Special Session on

Hairpin Conductor Windings Enabling Advanced Cooling Technologies in EV Electrical Machines

Organized and co-chaired by:

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Abstract

Electrical machines acquire a continuously increasing research interest due to energy decarbonisation underway, while transportation electrification constitutes a crucial task in this target. In particular the recent electric vehicles emergence reflects the leading role of transportation electrification in achieving pollution reduction constraints and green-house gas emission regulations. These developments have oriented research efforts in increasing the operating speed of inverter driven electrical machines implemented in such applications, aiming to attain greater power densities without compromising high efficiency. To that respect, higher thermal evacuation capabilities became critically important, leading to innovative cooling technologies introduction. They are based on both advanced configurations and materials exploitation, such as: hairpin conductor windings with dielectric oil spray cooling, insulation materials presenting high thermal conductivity, harmonic frequencies management through appropriate converter control as well as respective manufacturing techniques.

This special session is dedicated to all aspects of research on hairpin conductor windings enabling advanced cooling of electrical machines production serving transportation electrification initiative. Papers dealing with the research, application and manufacturing of constitutive parts, design, integration and operation of electrical machines involving advanced cooling technologies are welcome.

Topics of interest include, but are not limited to:

- Winding structures facilitating advanced cooling such as hairpin conductor ones.
- Cooling system configurations achieving high thermal evacuation capability such as dielectric oil spray cooling.

- Electrical machines involving Insulating materials with high thermal conductivity.
- Analysis of harmonic losses and converter control for hair-pin conductor winding electrical machines.
- Manufacturing techniques and technologies implemented in advanced electrical machine cooling.

Important dates

- Full Paper Submission: February 1, 2026
- Full Paper Notification: May 1, 2026
- Final Paper Upload: June 1, 2026

Submission of papers

Paper submission follows the rules of regular papers. All the instructions for paper submission are included in the conference website:
https://icem2026.ubi.pt/submission.html