Low-temperature thermal conductivity measurements of Al$_2$O$_3$ ceramic for use in bolometric particle detector$^1$ ALEXEY DROBIZHEV, UC Berkeley; Lawrence Berkeley National Laboratory, CUORE COLLABORATION$^2$ — Bolometric particle detectors for rare weak processes operate at temperatures as low as 10mK and are background-dependent, so radiopure structural materials such as alumina ceramic (Al$_2$O$_3$) are of interest, and their thermal properties in the very low temperature regime must be understood. Our experiments are conducted in a dilution refrigerator, with heaters being used to create temperature gradients across elongated alumina samples of different cross-sectional geometries mounted in copper clamps, with one end thermalized on the 10mK plate of the cryostat. Temperatures of both ends are measured with RuO$_2$ resistance thermometers, and thermal conductivity $k(T)$ can be determined using the relationship $\frac{dQ}{dt} = \frac{A}{l} \int k(T) dT$, where $\frac{dQ}{dt}$ is heating power, $A$ is cross-sectional area of the sample, $l$ is its length, and $T$ is temperature. Absolute values and temperature dependence of thermal conductivity of the alumina samples were measured and compared to well-investigated single-crystal sapphire properties. Thermal conductivity of other materials of interest was also investigated; the results will be presented.

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