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C3Or2A-06: Rotor Cooling Concept for the Assumed superconductive Motor

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The consortium of the Advanced Superconducting Motor Experimental Demonstrator (ASuMED) will develop, build and test the first fully superconductive motor for aerospace applications. The cryogenic topology of the motor is based on a dual-cryostat concept, which consists of two separate cryostats for the rotor and stator. The rotor cryostat design is particularly challenging because of the cryogenic operating temperatures, the cooling requirements and the rotating parts, which include a rotary seal. A number of alternatives based on different heat transfer mechanisms were considered. The feasibility of these options was assessed by preliminary analyses, which show that a forced convection based system is the optimal solution to achieve the required cooling power in the rotor. The forced convection cooling system is realised by the forced circulation of cooling gas (gaseous helium) in the system. This is the so-called externally controlled cooling system for the rotor. A detailed flow and heat transfer analysis shows that the system has the potential to achieve the required cooling power.

Author: Mrs PEREZ , Ana

Co-authors: Mr VAN DE WOUDE , Ruud; Mr DEKKER , Ronald; Mrs MENDEZ , Rossi

Presenter: Mrs MENDEZ , Rossi

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