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Turbocompressor test facility operating with light gases: architecture, operation and preliminary results with air

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To better understand the challenges and opportunities associated with the design and operation of radial compressors with light gases, a closed loop test facility has been designed, built and commissioned at the ITSM. The test facility has been developed to operate with air as well as with helium-neon gas mixtures of varying mixing ratios ranging from pure neon to pure helium.

The test facility includes a preconditioning unit, in which the operating gas is first prepared. The preconditioned gas is then admitted to a closed test loop, where a high-speed motor supported by gas bearings directly drives a radial compressor impeller. The test rig architecture allows to adjust the gas mass inside the test loop as well as compressor inlet temperature and pressure as desired. After having designed a first exploratory compressor stage at low tip Mach number, the main objective of this test rig is to validate its aerodynamic performance experimentally for different gas composition before moving to other designs in a next step.

This presentation gives an overview of the test rig and describes its architecture, components and operation. Moreover, the aerodynamic performance of a newly designed centrifugal compressor stage is validated with air.

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