



Delivery of the Windowless Gaseous Tritium Source (WGTS) for the KATRIN Project at KIT

For the Karlsruhe Institute of Technology (KIT) RI has recently finished the production of the Windowless Gaseous Tritium Source (WGTS) for the Karlsruhe Tritium Neutrino (KATRIN) experiment.

The WGTS is a 15 m long, 5 m high, 1.5 m wide and 25 tons heavy system housing 5 superconducting solenoids and 5 cryogenic media circuits (liquid neon, liquid helium, liquid Argon, liquid nitrogen and 40 K gaseous helium) inside a common vacuum vessel. The WGTS is a key component of the KATRIN experiment currently under final construction at the Tritium Laboratory located on the KIT campus Nord. With the KATRIN experiment scientists at KIT ultimately want to determine the neutrino mass. Amongst various challenges, all components of the WGTS had to be produced according to the European pressure equipment directive, the KIT tritium laboratory requirements and to the highest level of quality control standards. The alignment and straightness of the 12 m long liquid neon cooled beam tube placed inside the 5 superconducting magnets required a tolerance of ± 0.5 mm.

Maintaining this alignment and straightness after cooldown to cryogenic temperatures was one of the most challenging tasks during the design and production of the WGTS. In addition a temperature stability of the beam tube below ± 30 mK at 27 K operating temperature had to be achieved. As an intermediate step during the WGTS production a so called Demonstrator was built at RI and tested at KIT using the original beam tube and cooling concept of the WGTS. With this Demonstrator the temperature stability and alignment requirements of the final WGTS were demonstrated during cold testing at KIT.

The successful completion of the WGTS was accomplished through a trustful partnership between the scientist of KIT and the RI project team during the design, manufacturing and especially the 2 years assembly phase of the WGTS. Prior delivery extensive factory acceptance testing of the WGTS demonstrating the alignment of the beam tube and the integral leak tightness of all cryogenic circuits was done. The KATRIN collaboration honored the achievement of RI through the execution of the WGTS project with a supplier award in gold.