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LAWRENCE BERKELEY LABORATORY - UNIVERSITY OF CALIFORNIA		CODE	SERIAL	PAGE
ENGINEERING NOTE		D32291	M5212	1 of 4
AUTHOR	DEPARTMENT	LOCATION	DATE	
N. KATSUBE	MECHANICAL ENGINEERING	BERKELEY	July 31, 1978	
PROGRAM - PROJECT - JOB				
DOUBLET III BEAMLINE SYSTEM				
NBIS CRYOPANEL				
TITLE				
THERMAL CONDUCTIVITY INTEGRAL FOR ALUMINA				

The heat leak in a cryogenic support whose ends are at temperatures T_1 and T_2 is given by:

$$Q = \frac{A}{L} \int_{T_1}^{T_2} k dT$$

Alumina is a common material used at LBL for thermal and electrical insulation when organic materials are not allowed due to high vacuum reasons.

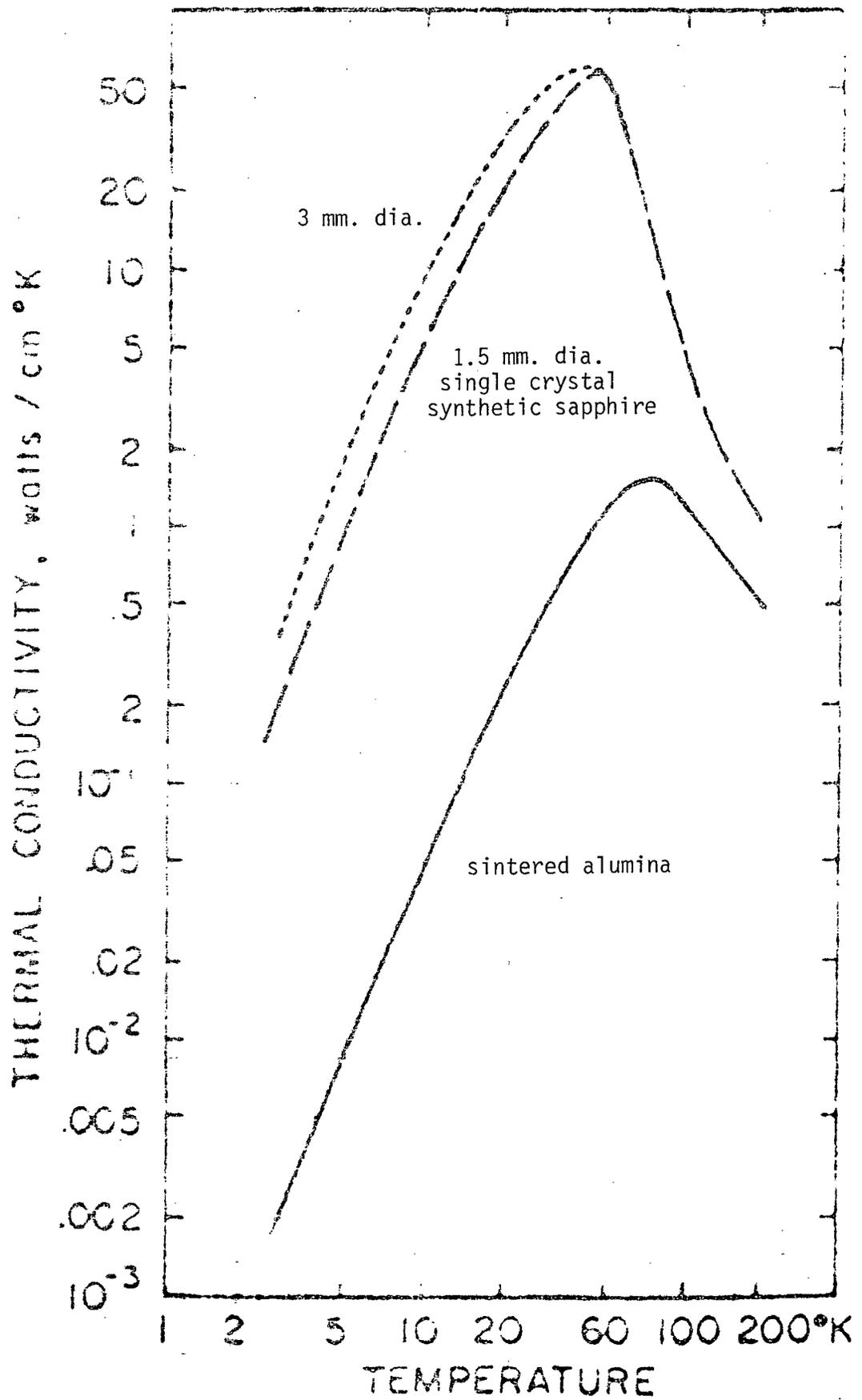
The thermal conductivity of Alumina was measured by Berman¹. His curves are replotted in linear coordinates and the thermal conductivity integral is computed and plotted against temperature.

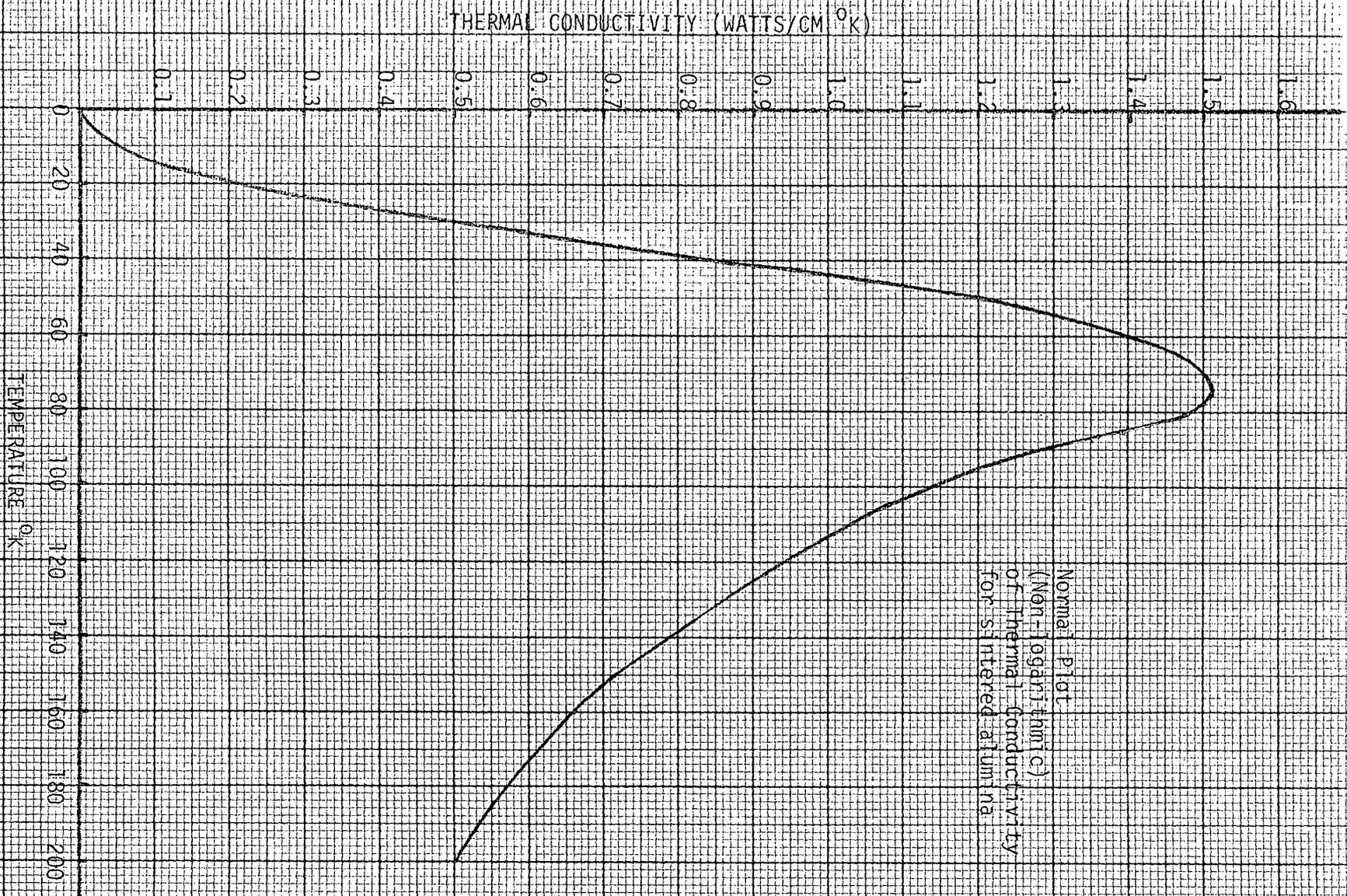
For the sake of comparison, the thermal conductivity integrals of various materials for temperature range from 4°K to 80°K are listed below

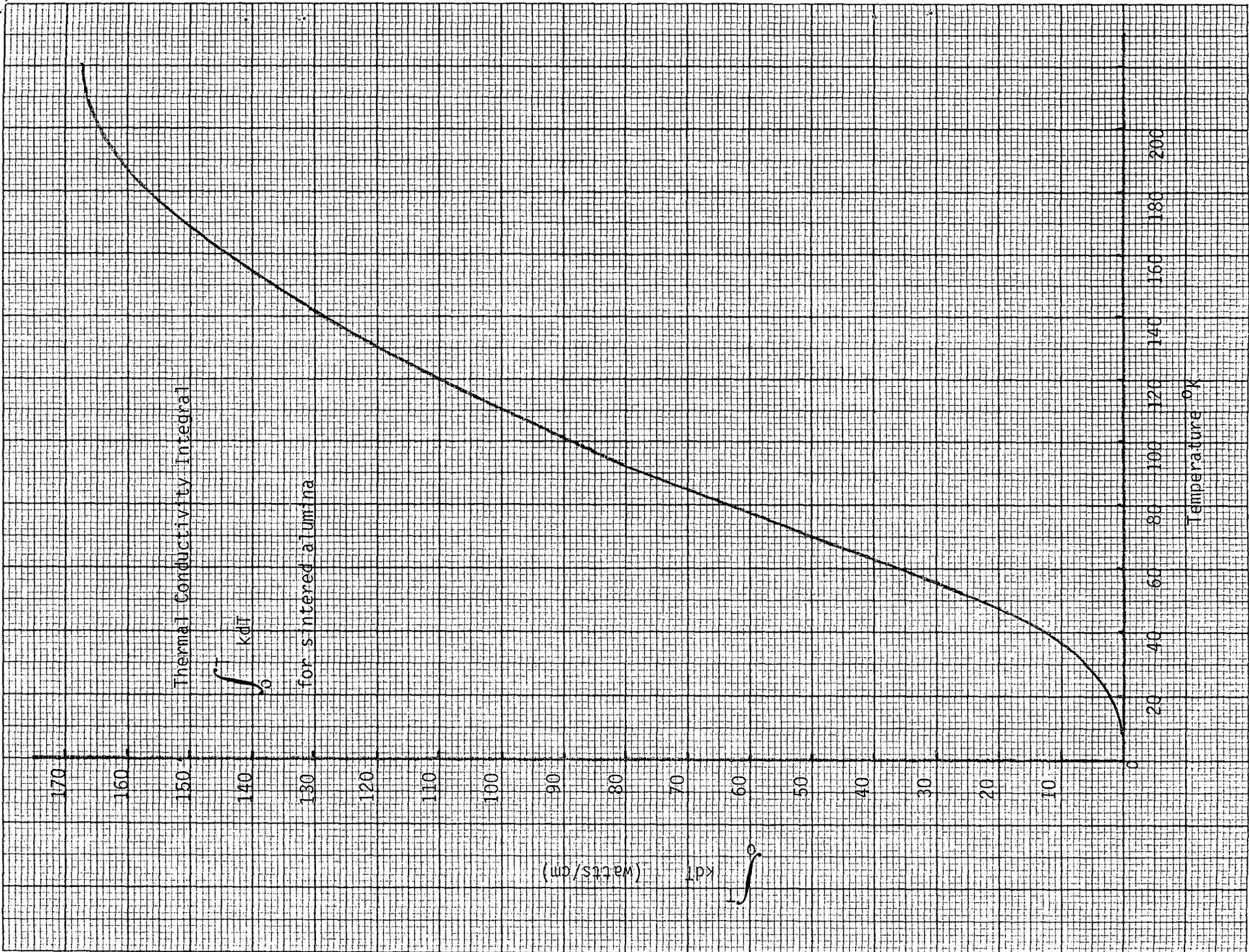
$\int_{4^{\circ}\text{K}}^{80^{\circ}\text{K}}$	kdT for Stainless Steel	=	3.49 watts/cm
	Alumina	=	64.00 watts/cm
	6063 Aluminum	=	167.00 watts/cm
	1100 Aluminum	=	233.00 watts/cm
	OFHC Copper	=	600.00 watts/cm
	ETP Copper	=	700.00 watts/cm

The alumina is a poor thermal insulator compared to stainless steel. Thus, it is only used as a standoff when electrical insulation is required. For instance, the Doublet III cryopanel requires electrical insulation due to eddy current problems.

¹Berman, R., Proc. Phys. Soc. (London) Ser. A, Vol. 65, p.1029 (1952)







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