



## **MECHANICAL ENGINEERING STUDENT SEMINAR**

Wednesday, August 9, 2023, at 13:30, D. Dan and Betty Kahn Building, Room 217.

# Infra-red thermography measurements of the convective heat transfer from a flat surface exposed to a turbulent co-axial impinging jet

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#### Adviser: Assoc. Prof. René van-Hout & Assoc. Prof. Beni Cukurel

Impinging jets are a commonly employed method for cooling electronic circuit boards or turbine blades due to their high convective heat transfer coefficients and simple setup. The present research concerns the measurements of the instantaneous temperature distribution of a thin, flat, heated metal coating (in-house designed and constructed) cooled by a co-axial impinging, round air jet. The measured temperature distributions will be utilized to determine the local instantaneous convective heat transfer coefficients. The thickness of the coating layer (600 [nm]) was selected such that spatial temperature differences are not affected by conduction and the heat capacity of the test surface is sufficiently low. Hence, both temporal and spatial changes in heat transfer can be linked to the unsteady flow field. A high-speed infrared camera (Telops Fast M1K Mid-Wave Range - 640 × 512 pixels) was used to measure the instantaneous temperature distribution of the coating. Measurements were performed at two stand-off distances and three different outer to inner jet velocity ratios. The metal coating was heated by Joule heating, resulting in a constant heat flux boundary condition. The results of this experimental study are the first step in the optimization of cooling applications by impinging co-axial jet configurations and will enable a better understanding of the different flow fields' footprint on heat transfer.

In this seminar, the design of the experimental setup and the heated surface (e.g., the detectable fluctuating frequency) will be discussed after which, data processing and Nusselt number distributions and scaling will be shown and compared to literature and results.



#### Note: the seminar will be given in English

Seminars Coordinator: Assoc. Prof. Matthew Suss.