System temperature measurements

Chang Lee
MPIfP

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T_{system}

- Dicke's radiometer formula

$$\frac{\delta\nu}{dt} \propto \frac{1}{T_{\mathrm{sys}}^2},\ T_{\mathrm{sys}} = T_{\mathrm{bg}} + T_{\mathrm{amp}}$$

scan rate (FOM)

5—6 K for HEMT

topics for future…

$$T_{\mathrm{bg}}(\nu) = \frac{B(\nu, T_{\mathrm{phys}})}{k_B} \int G(\nu,\theta)\ a(\nu,\theta)\ d\theta$$

blackbody radiation

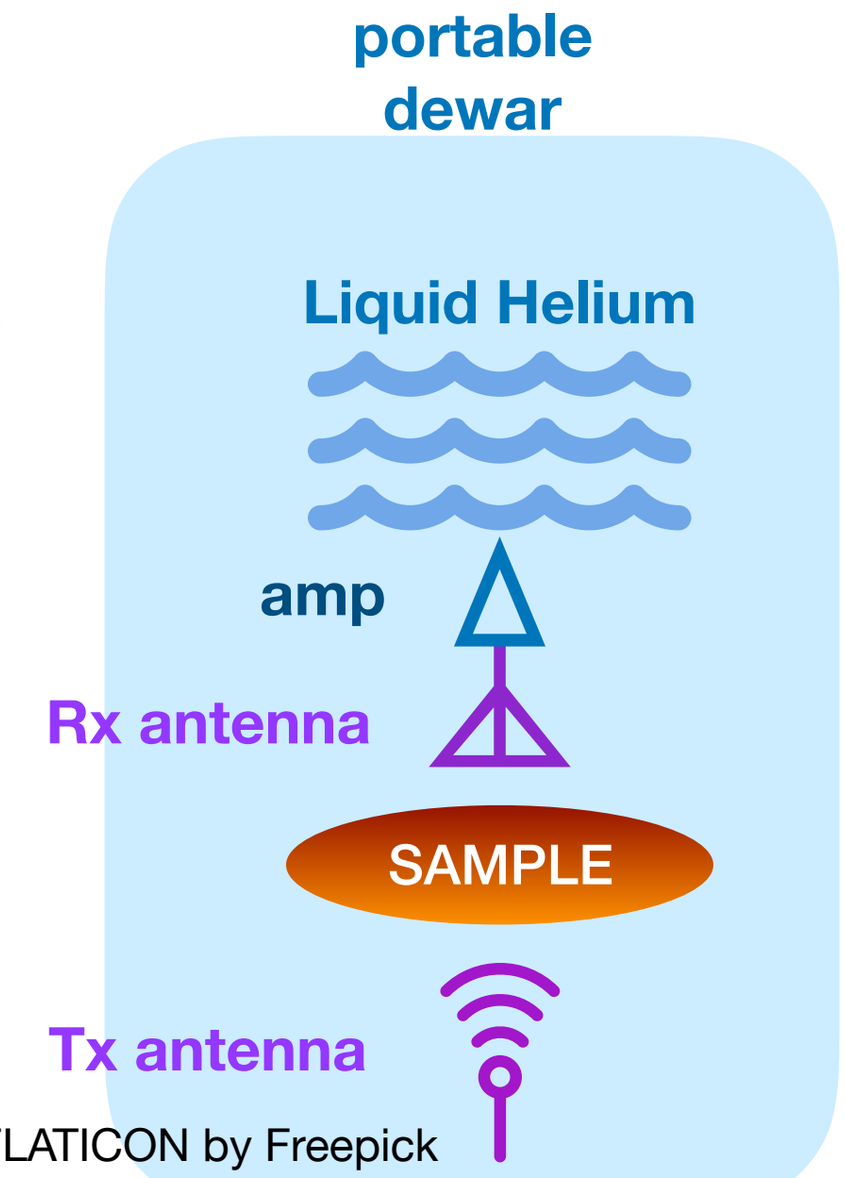
beam pattern

material emmisivity

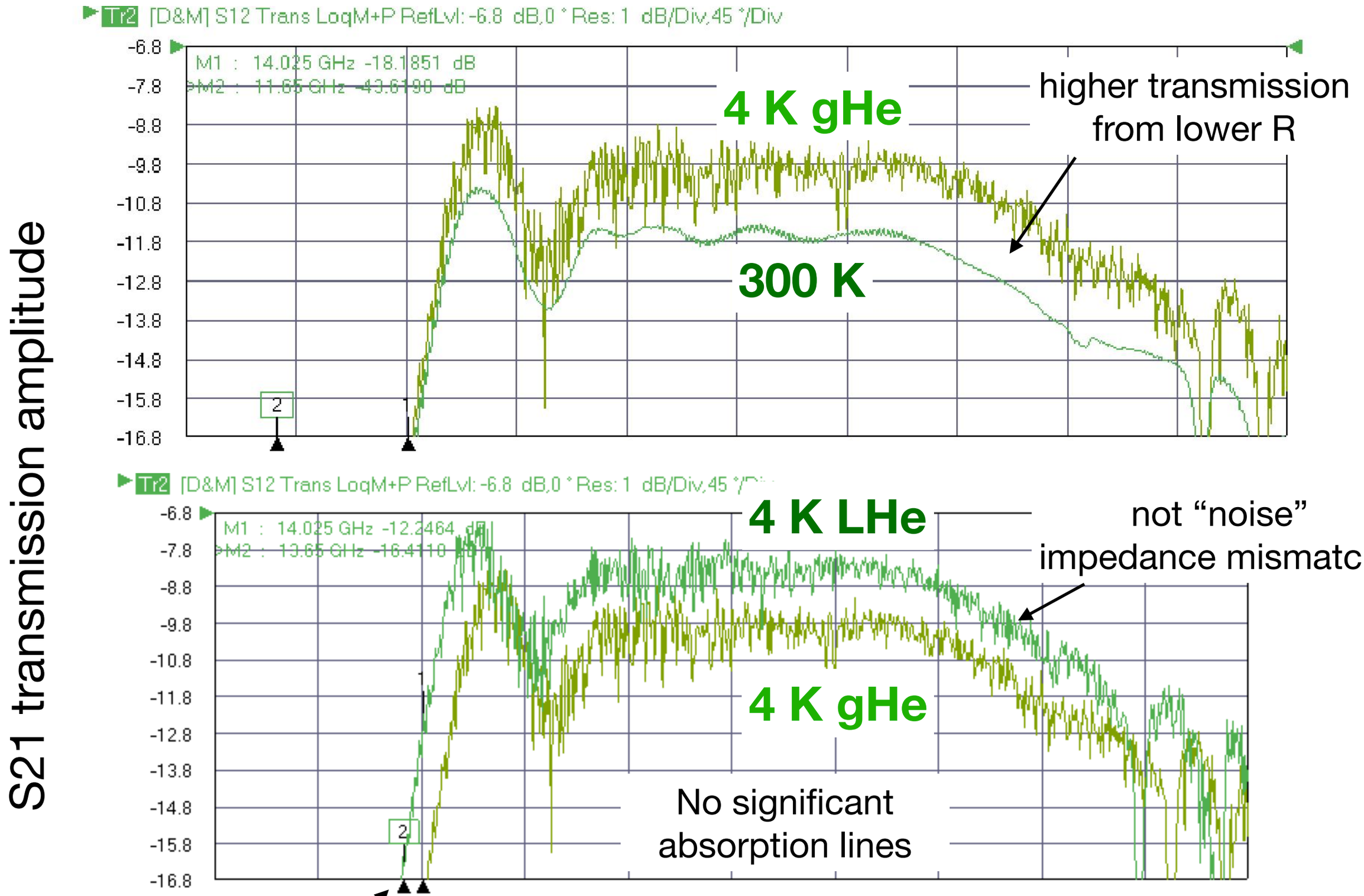
unknowns

Emissivity measurement

- In May, warm (300K) and cold (4K) measurements were considered.
  - Absolute calibration difficult at 300K. Too many systematics.
- Simple tests at **LHe** transfer dewar
  - Uniform stable 4K throughout the whole setup.

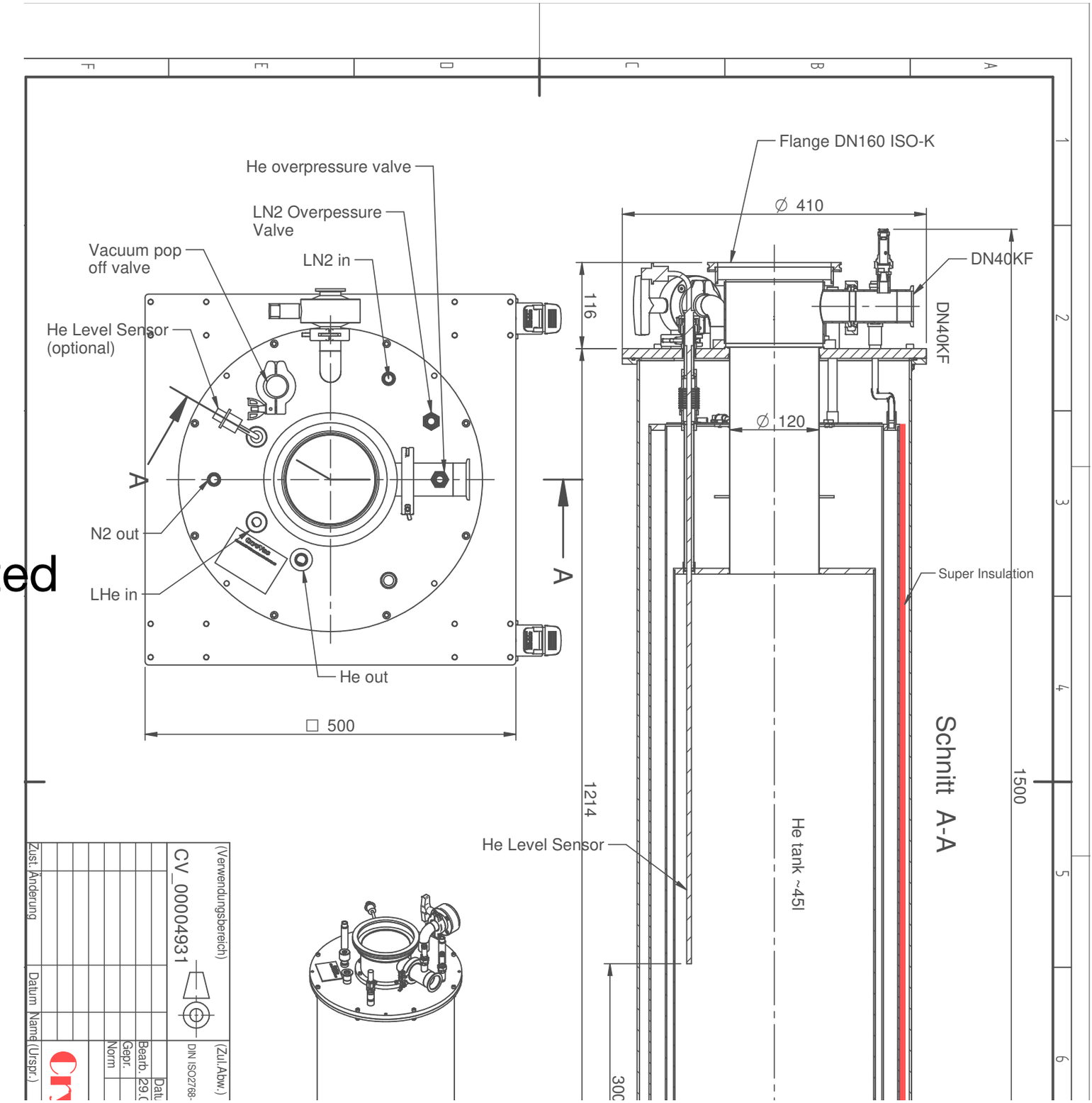


Images from FLATICON by Freepick


Tr2 [D&M] S12 Trans LogM+P RefLvl: -6.8 dB,0 ° Res: 1 dB/Div,45 °/Div
M1 : 14.025 GHz -18.1851 dB
M2 : 11.65 GHz -43.6190 dB
-6.8
-7.8
-8.8
-9.8
-10.8
-11.8
-12.8
-13.8
-14.8
-15.8
-16.8
2
4 K gHe
300 K
higher transmission
from lower R
Tr2 [D&M] S12 Trans LogM+P RefLvl: -6.8 dB,0 ° Res: 1 dB/Div,45 °/Div
M1 : 14.025 GHz -12.2464 dB
M2 : 13.65 GHz -16.4110 dB
4 K LHe
4 K gHe
not “noise”
impedance mismatch?
No significant
absorption lines
S21 transmission amplitude
frequency
Change of the cutoff freq
agrees with literature

New LHe bath

- Φ 30mm → **ϕ 120mm** neck, no intermediate valves
- 45L LHe,
  ϕ 250 x 800 mm (?)
- Already ordered, expected delivery by Dec.
- Vacuum & He purge
  KF25 tee, 2 x valves for Vac and gas He purge.
  1 x dial gauge

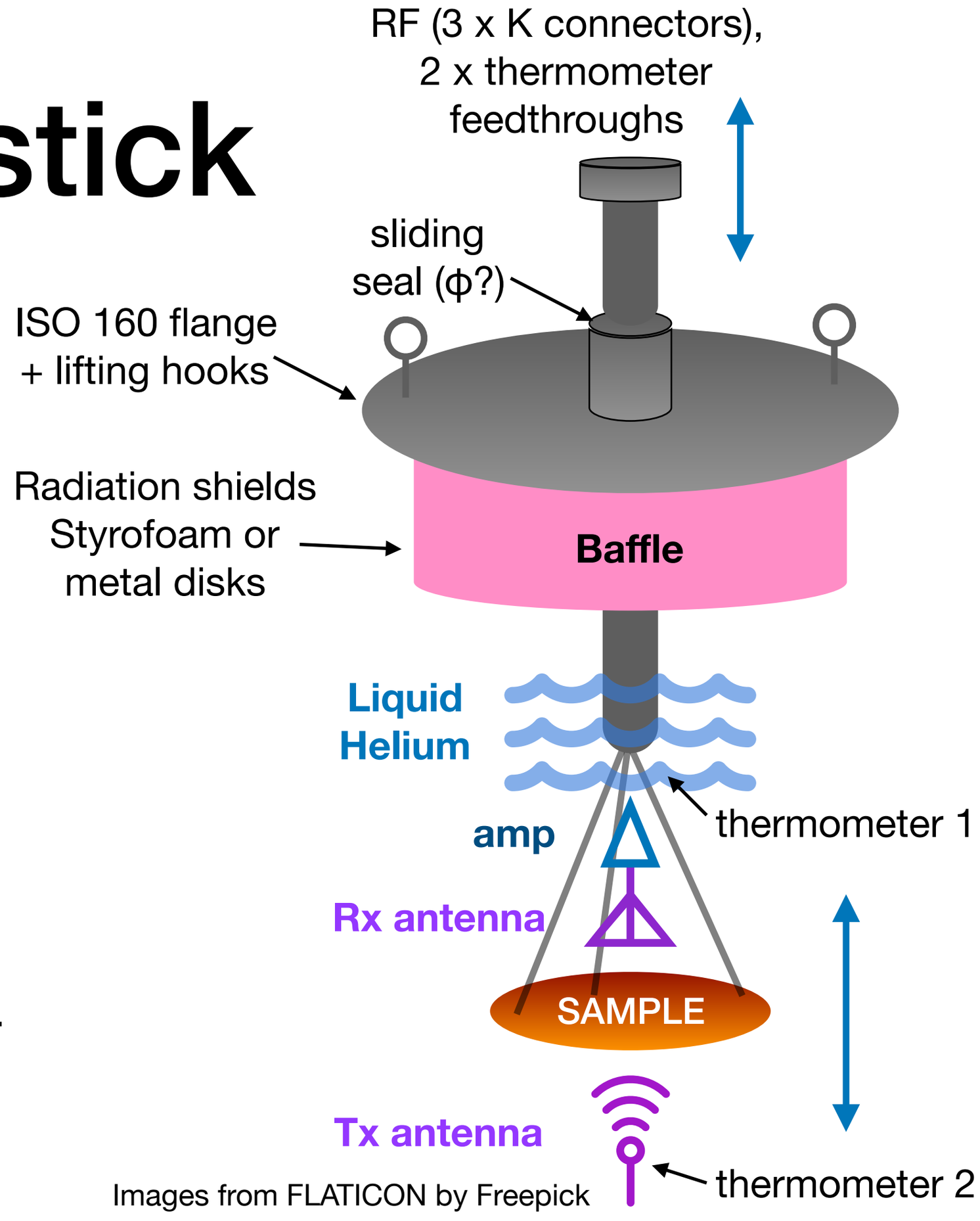


LHe dip stick

- General design inherited from the portable dewar dip stick.

- Sliding sample & feedthroughs for easy handling & installation

- Exact designs to be worked by D. Kittlinger & Alexander



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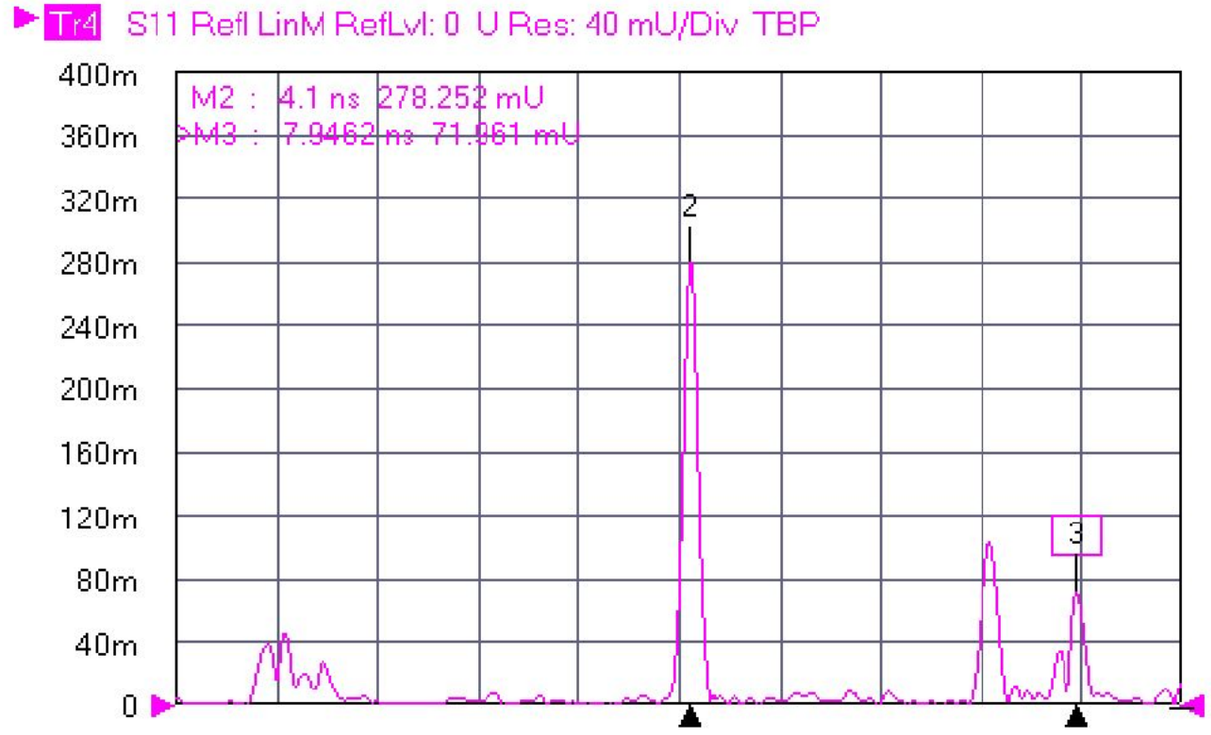
Antenna

- Not much progress here, but
- Basic designs borrowed from the warm measurement.
- I am learning about wave optics and antennas in the context of the test of the principle setup
- Help from MPIfRA


Tr4 S11 Refl LinM RefLvl: 0 U Res: 40 mU/Div TBP
M2 : 4.1 ns 278.252 mU
>M3 : 7.9462 ns 71.861 mU
400m
360m
320m
280m
240m
200m
160m
120m
80m
40m
0
2
3