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## Development and Qualification of a High-Speed Chopper Disc Hub

*Tuesday, 21 October 2025 16:00 (15 minutes)*

This presentation will discuss the development and qualification of a novel spiral hub designed for high-speed Carbon Fiber Reinforced Polymer (CFRP) Chopper discs on a magnetically levitated SKF spindle. The development of the spiral hub was motivated by previous failures of Chopper disc hubs, which were attributed to high press-fit stress and low-cycle fatigue due to stress cycles during acceleration and deceleration, combined with high load disturbances generated by the magnetic spindle. The spiral hub, manufactured from Titanium alloy, was developed to address these challenges and improve the robustness of the system.

The qualification process involved a series of rigorous tests, including:

- Geometrical measurements and pre-balancing
- Commissioning and fine balancing: Successfully performed up to 354 Hz speed with an acceptable balance level for high-speed operation.
- High-speed operation and clocking measurement: Measuring predictable disc clocking and replicating the expected behavior of the hub.
- Speed cycling test: Performing 50 acceleration and deceleration cycles between 0 and 336 Hz with successful health checks.
- Spindle control loss load measurement and proof load: Validating the hub's strength and robustness against spindle instability, with an estimated maximum radial force of 13 kN.
- The spiral hub successfully resisted the SKF spindle instability at its maximum power, outperforming the old aluminum hub.

The presentation will conclude with a discussion on the future work, including implementing measures to avoid uncontrolled load cases and further measuring the Clocking behaviour of the hub.

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