**Vibrating coils magnetometer: critical current evaluation in REBCO tapes**

**at various temperatures**

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**Introduction**

High temperature superconducting (HTS) wires (Bi-2212) and tapes (REBCO, Bi-2223) capable of carrying high critical currents (Ic) while in high magnetic fields background are paramount for all-superconducting high-field magnet technology advance. As Ic is the key parameter for tapes’ performance, its characterization in high field by reliable and versatile methods is mandatory. Systematic mapping of $I\_{c}\left(B, Θ, T\right) $is crucial also for understanding both vortex pinning and quench mechanisms. However, the high *Ic* values of many conductors makes measurement challenging, especially for off-axis measurements where large torques are present. We developed a Vibrating Coils Magnetometer (VCM) for contact-free magnetization measurements as a function of angle between sample and background field (B), B strength, and temperature (T). The sample can be rotated by 360o around the B direction in up to 31 T magnetic field, while the sample temperature can be stabilized at up to 100K with less than 0.05K variation during measurements.

**Experimental**

The pick-up coils movement is driven by a piezoelectric actuator. We use two heaters to vary the temperature up to 100 K with great stability. One heater is placed close to the sample, directly on the sample rotator, while the second is wrapped around the sample space and kept 10 K lower than the desired temperature.

**Results**



Figure 1 (a) Magnetization loops from VCM in REBCO conductor at various temperatures. b) lines: Ic extracted from VCM data (Ic ~ V+-V-) compared to transport data (symbols) by adjustment in one point (10 T, 20 K)

**Conclusions**

VCM magnetization raw data provide *Ic* values in good agreement with the measured transport *Ic* values (Fig.1 a). Our VCM provides complementary data to 4-probe transport critical current to complete the characterization of highly anisotropic materials at low T and B, and at high angle and high B, regimes in which transport techniques fail often due to high Ic related experimental issues. As a final note, VCM measurements consume, in average, less than 20% of the LHe required for transport measurements.

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