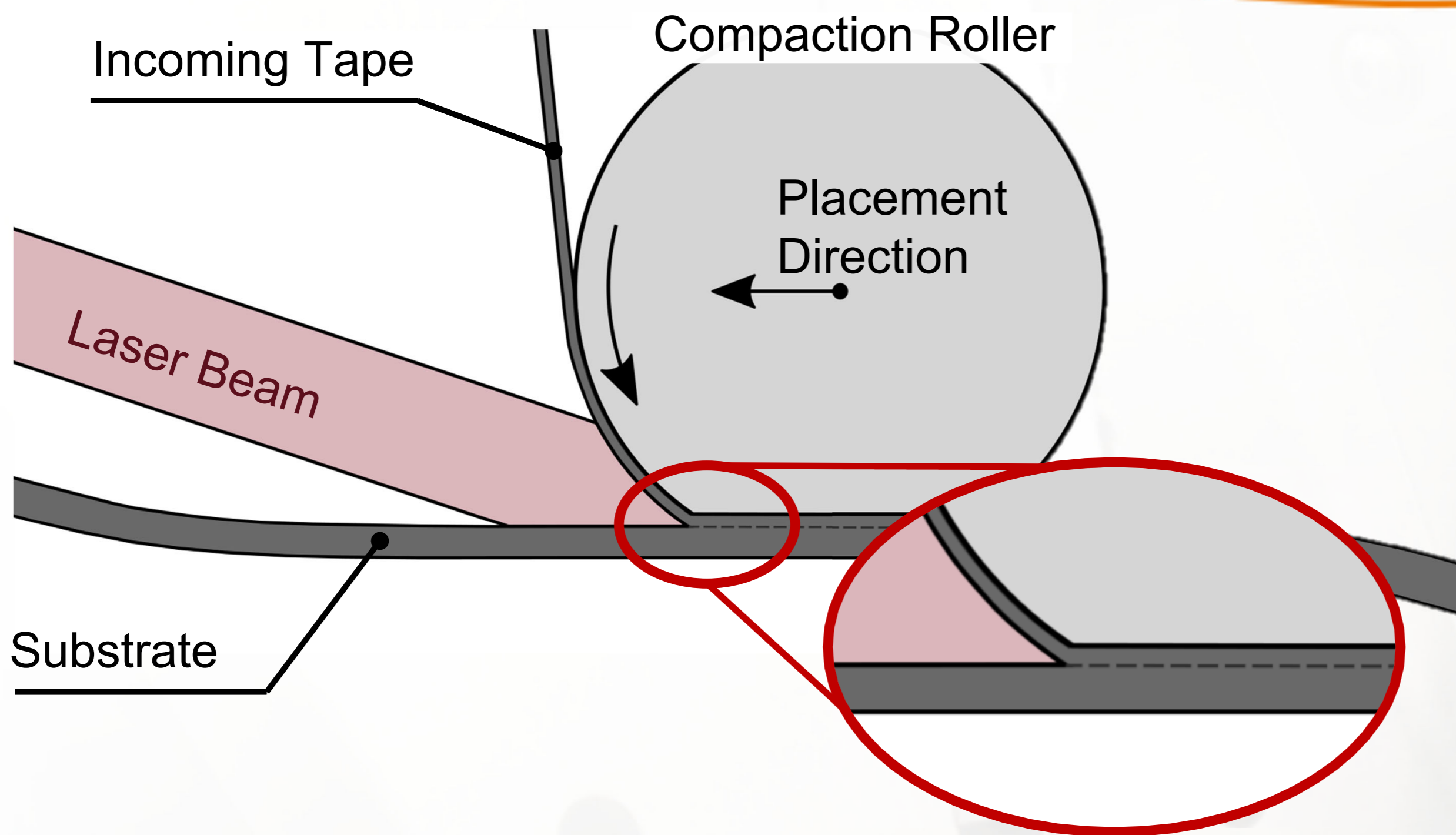


Towards Robust Laser Assisted Fibre Placement

Adapting the process to the incoming material properties

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Research Goals

- Investigating **material and process variability**
- Maintaining **nip-point process temperature**
- Robust process with **temperature control** (material based)

Motivation: Towards In-Situ Consolidation

Laser assisted fibre placement (LAFP) and laser assisted tape winding (LATW) pose unique opportunities for the aerospace and automotive industry to manufacture **thermoplastic composite** (TPC) structures at large scale. LAFP technologies provide a high degree of automation, offering a scalable solution to meet the increasing demand for lightweight structures. Moreover, **in-situ consolidation** during LAFP has the potential to serve as a **cost-effective** single step manufacturing process for thermoplastic composites.

Process Temperature Measurements

Uniform nip-point temperature is desired (~380°C) but is challenging to maintain due to material variation.

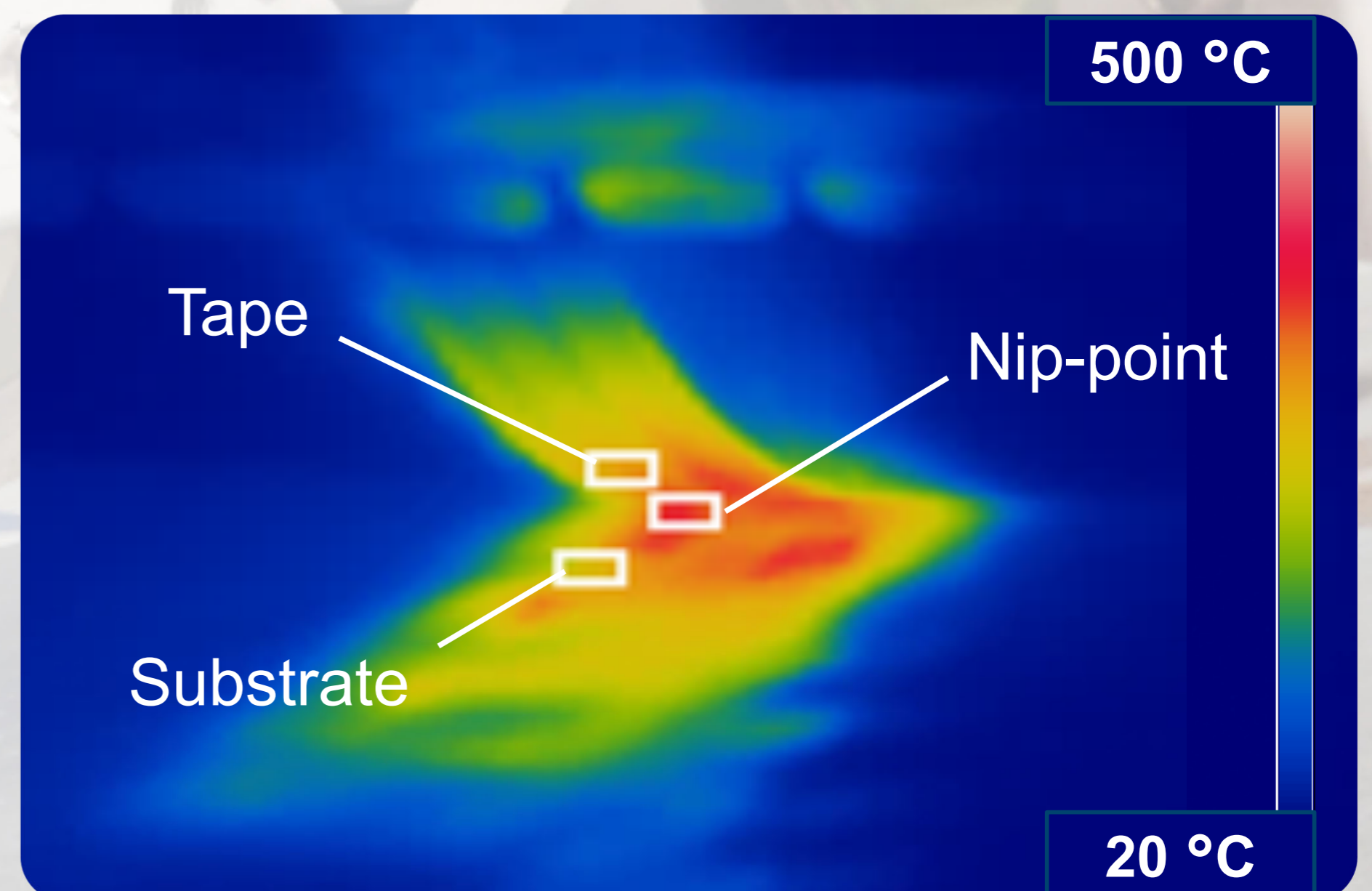


Figure 2: Measured temperature distribution during fibre placement, with temperature variations in the tape

Research Approach

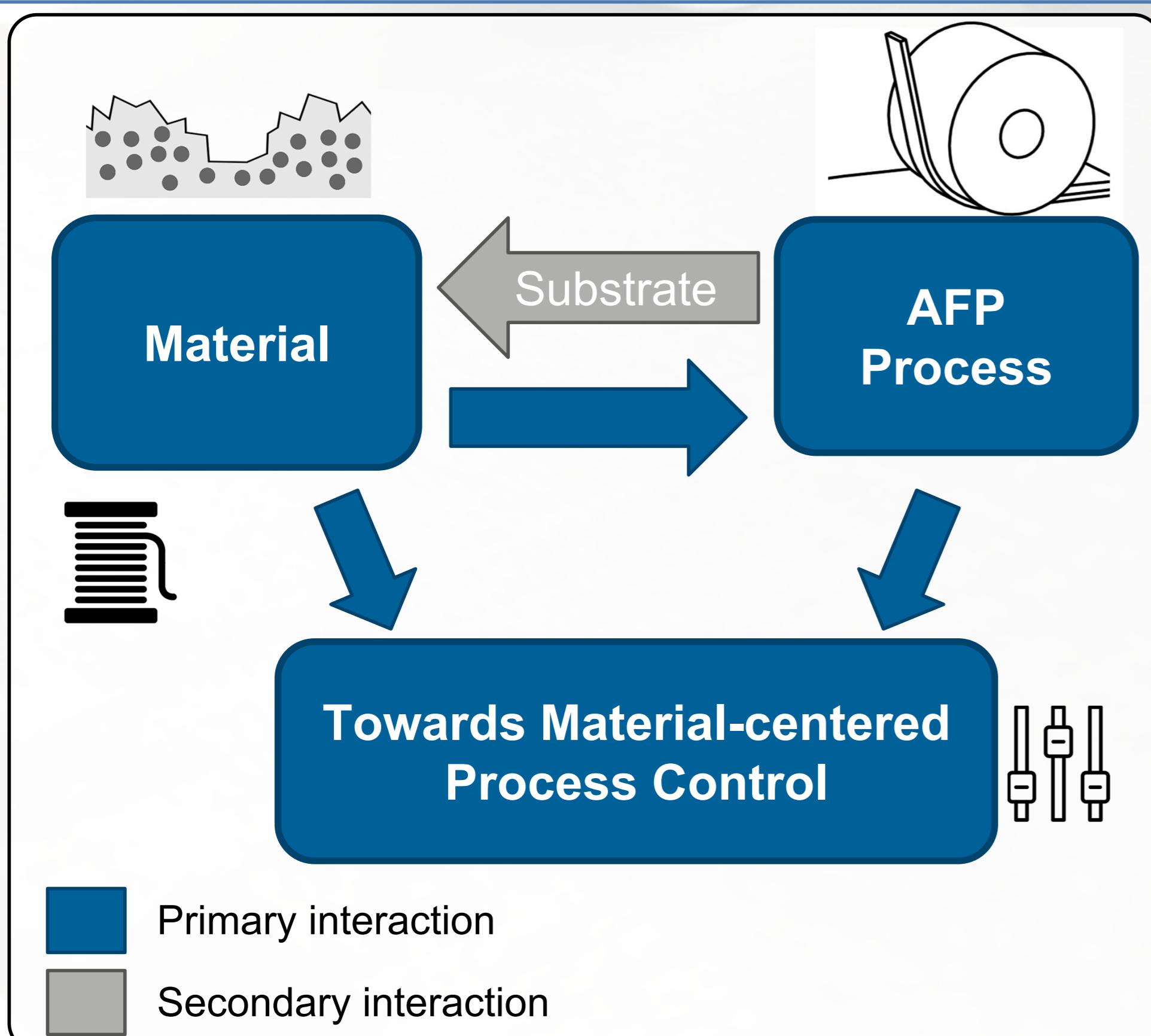


Figure 1: Flowchart depicting the research domains considered, with the interactions between them

Next Research Steps



More research is needed into the **material properties** relevant for laser heating (e.g., optical reflectance, roughness, etc.)



Once the material variation is quantified, **opto-thermal models** will be used to predict the expected variation in temperature



With the results of the previous steps, a surrogate model will be used to **connect the material & process** while observing variations in the material properties with an **in-line monitoring system**

More information?



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