UNIVERSITÉ DE GENÈVE
FACULTÉ DES SCIENCES

ARIES

WP14.5 - Measurements @ UNIGE

Carmine SENATORE, Christian BARTH

Département de Physique de la Matière Quantique
Université de Genève, Switzerland

A new probe for High Current, High Temperature Stability

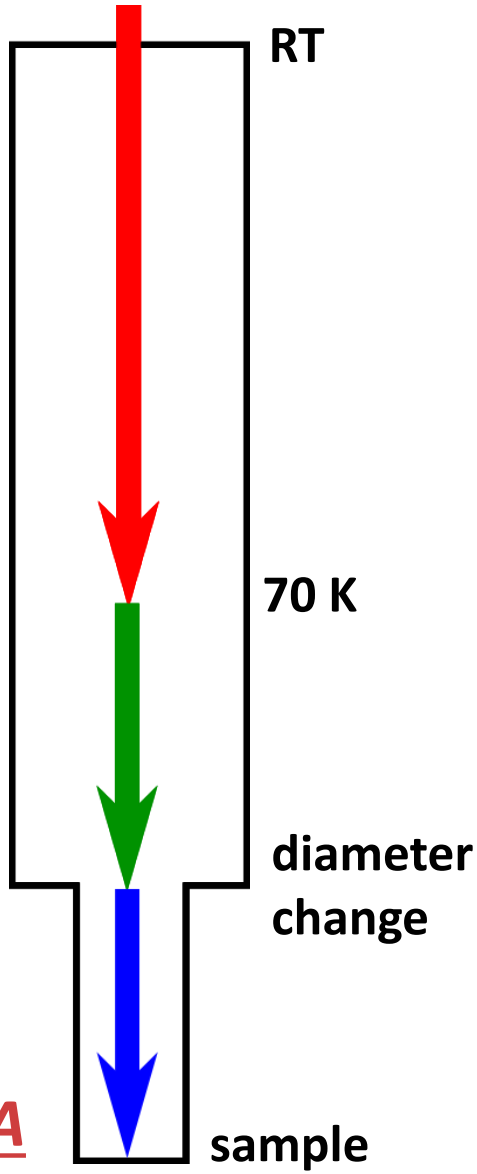
$I_c(B,T,\theta)$ measurements

Three current lead sections

- **RT → 70 K: concentric brass tubes**
  - *He gas cooled*
  - *3 separate gas paths*
- **70 K → diameter change: upper HTS leads**
  - *high number of tapes*
  - *copper stabilized tapes*
  - *no structural metal*

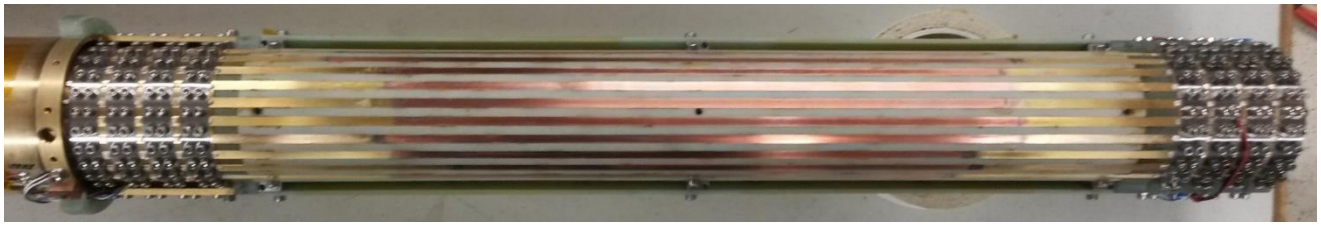
  } **low thermal conductivity**
- **diameter change → sample: lower HTS leads**
  - *low number of tapes*
  - *stabilization free tapes*
  - *no metal*

  } **minimal thermal conductivity**

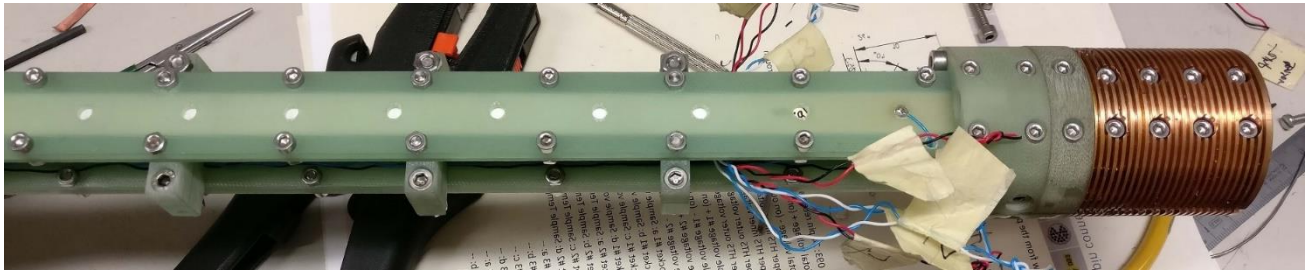


low heat input & high currents – rated @ 2.4 kA

HTS current leads



Upper current lead: 10 stacks of 4 tapes (4 mm wide) per current lead



Lower current lead: 1 stack of 4 tapes (12 mm wide) per current lead

Active compensation for high temperature stability in gas flow

The problem:

Ohmic heating at copper connections of samples to the current leads:

- *generates unavoidable additional heat input during experiments*
- *cannot be compensated by the VTI (response too slow)*
- *determines a sample temperature increase*

The solution:

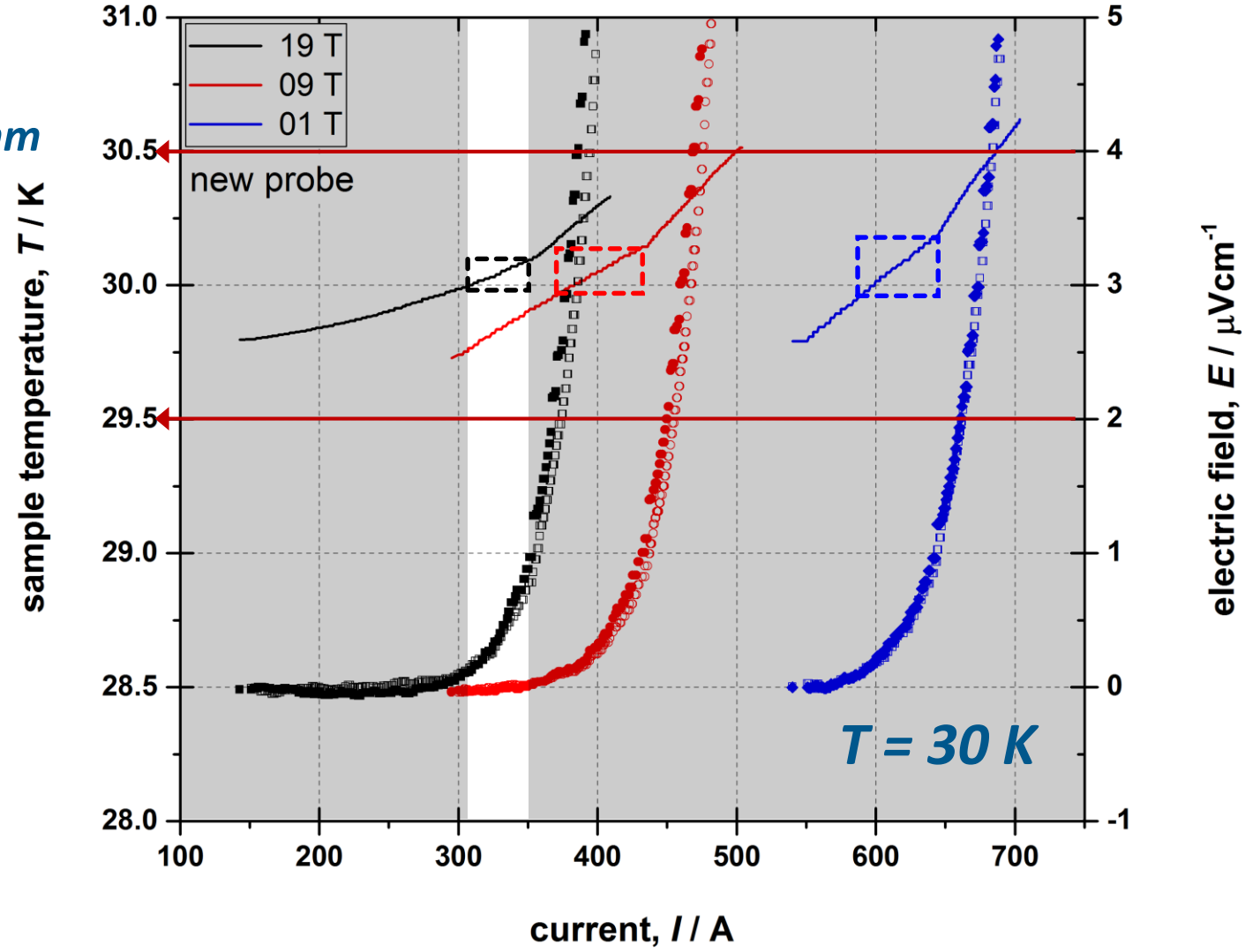
- *Small heaters at the copper connections set to max. ohmic heating power before each experiment*
- *heating power is reduced during the current ramp keeping the total heat power constant via a PID control → stable sample temperature*

Gas flow without active compensation

BHTS #16616-1-2-0

Sample length 120 mm

Parallel field



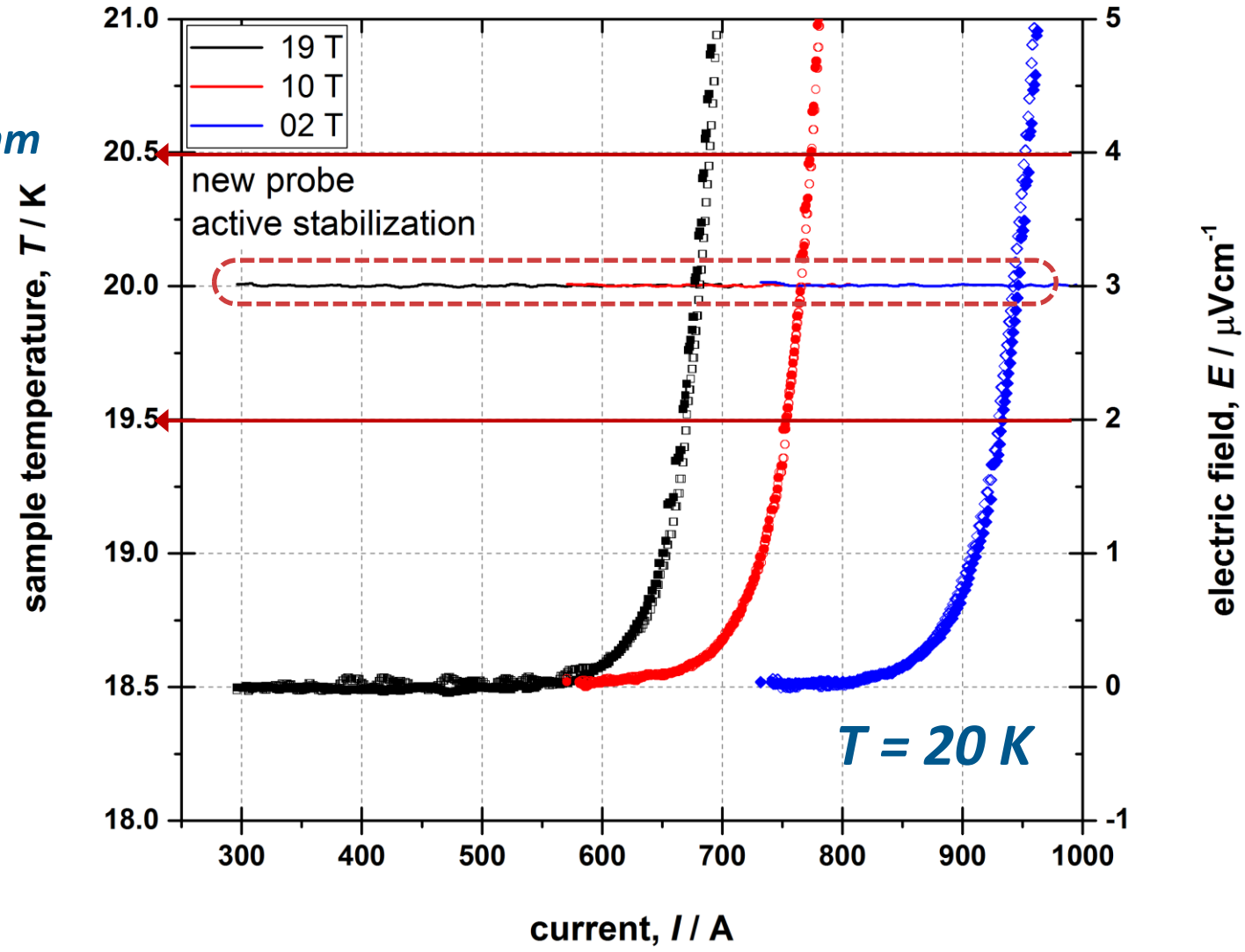
ΔT within ±0.5 K up to 1 kA

Gas flow with active compensation

BHTS #16616-1-2-0

Sample length 120 mm

Parallel field

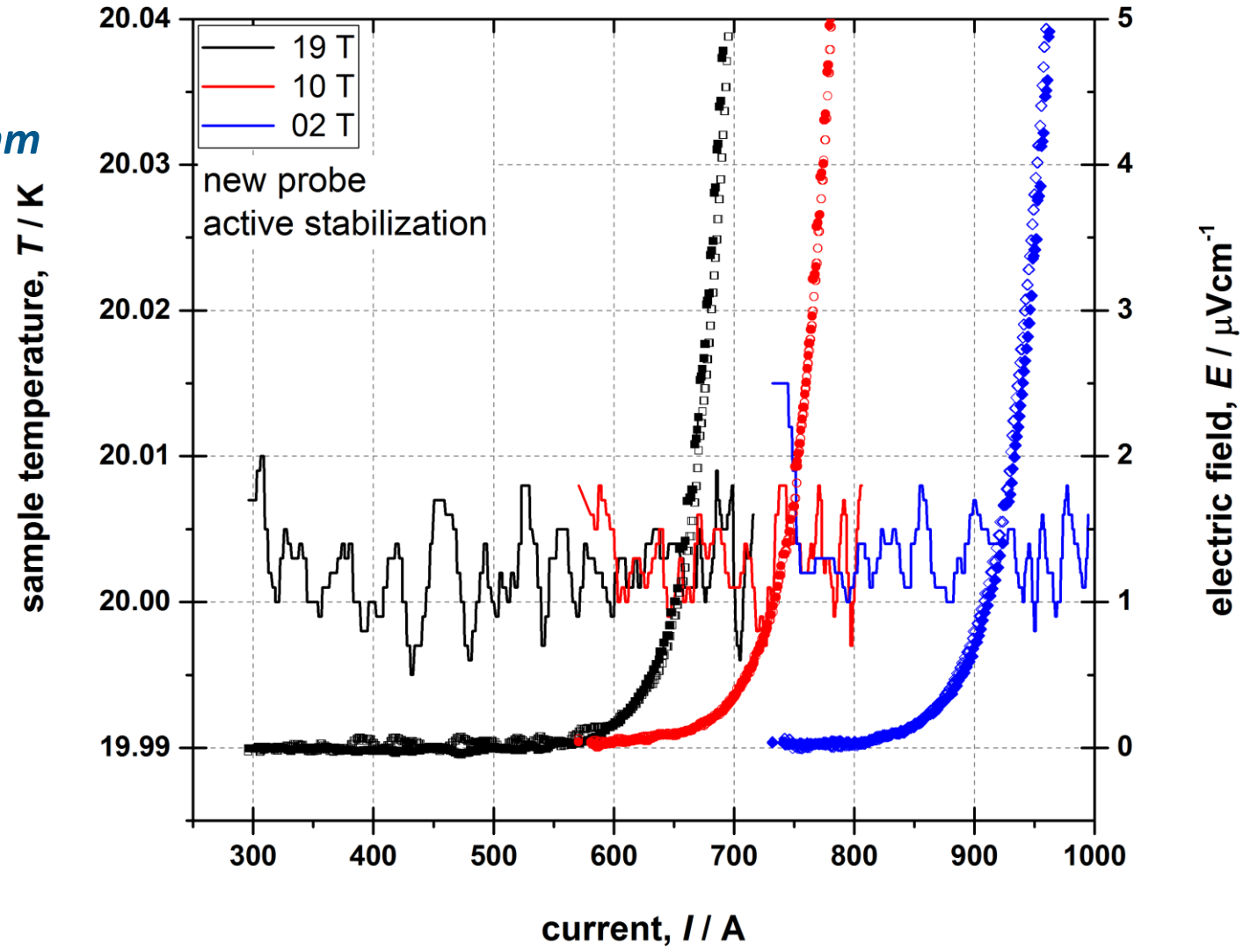


Gas flow with active compensation

BHTS #16616-1-2-0

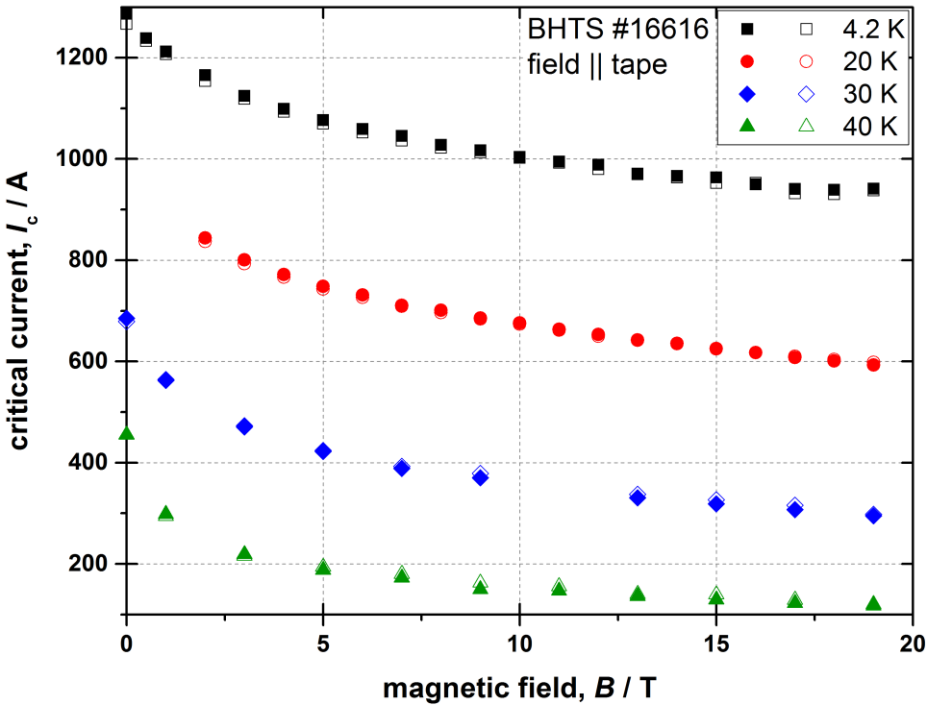
Sample length 120 mm

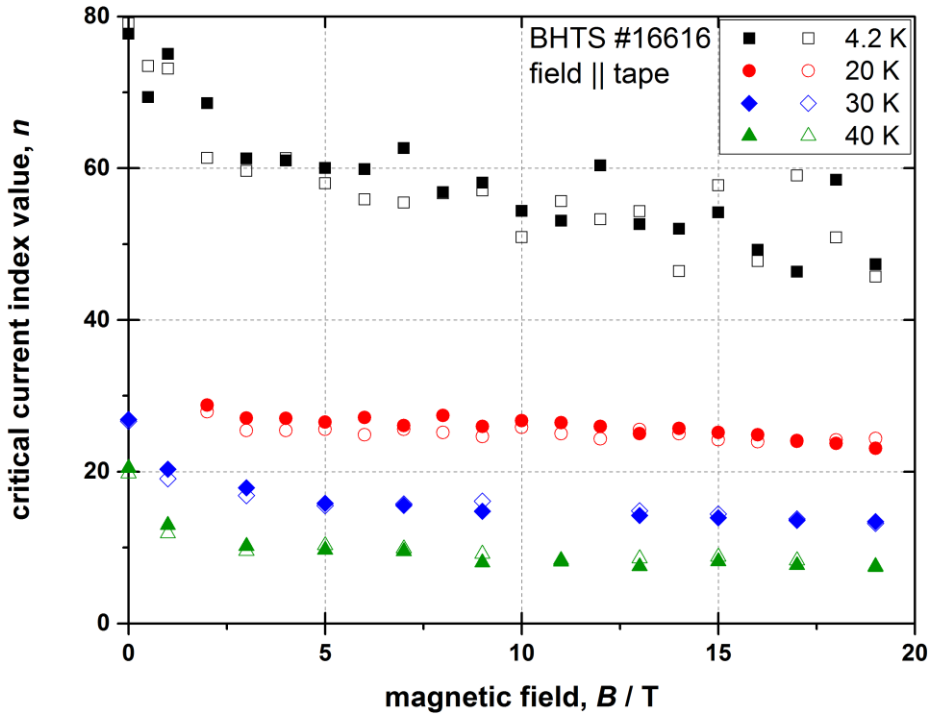
Parallel field



ΔT within ±0.01 K up to 1 kA

Critical current & n-values





Up to 1.5 kA in LHe bath and up to 1 kA in gas flow

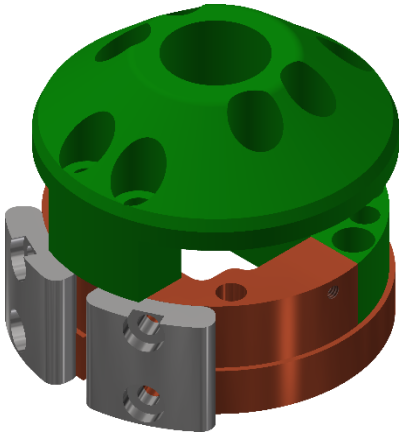
Existing sample adapters

- ***-15°, -7.5°, 0°, 7.5°, 15°, 22.5°, 30°, 37.5°, 45°, 90° tested up to 800 A***

- ***0° high current: tested up 1.5 kA in LHe bath and 1 kA in gas flow***

15°

-15°



0° high current