MATTER AND TECHNOLOGIES

Contribution ID: **91** Type: **Poster without speed talk**

# Optimization Potential for Cooling Superconducting Technologies by Using Cryogenic Mixed-Refrigerant Cycles

In the wake of the energy transition, the transport of large amounts of electrical energy in densely populated areas but also over long distances is a topic of concern. To achieve this, superconducting power cables are a suitable option. For economical and energy-efficient operation below the transition temperature (well below 100 K), refrigeration systems are required, which have a significant impact on operating costs.

On this poster, various existing technical processes for providing low temperatures needed for superconducting technologies such as HTS cables are presented and compared with cryogenic mixed-refrigerant cycles (CMRC) based on the Joule-Thomson effect. The distinctive feature of CMRC is the combination of good scalability of the cooling capacity, adaptability of the mixture to the specific application and a simple and thus inexpensive process design. While the process is simplistic in itself, finding ideal operating conditions and mixture compositions requires careful consideration. In order to optimize these characteristics for CMRC cascades, an adapted version of the Differential Evolution algorithm is implemented.

## Speed Talks

I am unable/unwilling to give a speedtalk.

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**Session Classification:** Poster session

**Track Classification:** Accelerator Research and Development