SRF 2021

28 June 2021 – 02 July 2021

Seebeck Coefficient Measurement at Cryogenic Temperatures for the LCLS-II HE Project *

Paper ID: THPFDV006

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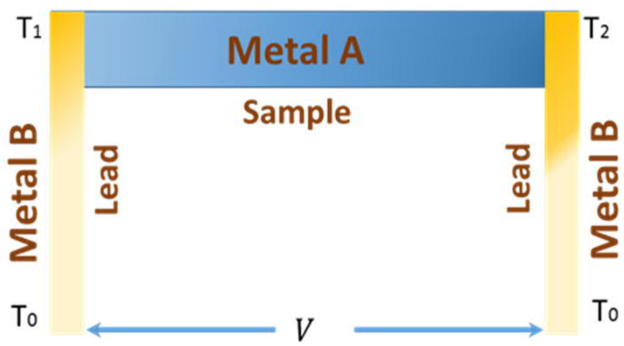
Abstract

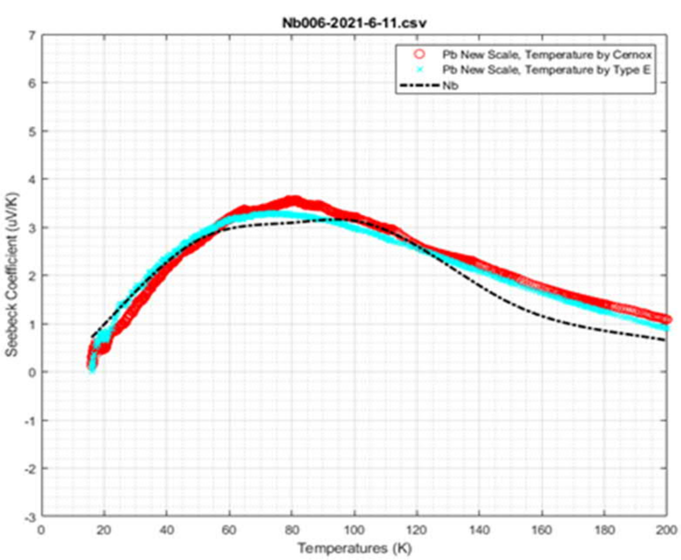
Reducing thermoelectric currents during cooldown is important to maintain high quality factors (Q_0) of the cavities in the LCLS-II HE cryomodules. The temperature-dependent Seebeck coefficients of the materials used in the cryomodules are needed for quantitative estimation of thermoelectric currents. In this work, we present a set-up for cryogenic Seebeck coefficient measurements as well as the measured Seebeck coefficients of high-pure niobium at cryogenic temperatures between 4K and 200K.

Measurement Method:

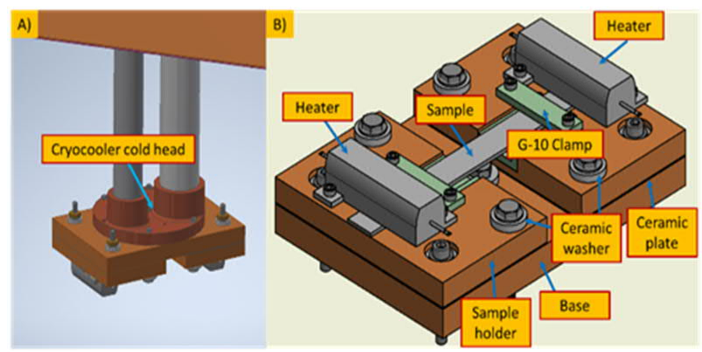


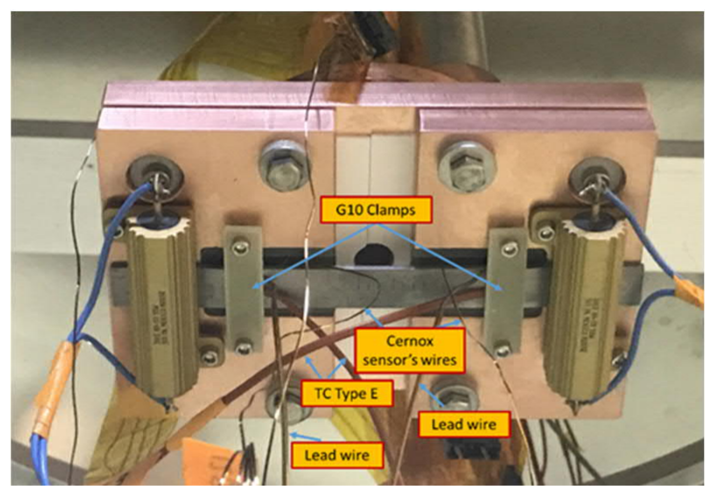
$$(\ _{ave}) = -\frac{\ }{\Delta} + (\ _{ve}).$$

Measurement Results of Nb:



Measurement Set-up:





Conclusion

The measurement results of niobium is consistent with the results from literature, which proved the measurement system works properly. The main measurement errors came from temperature measurements due to poor thermal contact of sensors and sample surface. A improvement will be made for future tests.

*** Work supported by the US DOE and the LCLS-II-HE Project.**

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