Ozone Radiometer at 142 GHz: Calibration

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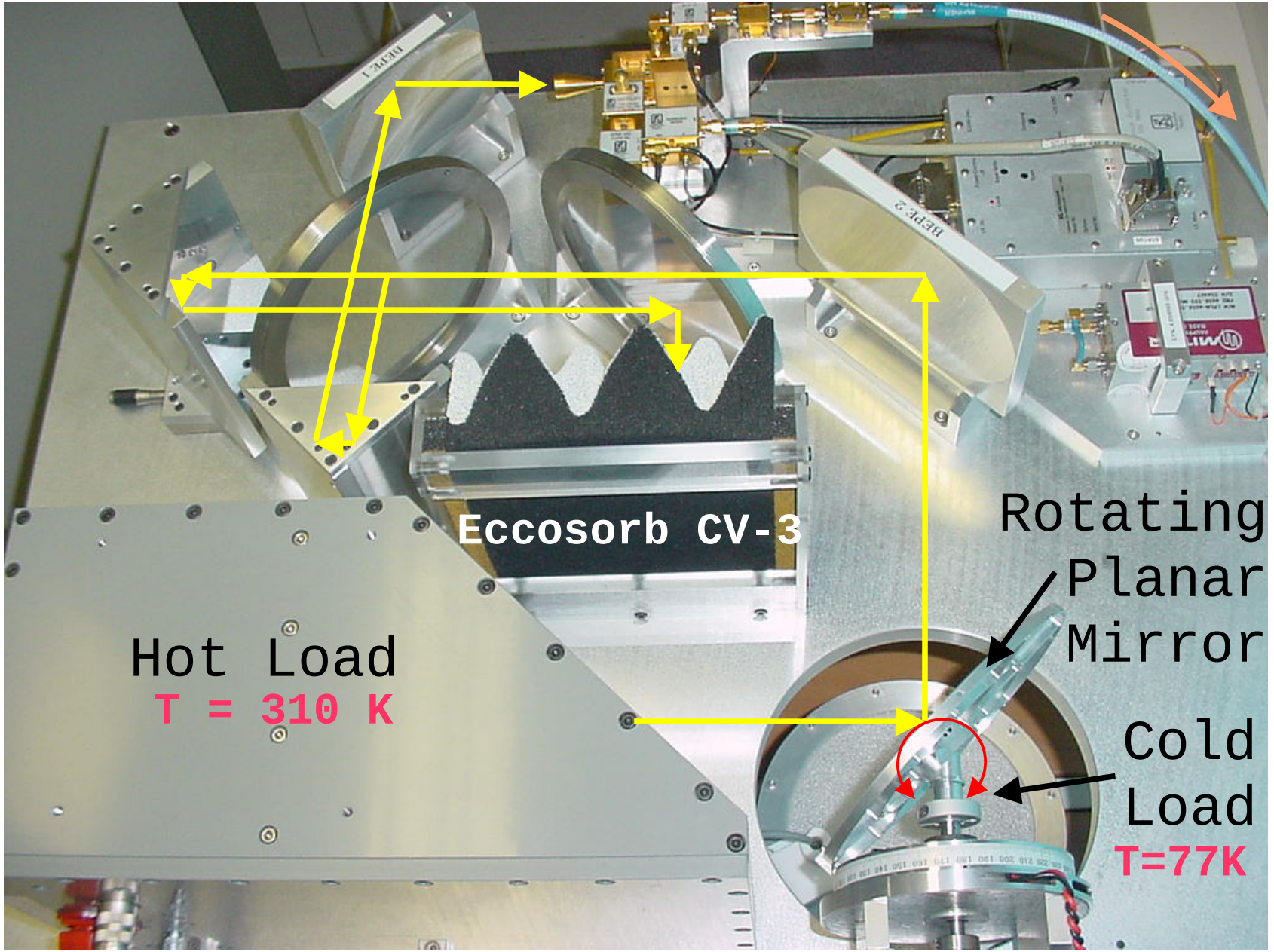
The Stratospheric Ozone Monitoring Radiometer SOMORA

- Developed by the IAP for MeteoSwiss
- Tuned to Ozone at 142.175 GHz
- Improved version of the GROMOS instrument
- Operated at the IAP since January 2000
- Moved to Payerne in June 2002

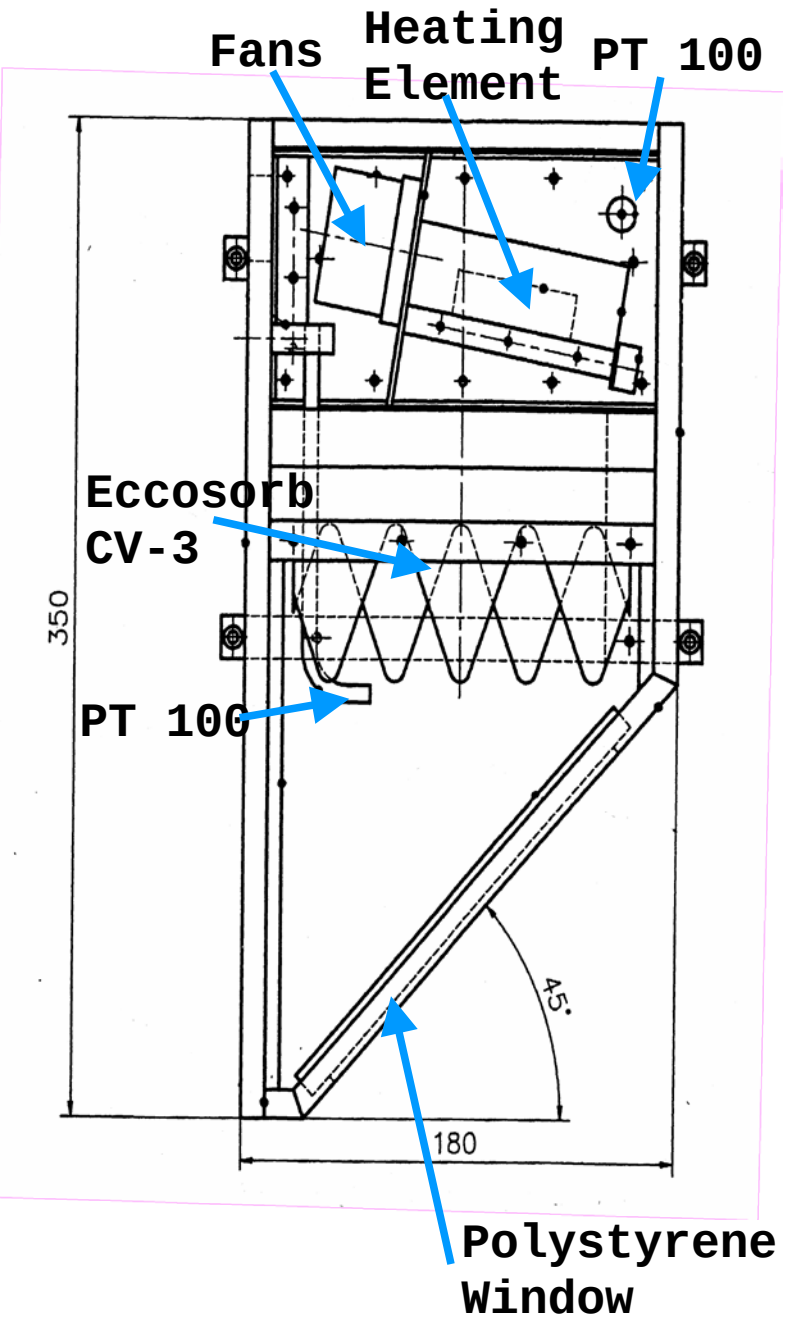
Somora location in Payerne

SOMORA Quasi-Optics

IF 7.1 Ghz

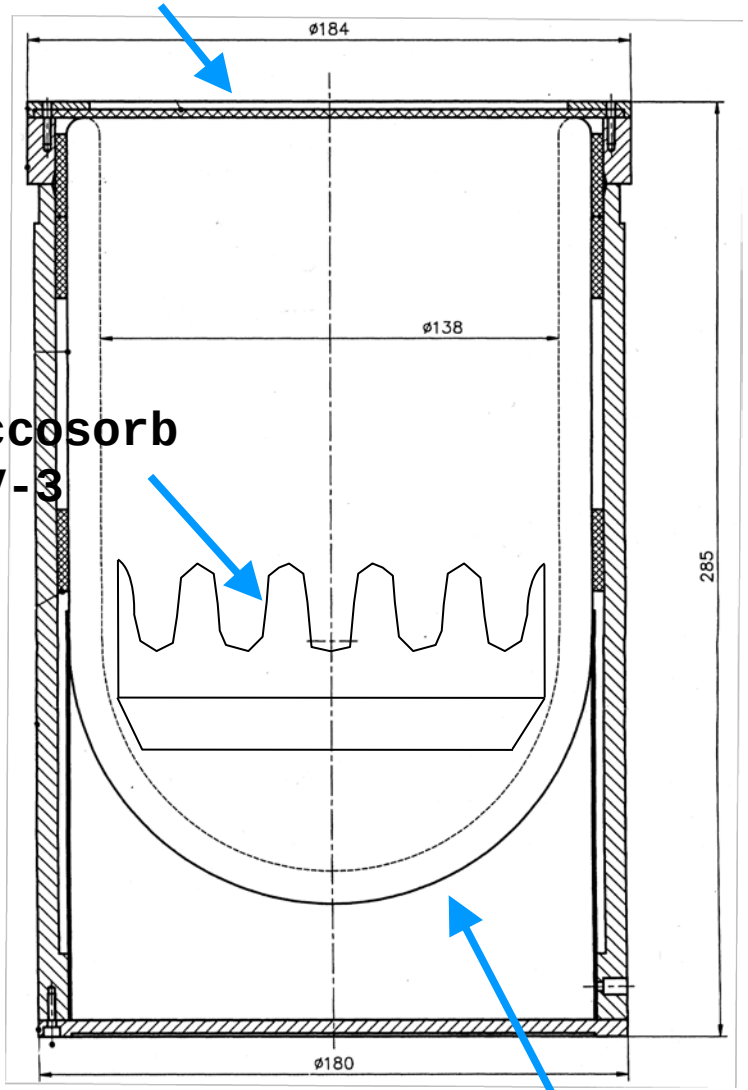


SOMORA Hot Load



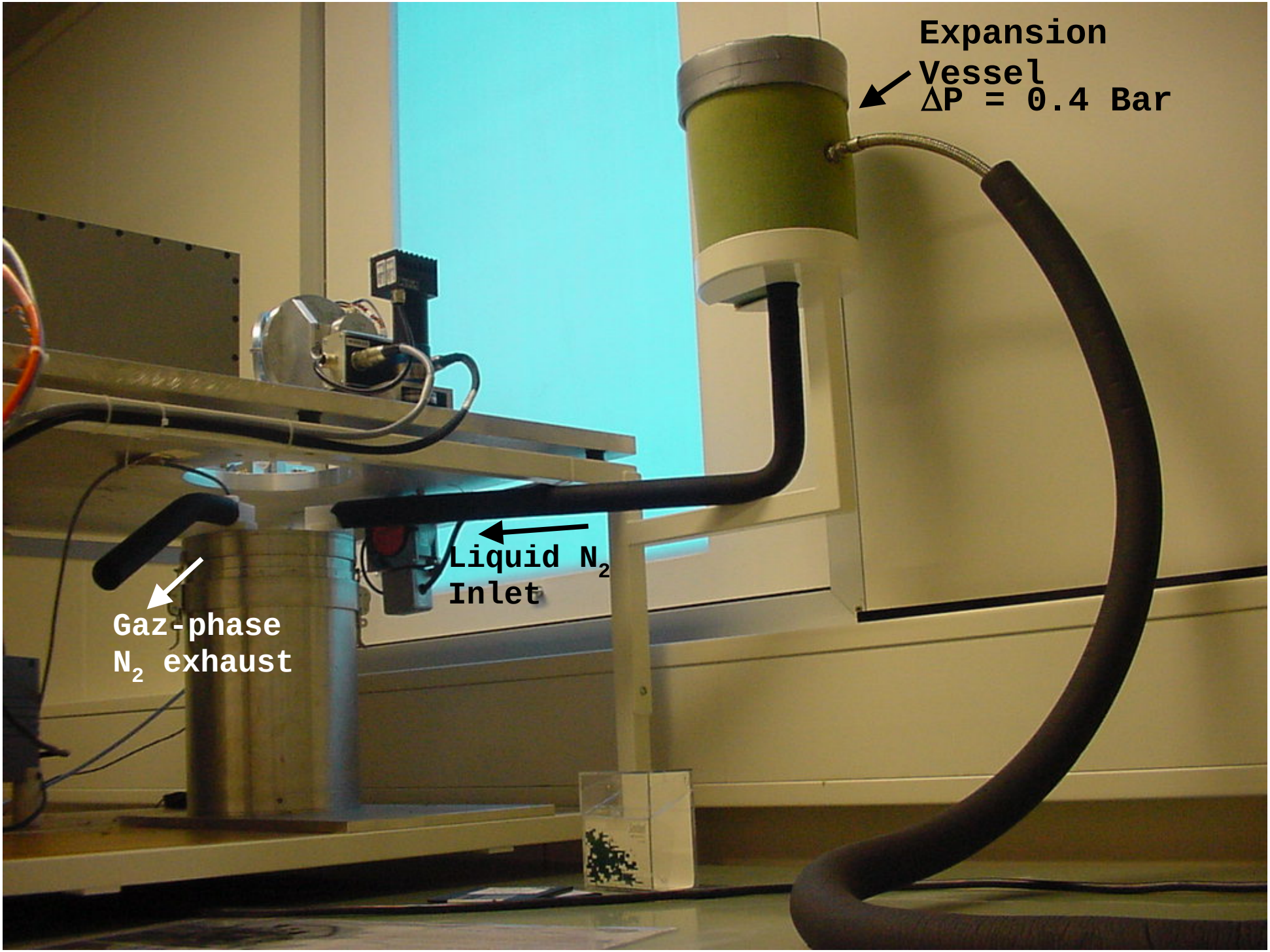
SOMORA Cold Load

Packaging
Foam Material

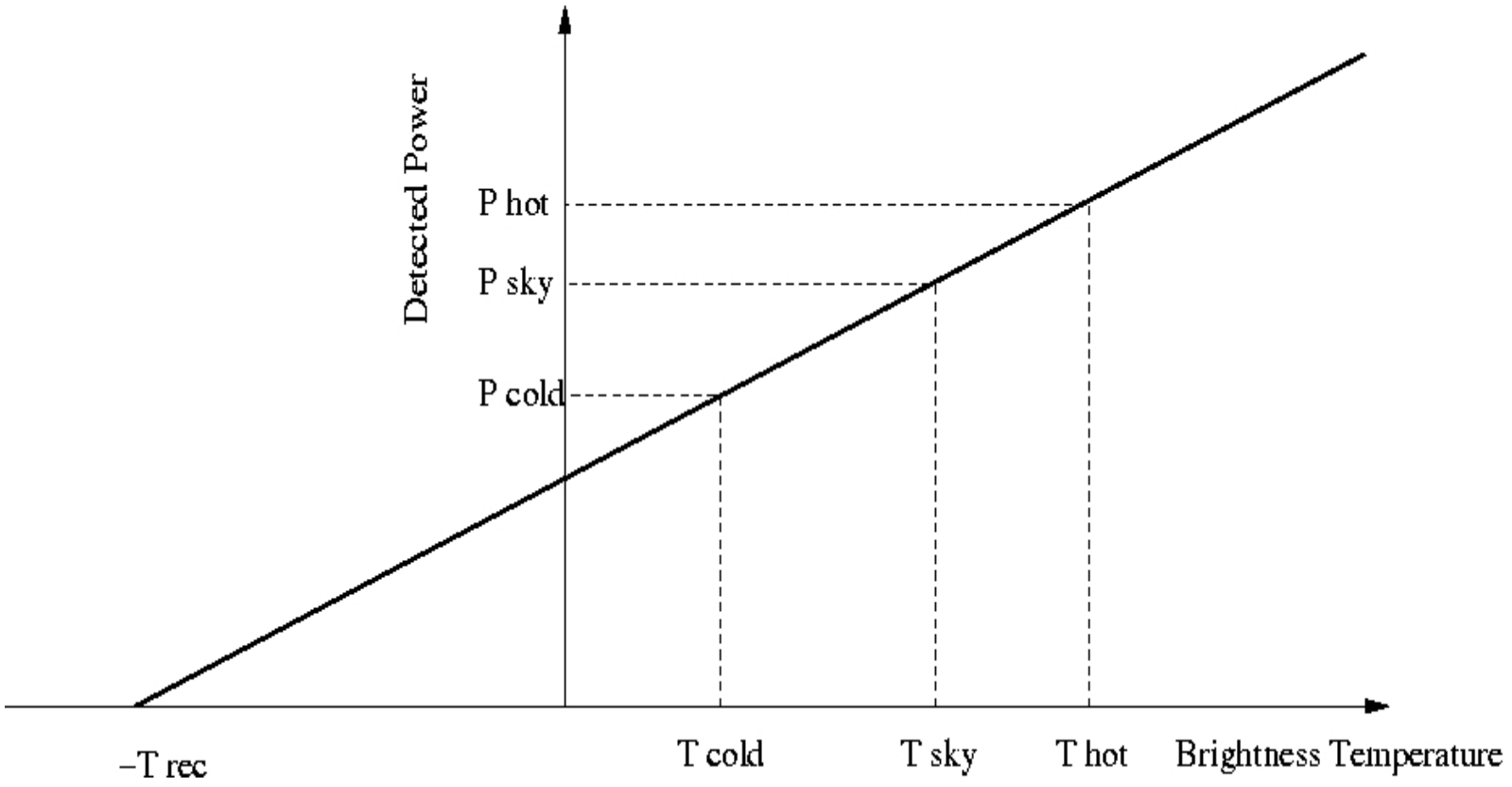


Eccosorb
CV-3

Dewar Vessel


Expansion
Vessel
ΔP = 0.4 Bar
Liquid N_2
Inlet
Gaz-phase
N_2 exhaust

Total Power Calibration



$$T_{sky} = \frac{P_{sky} - P_{cold}}{P_{hot} - P_{cold}} (T_{hot} - T_{cold}) + T_{cold}$$

$$T_{rec} = \frac{T_{hot} - yT_{cold}}{y - 1}, \qquad y = \frac{P_{hot} - P_0}{P_{cold} - P_0}$$

Temperature Definitions

- **T**: Physical Temperature
- T_P: „Planck“ Brightness Temp.:

$$T_P = \frac{h\nu}{k} \frac{1}{\ln(1+\frac{2h\nu^3}{Pc^2})}$$

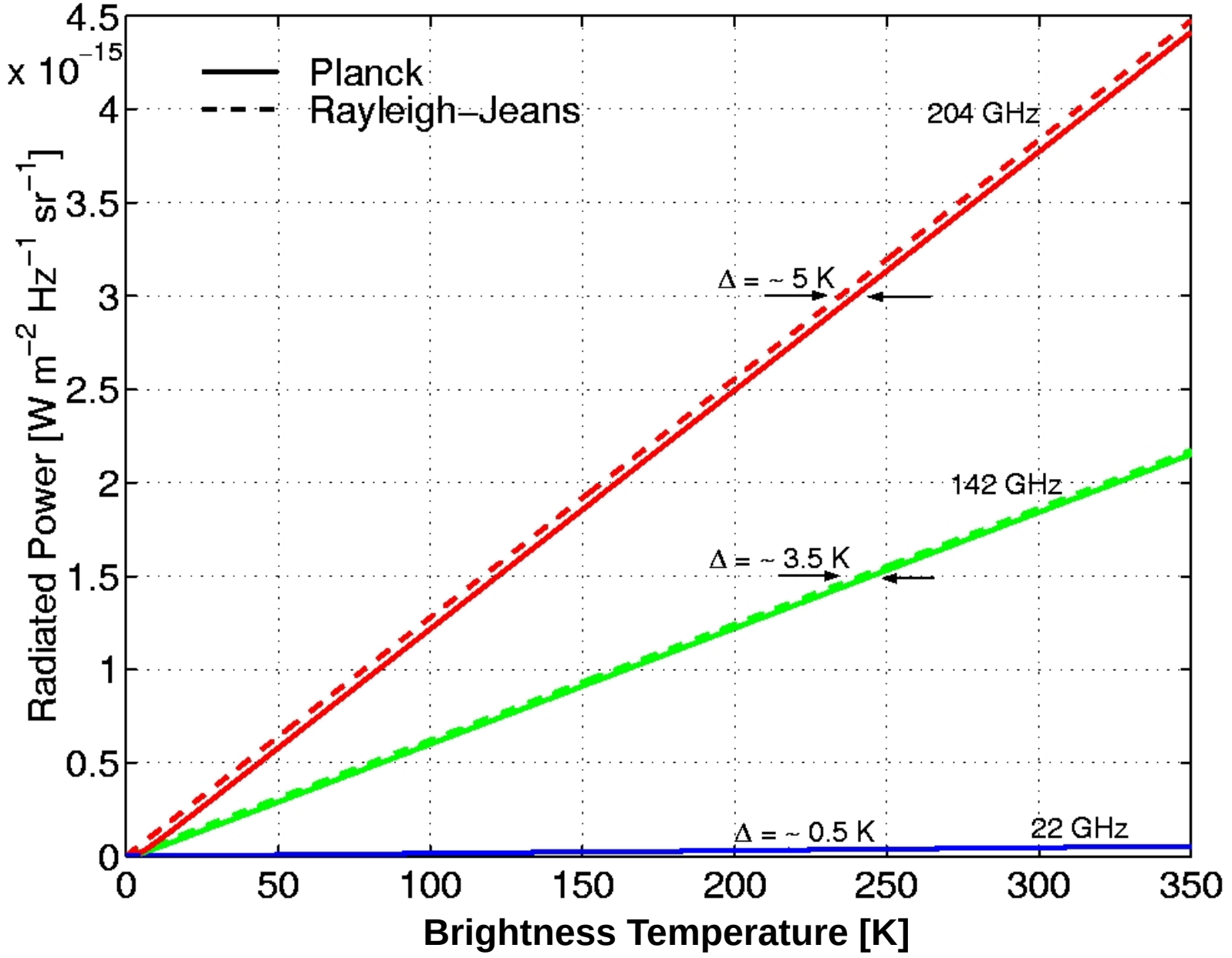
- In the RJ limit ($h\nu \ll kT$):

$$T_P \approx \frac{Pc^2}{2k\nu^2} := T_{RJ}$$

$\Rightarrow$ P ÷ T

$\Rightarrow$ P can be replaced by T in RT model

Example: Planck and RJ emission curves at various frequencies



Conclusions:

- SOMORA: Total power radiometer
- **P** ÷ **T** in considered T range
  ⇒Total power calibration formula can be used
- $\mathbf{T_{RJ}} \neq \mathbf{T_P}$ ⇒Radiative transfer computed in the units of **P**