Weekly report

2019/07/23

Work status

Up to last week (~ 7/10)

- Attached three MMC+SQUID sets to ADR(adiabatic dilution refrigerator)

1st set : 1.4*1.3mm^2 in both side (5% sensor(Ag:Er) area difference)

2nd set : 1.4*1.3mm^2 in one side

3rd set : 1*1mm^2 in both side with Po210 source -> to check that equal amount of current is flowing in pick-up coil

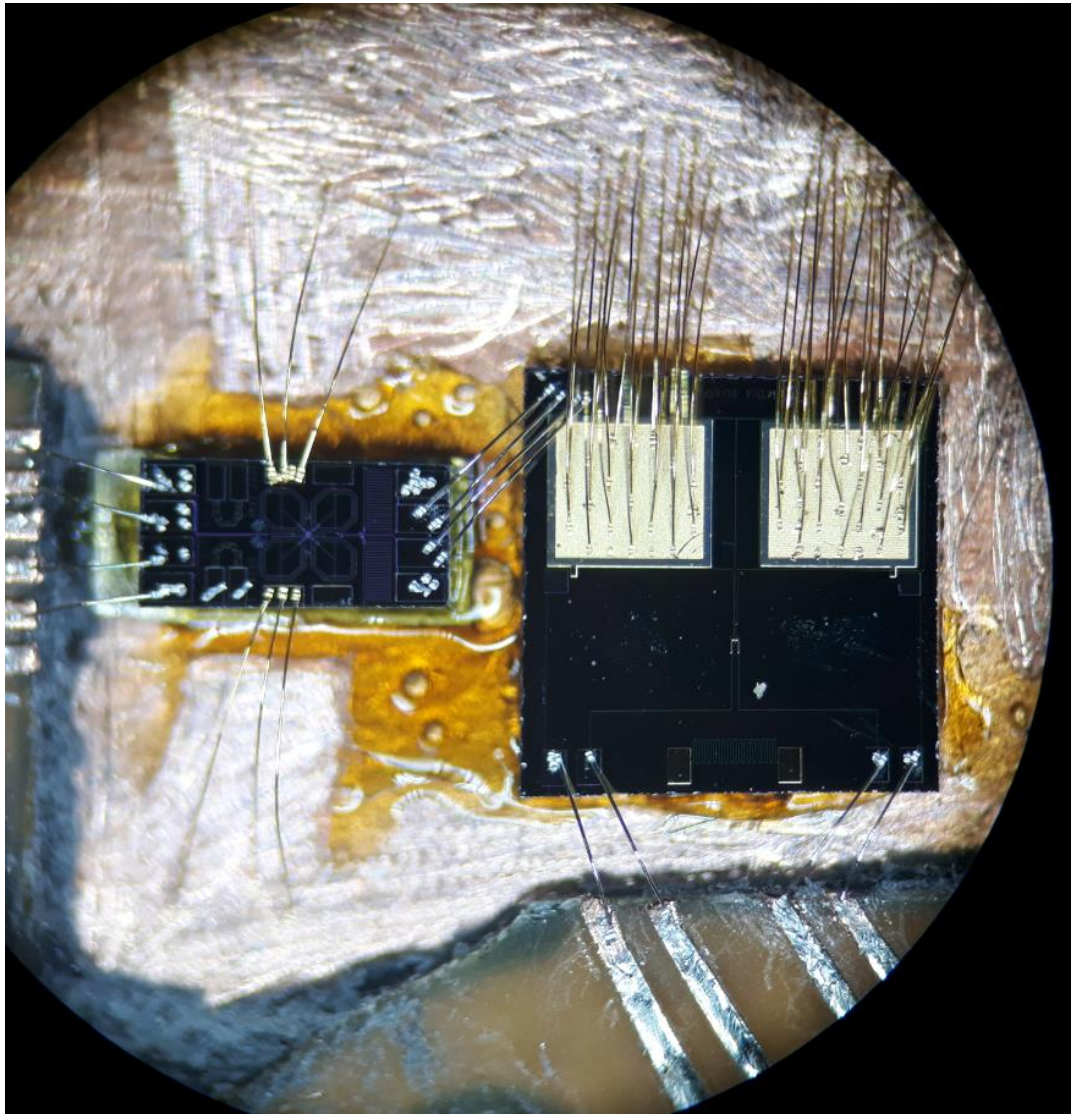
- Lowered the temperature down to 2.7K with vacuum pump and compressor

However, short resistances were measured at 2.7K & 300K

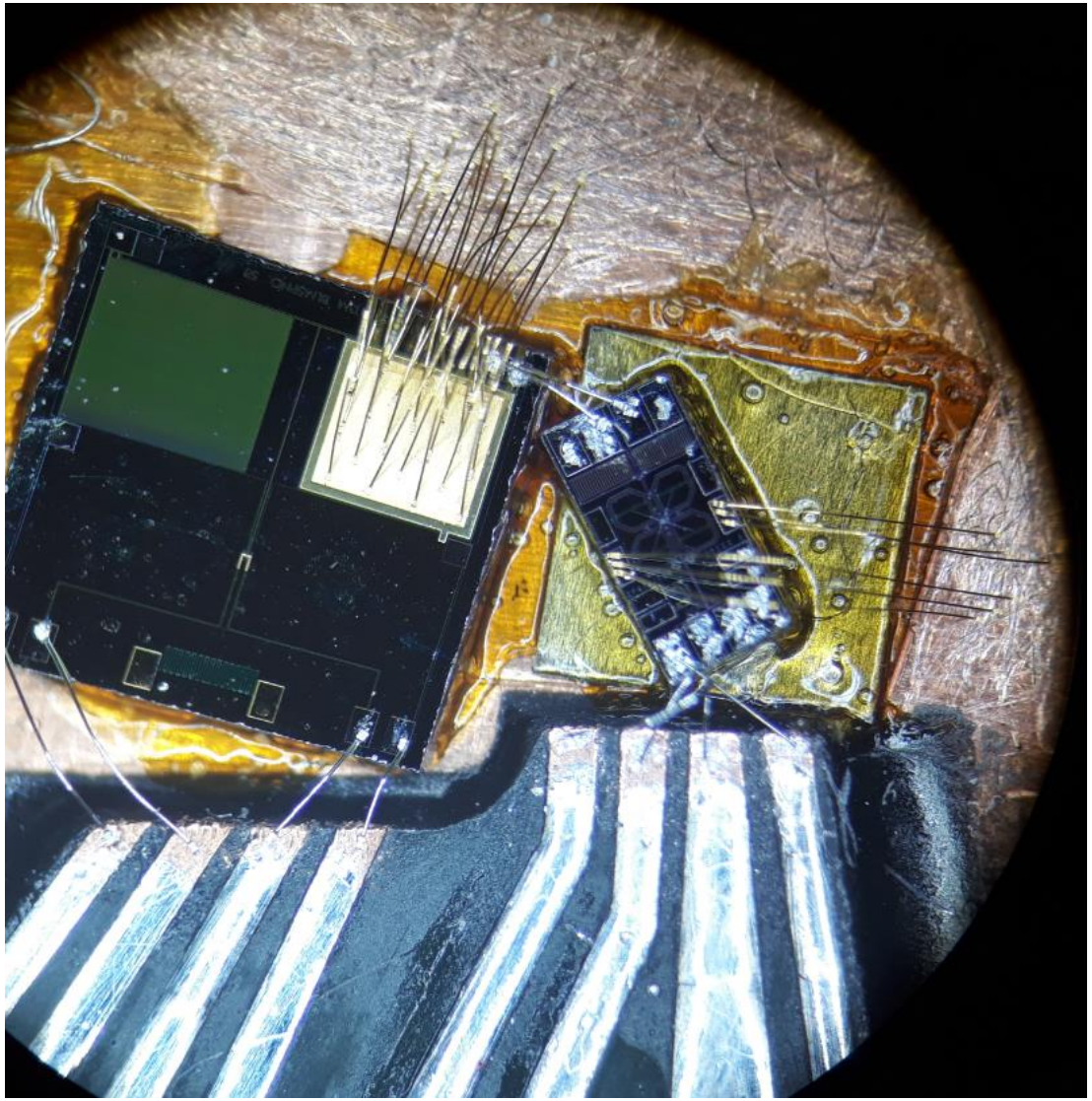
-> current status : replacing problematic SQUIDs and MMC

1. Setup figure

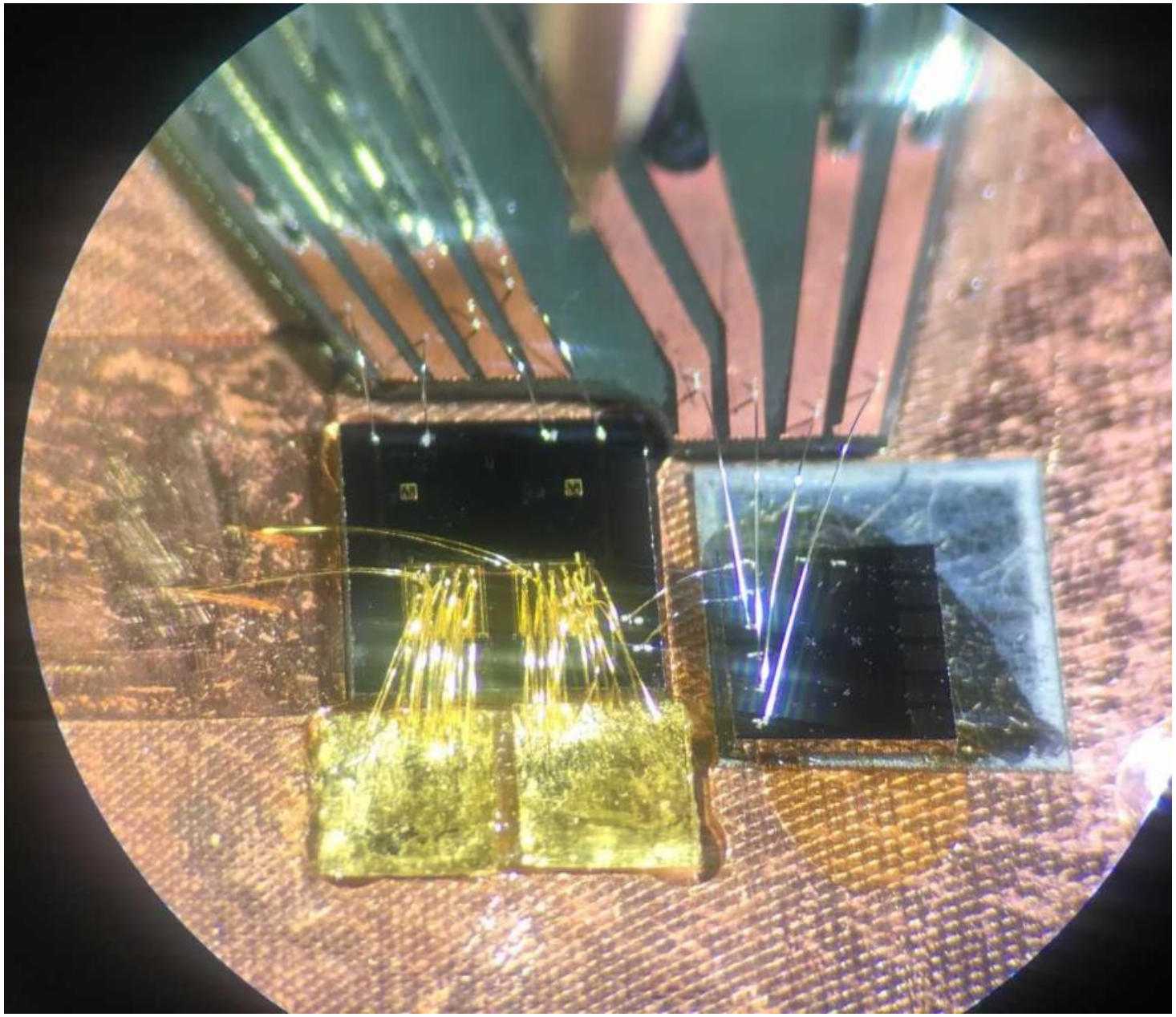
1st set
MMC : A17_02_1413M_BLM5P_057
SQUID : JENA_2018_050

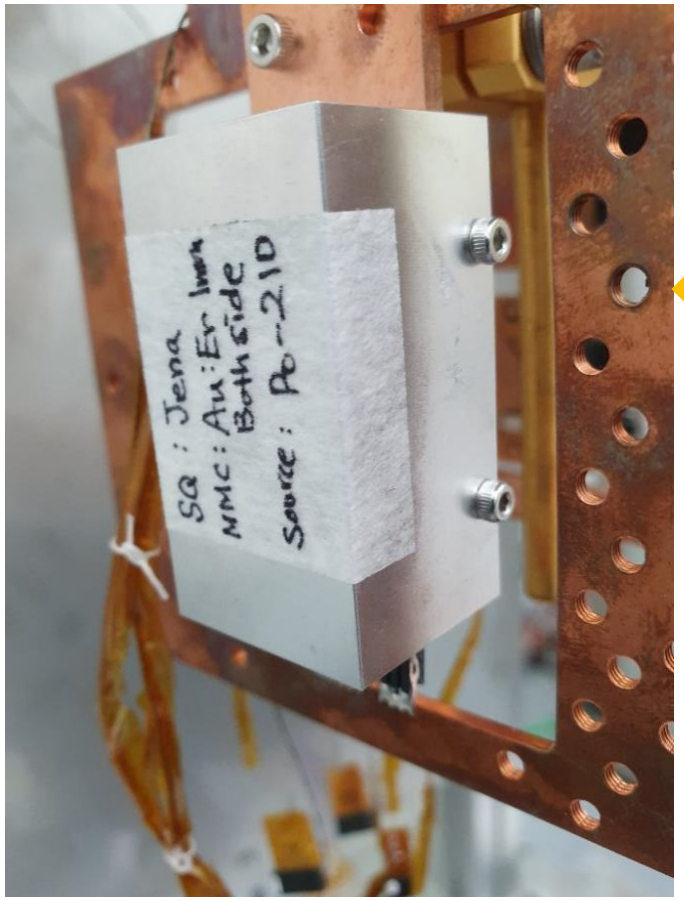


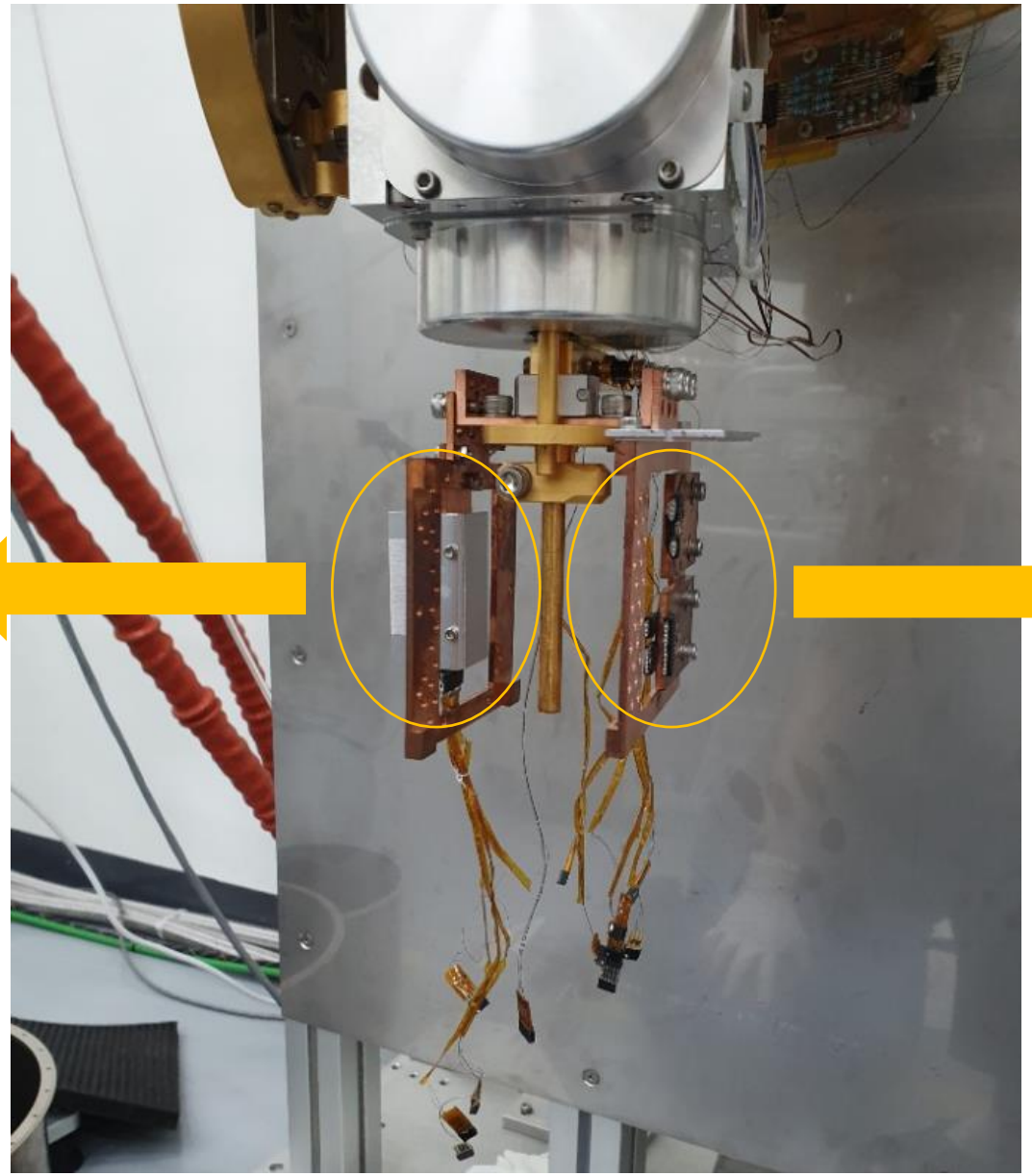
2nd set
MMC : A17_02_1413M_BLM5P_058
SQUID : JENA_2018_048

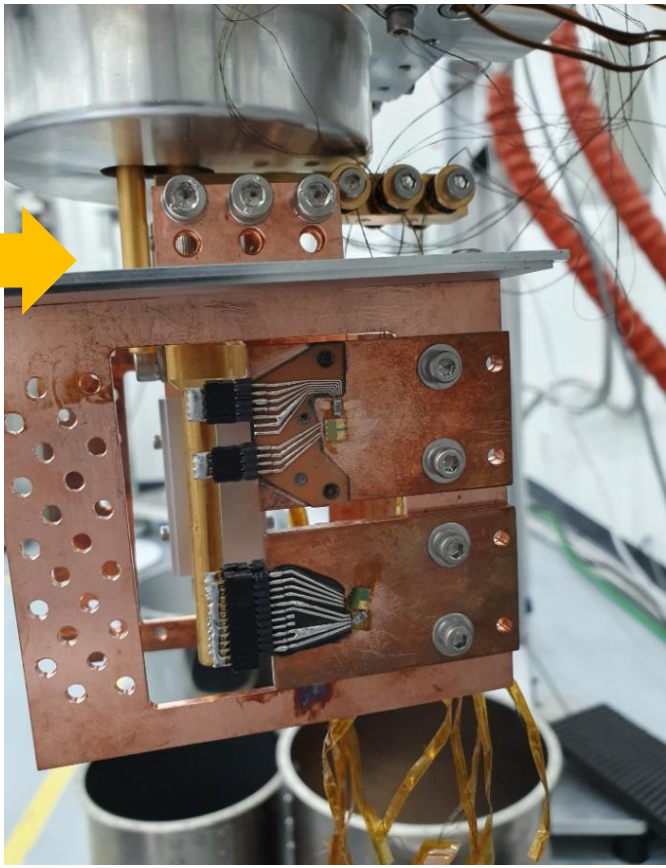


3rd set
MMC : Au:Er 1*1mm^2
SQUID : JENA(ID:1499 A551, Type: VC1ABlue, N=6)



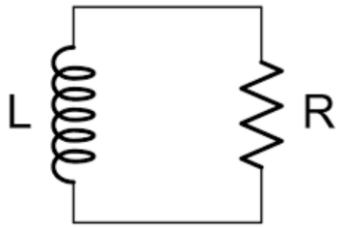

SQ : Jena
NMC : Au:Er Imm
Both sides
Source : Po-210





4k noise measurement (Johnson noise)

: to measure the inductance of MMC pick-up coil(meander coil)



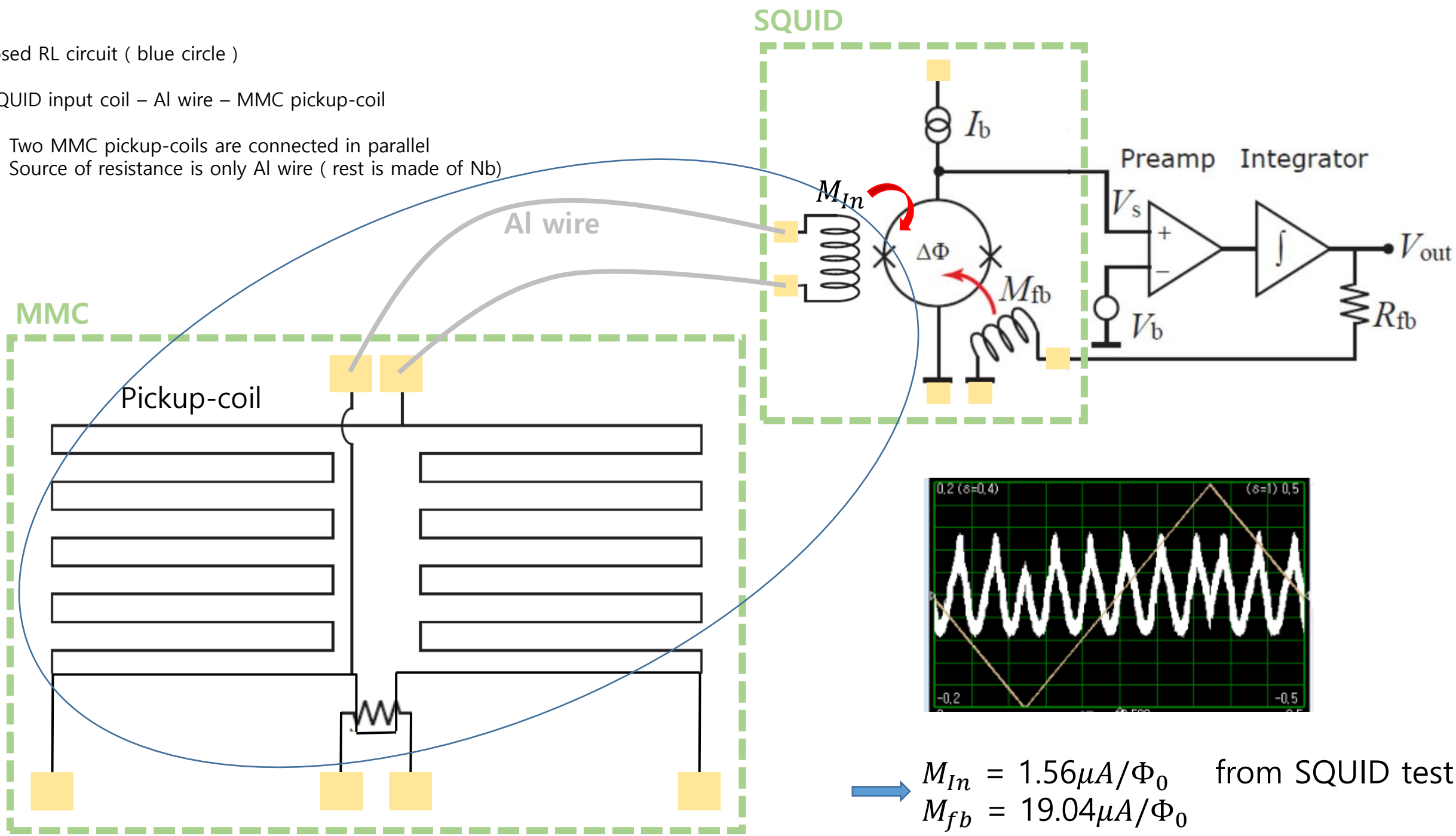
$$\langle I(f)^2 \rangle = \frac{4k_B T}{R} \frac{1}{1 + (\frac{2\pi f L}{R})^2}$$

-> Johnson noise in $\Phi_0 = M_{In} * \sqrt{\langle I(f)^2 \rangle}$

Closed RL circuit (blue circle)

: SQUID input coil – Al wire – MMC pickup-coil

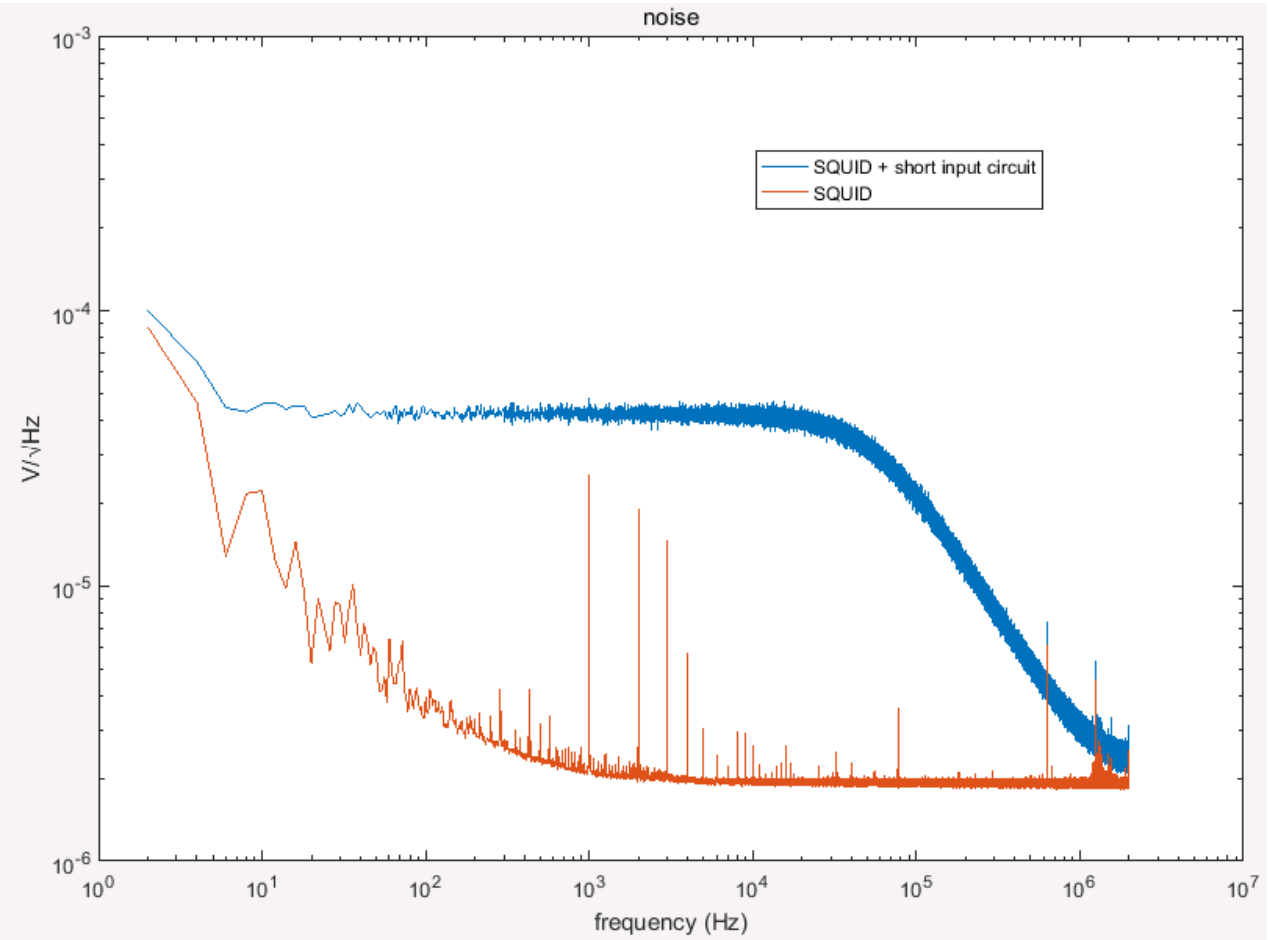
- Two MMC pickup-coils are connected in parallel
- Source of resistance is only Al wire (rest is made of Nb)

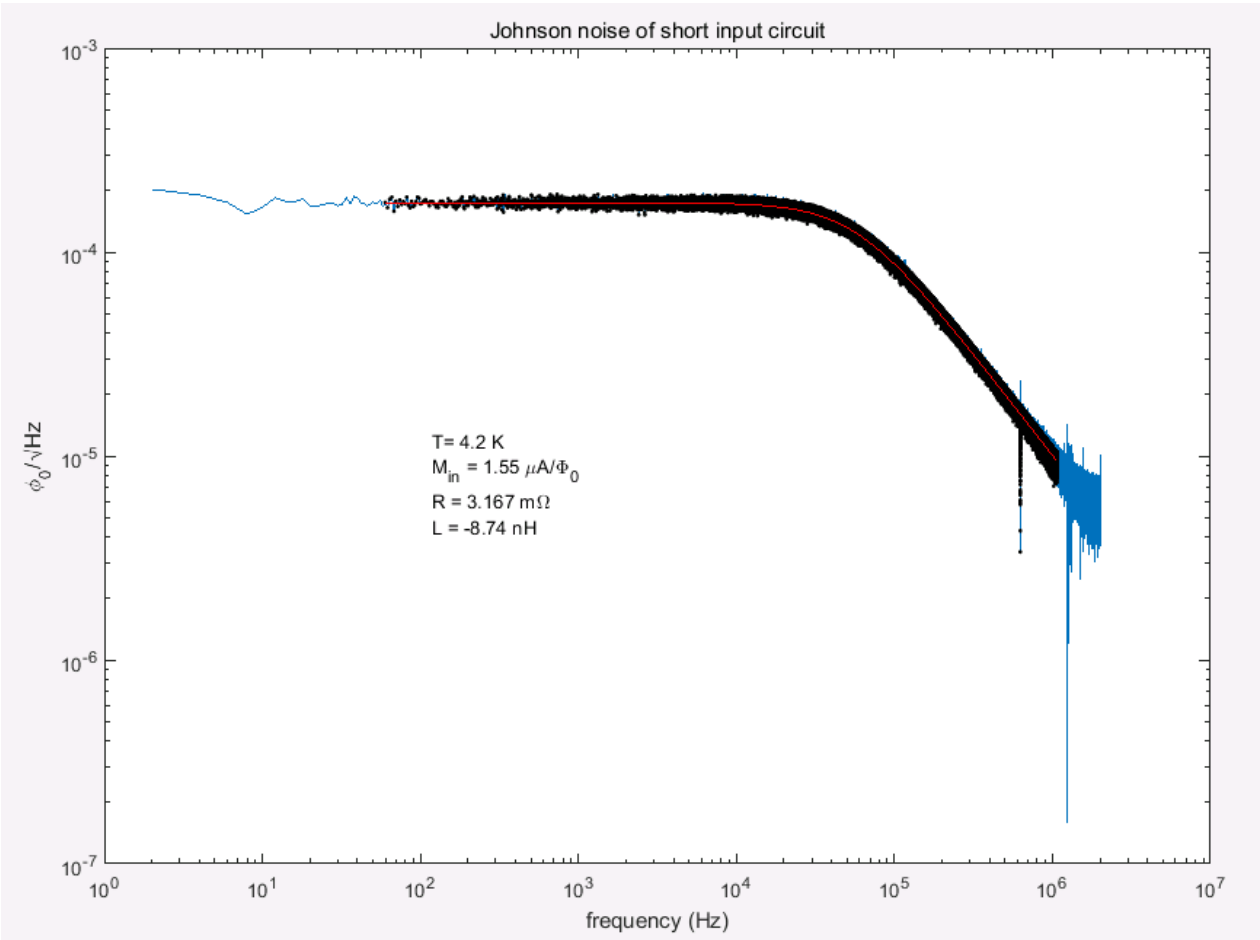


$M_{In} = 1.56\mu A/\Phi_0$ from SQUID test

$M_{fb} = 19.04\mu A/\Phi_0$

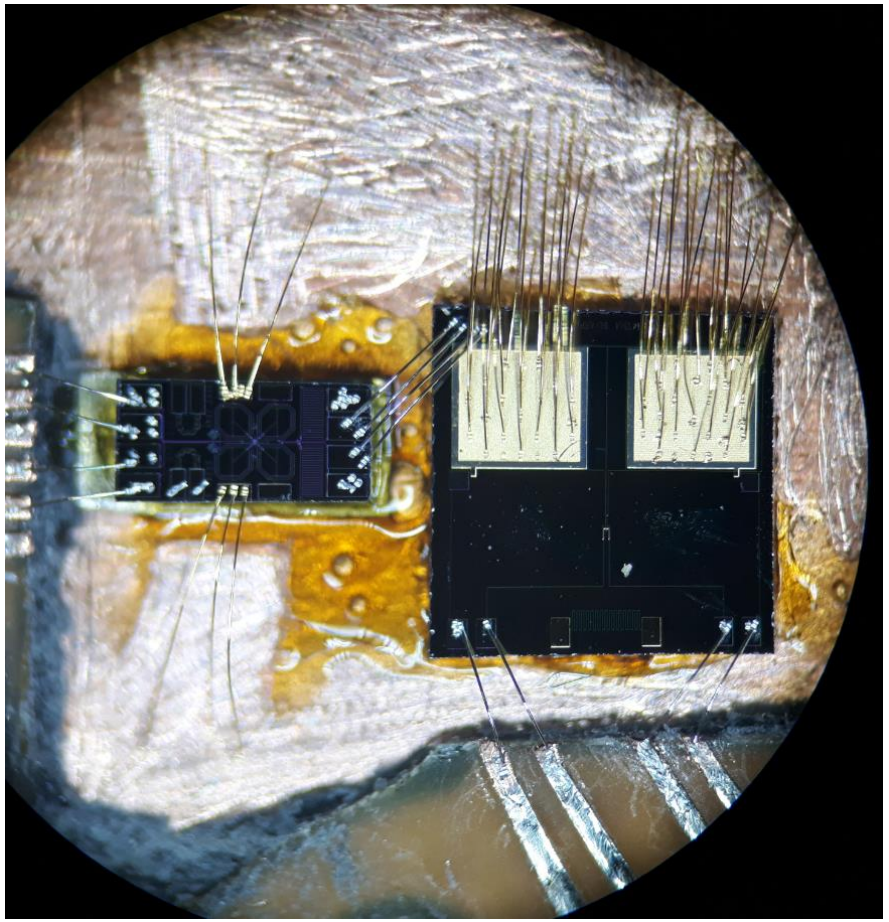
After subtraction of SQUID noise

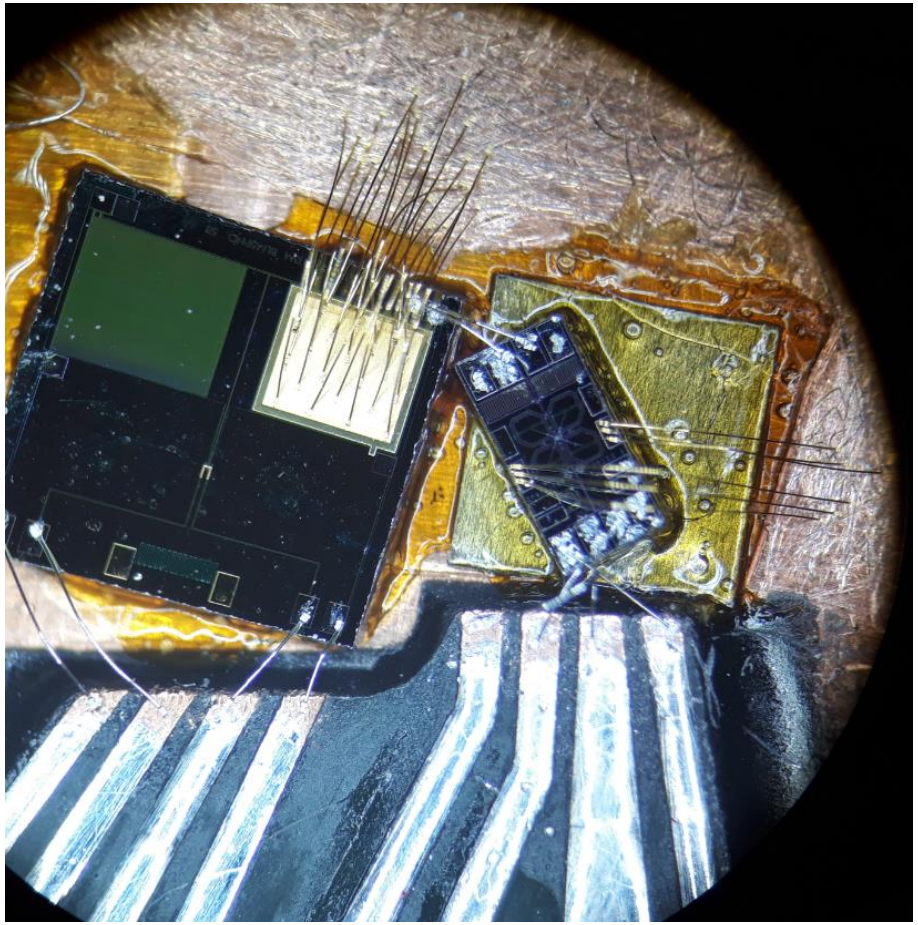


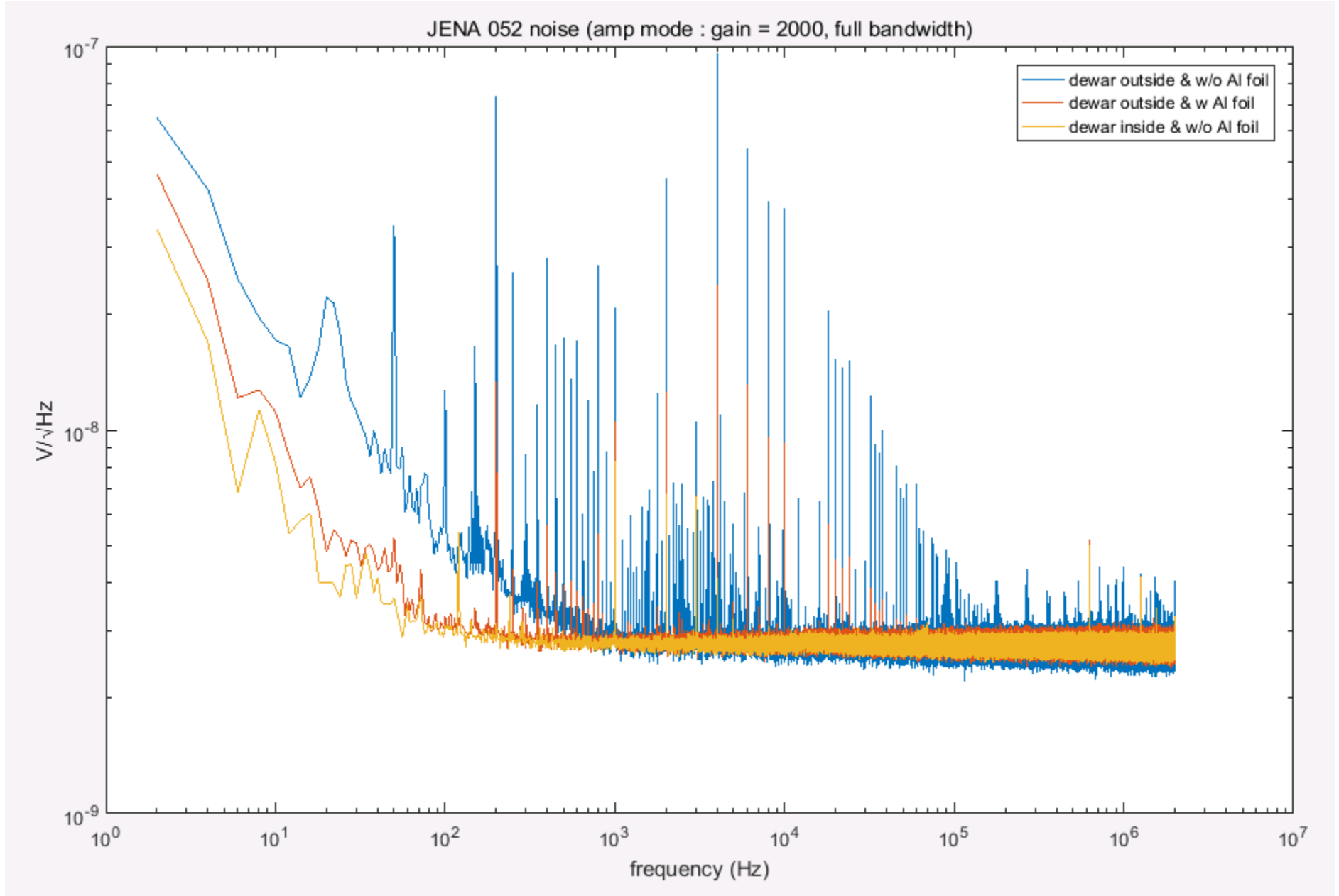


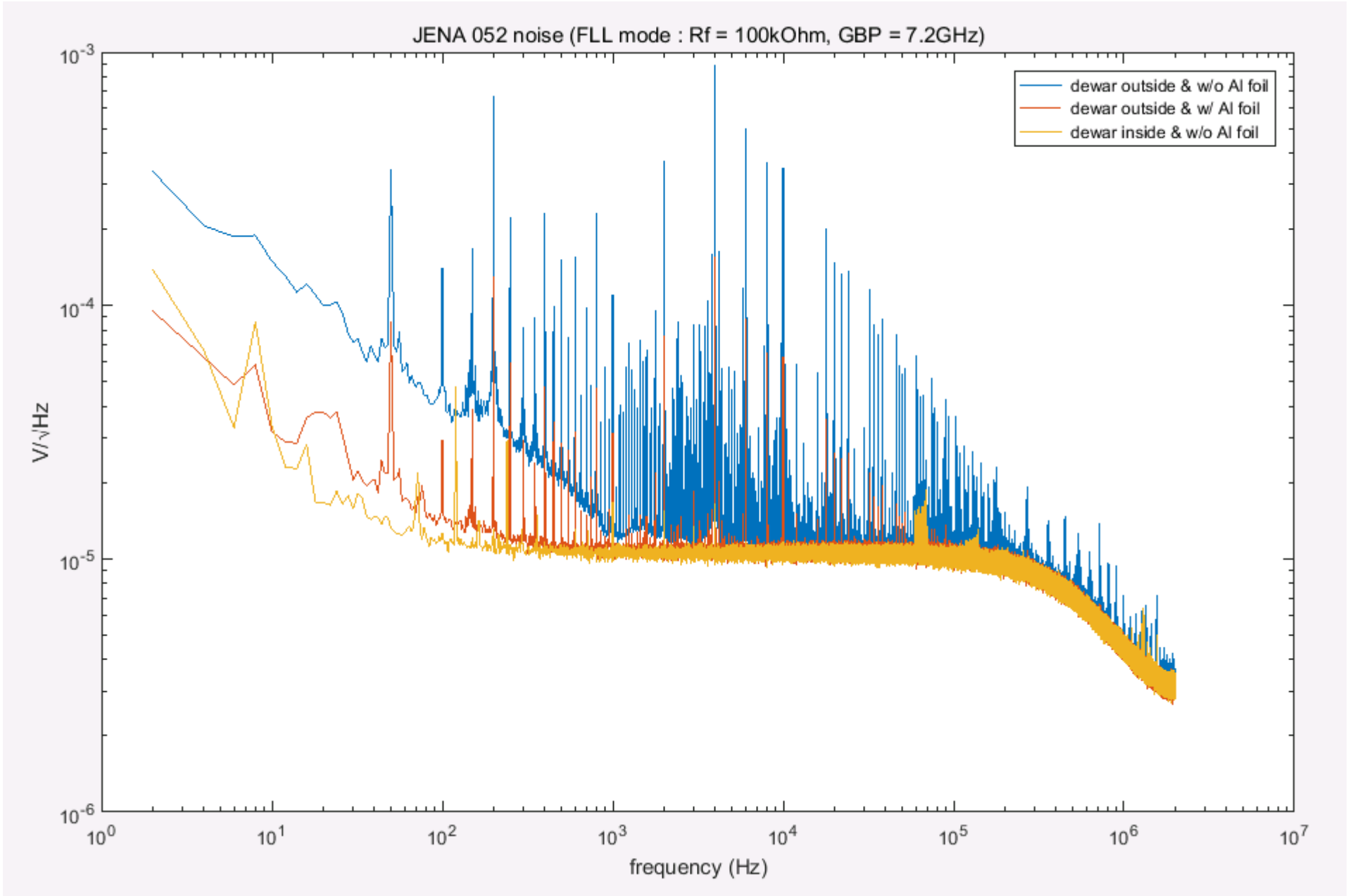
2. Attachment to ADR

Add heat connection to copper plate (gold wiring)






JENA 052 noise (amp mode : gain = 2000, full bandwidth)
dewar outside & w/o Al foil
dewar outside & w Al foil
dewar inside & w/o Al foil
V/√Hz
frequency (Hz)
10^-7
10^-8
10^-9
10^0
10^1
10^2
10^3
10^4
10^5
10^6
10^7


JENA 052 noise (FLL mode : Rf = 100kOhm, GBP = 7.2GHz)
dewar outside & w/o Al foil
dewar outside & w/ Al foil
dewar inside & w/o Al foil
V/√Hz
frequency (Hz)
10^-3
10^-4
10^-5
10^-6
10^0
10^1
10^2
10^3
10^4
10^5
10^6
10^7