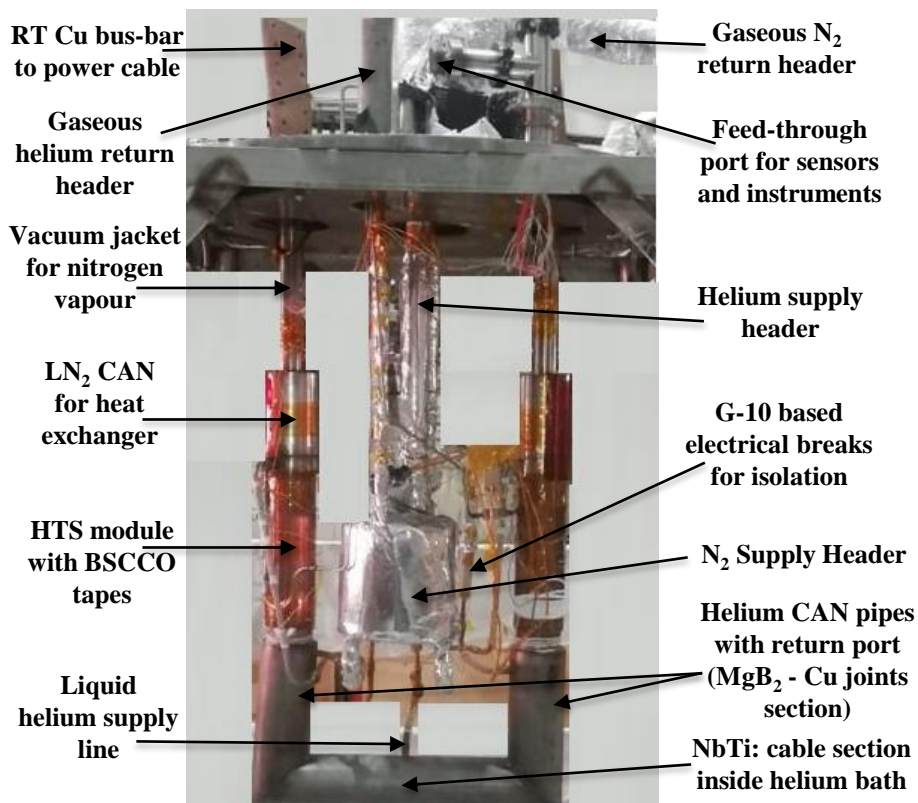


# Test Results of a Prototype HTS Current Lead with MgB<sub>2</sub> and NbTi Superconducting Joints

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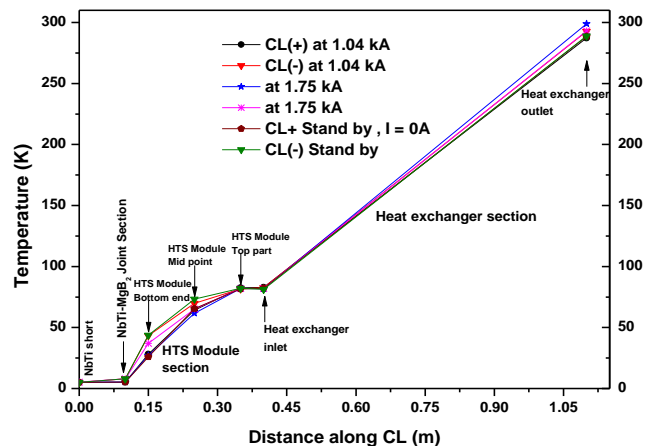
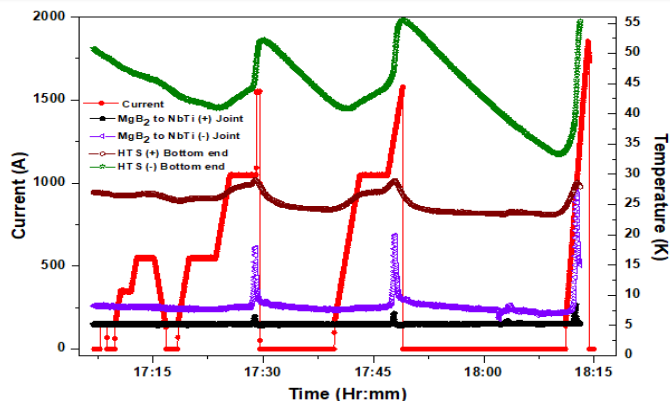
*HTSCL assembly equipped with all instruments on test stand*

- Current leads (CL) bridge the superconducting magnets near 5 K and power supply. They are the main consumer of cooling power in Tokamaks.
- Use of HTS CLs allow to operate well above liquid helium temperatures.
- For testing an indigenously developed prototype HTS CL, its bottom SC joints are prepared using MgB<sub>2</sub> wires as an intermediate between HTS and NbTi cable. Finally assembled CL are validated up to 1.2 kA current. For performance improvement of this CL, its NbTi part is planned to be replaced by a MgB<sub>2</sub> shunt.

*Source: IEEE Transactions on Applied Superconductivity, vol. 33, no. 4, pp. 1-8, June 2023, Art no. 4801408. Published Paper Link: DOI: 10.1109/TASC.2023.3258979*

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## Technical details of prototype HTS CL

Operating current	3.3 kA
Design current	4.12 kA
Heat exchanger	80 K cooled braided Cu wires (RRR: 100; OD: 0.2 mm; Nos. 17500) in SS304L jacket (OD: 38.2 mm)
HTS module	Cu electro-polished SS304L pipe (L: 0.45 m; OD: 0.116 m)
HTS tapes details	BSCCO-2223 tapes (4.34 mm wide; 0.2 mm thick; 42 Nos. vacuum soldered on 21 slots in stacks of two) with $I_c$ of $\sim 100$ K at 80 K, self-field
MgB <sub>2</sub> wires details	36 MgB <sub>2</sub> filaments each with niobium (Nb) as a chemical barrier and a copper (Cu) filament at the centre. Outer sheath material: Monel
Superconducting joints	HTS bottom Cu joint to MgB <sub>2</sub> wires (44 Nos.) and MgB <sub>2</sub> to NbTi: Cu joint

## Measured temperature and its profile along HTS CL

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