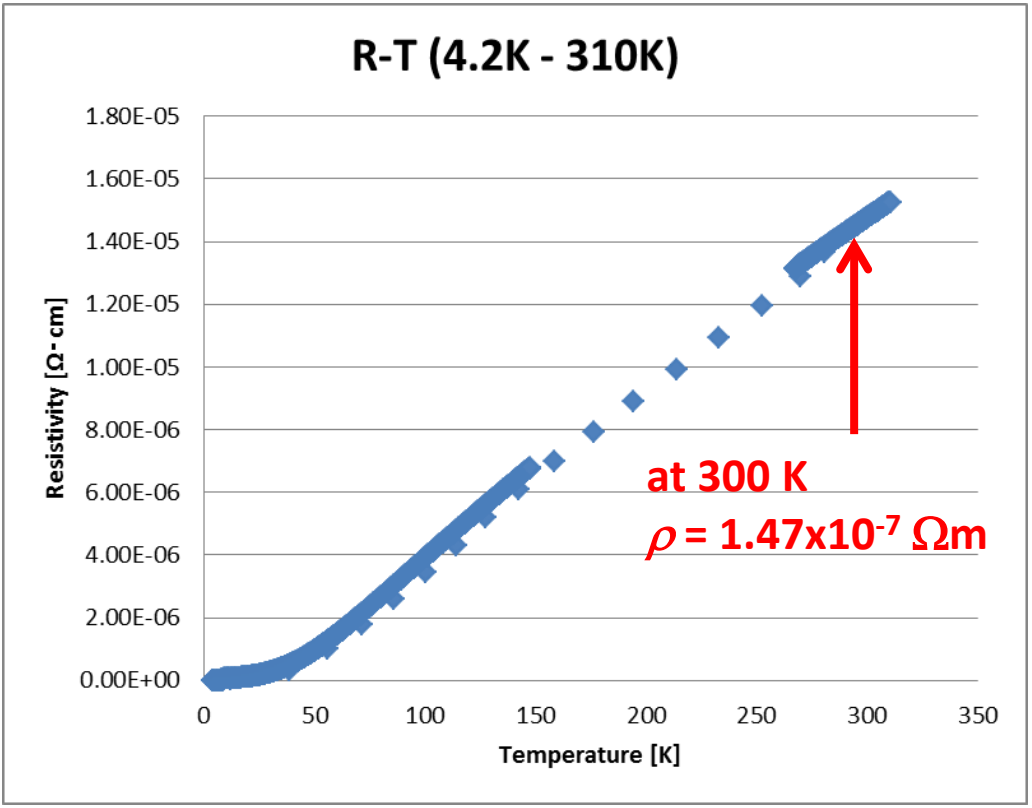
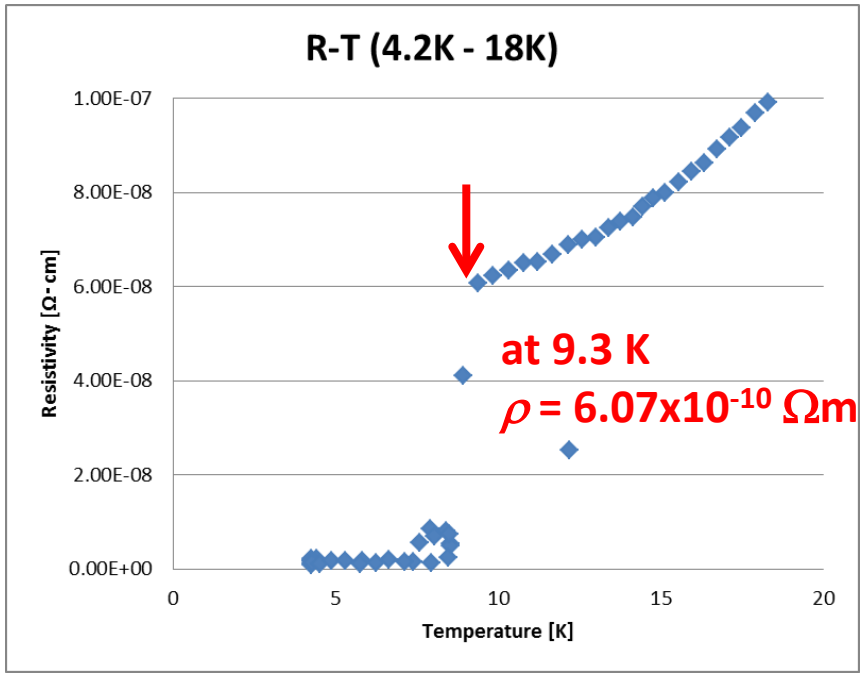
Exercise (2)

Please calculate the RRR value of Nb sample and make a figure of temperature dependence of the resistivity.





RRR = 242.2

Exercise (1)

Please measure and calculate following parameters;

Cu sample at RT

I = 100 mA
V = 6.380 μV
R = 6.38×10^{-5} Ω

L = 40 mm
W = 5.25 mm
t = 2.0 mm
S = 1.05×10^{-5} m^2

ρ = 1.67×10^{-8} Ω m

Frequency = 1300 MHz
Rs = 9.25 mΩ

G = 270 Ω
Q = 29189

Nb sample at RT

I = 100 mA
V = 44.76 μV
R = 4.48×10^{-4} Ω

L = 40 mm
W = 5.0 mm
t = 2.5 mm
S = 1.25×10^{-5} m^2

ρ = 1.40×10^{-7} Ω m

Frequency = 1300 MHz
Rs = 26.8 mΩ

G = 270 Ω
Q = 10075

Nb sample at 9.3K

I = 100 mA
V = 0.186 μV
R = 1.86×10^{-6} Ω

L = 40 mm
W = 5.0 mm
t = 2.5 mm
S = 1.25×10^{-5} m^2

ρ = 5.81×10^{-10} Ω m

Frequency = 1300 MHz
Rs = 1.73 mΩ

G = 270 Ω
Q = 156069

Exercise (3)

Please measure and calculate following parameters;

Cu cavity

Frequency = 1295.1 MHz
Loaded Q_L = 25000
P_{ref} : S_{11} = -1.07 dB
P_{ext} : S_{21} = -36.6 dB

Q_0 = 26540
Q_{in} = 4.17×10^5
Q_{ext} = 2.47×10^7
β_{in} = 0.0616 (under)

Z = 91. P_{in} = 1.0 W
E_{acc} = 6921 V/m

G = 270 Ω
R_S = 10.0 mΩ
ρ = 1.95×10^{-8} Ω m

Nb cavity

Frequency = MHz
Loaded Q_L = 4779
P_{ref} : S_{11} = dB
P_{ext} : S_{21} = dB

Q_0 = 9558
Q_{in} =
Q_{ext} =
β_{in} = 1.0

Z = 91. P_{in} = 1.0 W
E_{acc} = V/m

G = 270 Ω
R_S = 28.2 mΩ
ρ = 1.55×10^{-7} Ω m

$$P_{ref} = 10^{\frac{S_{11}}{10}} \cdot P_{in} \; [W]$$

$$P_{ext} = 10^{\frac{S_{21}}{10}} \cdot P_{in} \; [W]$$

Exercise (4)

Please compare following parameters measured by DC and RF;

Frequency = 1300 MHz
G = 270 Ω

Copper

DC:

Q_0 = 29189
R_S = 9.25 mΩ
ρ = 1.67×10^{-8} Ω m

RF:

Q_0 = 26540
R_S = 10.0 mΩ
ρ = 1.95×10^{-8} Ω m

Niobium

DC:

Q = 10075
Rs = 26.8 mΩ
ρ = 1.40×10^{-7} Ω m

RF:

Q_0 = 9558
R_S = 28.2 mΩ
ρ = 1.55×10^{-7} Ω m