

## Superconducting Flux Modulation Machine for Hybrid and Electric Aircrafts

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**Abstract** — Enabling electrification of aircraft propulsion will require electrical machines with very high power densities. To this end, high temperature superconductivity (HTS) might be an interesting option. HTS could for instance be coupled with liquid hydrogen cooling, as this fluid is envisaged as a potential aircraft fuel. In this context, a brushless machine topology, called flux modulation machine, which comprises a static DC HTS coil and a rotor made of HTS bulks, appears of interest. A first 50 kW prototype has been realised in 2019 using first generation of HTS tapes and multi seeded YBaCuO bulks. A second demonstrator, aiming to reach 250 kW, is currently investigated. This demonstrator employs second generation HTS tapes and single seeded GdBaCuO bulks. A solution combining magnetic field trapping and screening by the HTS bulks is also employed. In this presentation, the technical challenges and manufacturing procedures of the different components of the 250 kW prototype are presented. The envisaged test campaign will also be discussed.

**Keywords (Index Terms)** — Superconducting machine, Partially Superconducting, Flux Modulation, Aircraft Application