Fermilab

TM-792
1600.000

WARM-UP CHARACTERISTIC OF DOUBLER MAGNET

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Beginning at room temperature, RCB-80 was heated with a current of 10 amps dc for two hours. The magnet was horizontal in the test cryostat without vacuum. Thermocouples were placed in the bore on the coils to monitor temperature. The magnet voltage was measured to monitor the magnet resistance. The result is indicated in the graph.

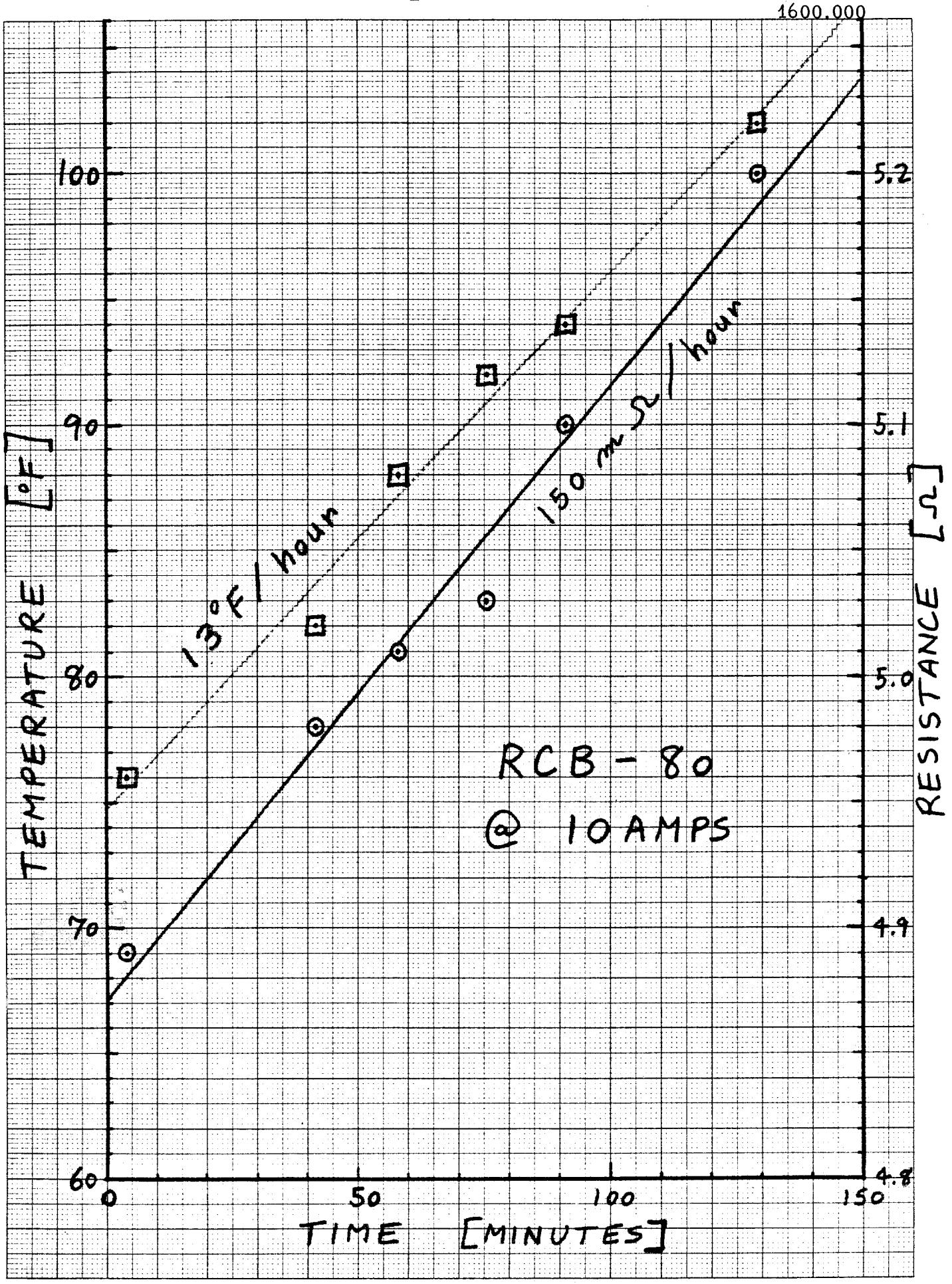
$$\beta = \frac{\Delta R}{\Delta t} = 150 \text{ m}\Omega/\text{hr} \qquad R_o = 4.8\Omega$$

$$\alpha = \frac{1}{R_o}\frac{\Delta R}{\Delta T} = 3.8\ 10^{-3}/°\text{F}^*$$

$$\frac{\Delta T}{\Delta t} = \frac{\beta}{\alpha R_o} = 8.3°\text{F/hr}$$

The temperature measurement and the resistance measurement agree roughly. The room temperature warm-up rate of a Doubler magnet is 11±3°F/hr at 10 amps.

*M.Kuchnir,J.L.Tague, Measurement of Resistance vs Temperature of 23 Strand Superconducting Cable, TM-679, 8/2/76


TEMPERATURE [°F]
100
90
80
70
60
RESISTANCE [Ω]
5.2
5.1
5.0
4.9
4.8
0
50
100
150
TIME [MINUTES]
13°F / hour
150 mΩ / hour
RCB - 80
@ 10 AMPS