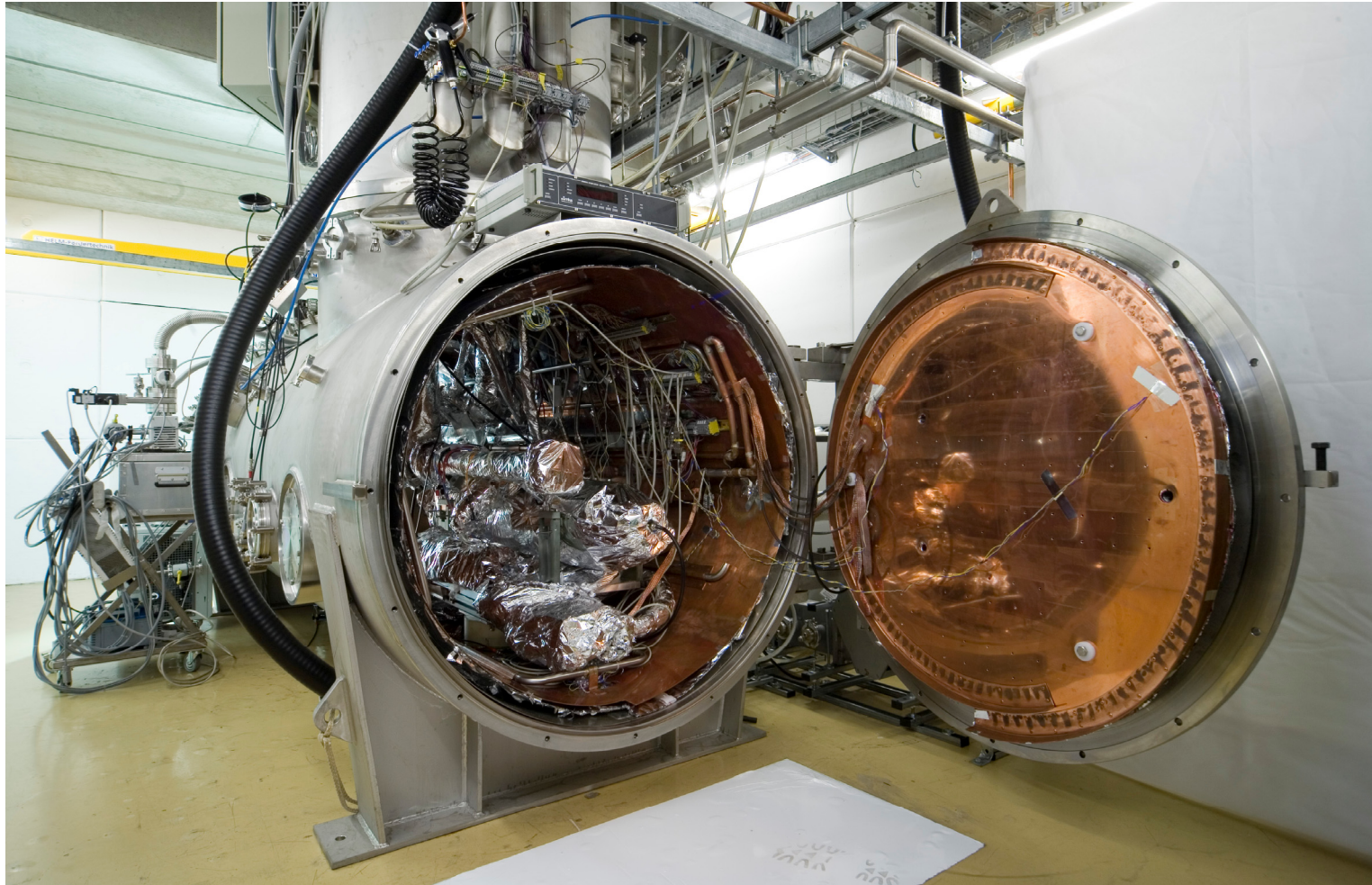


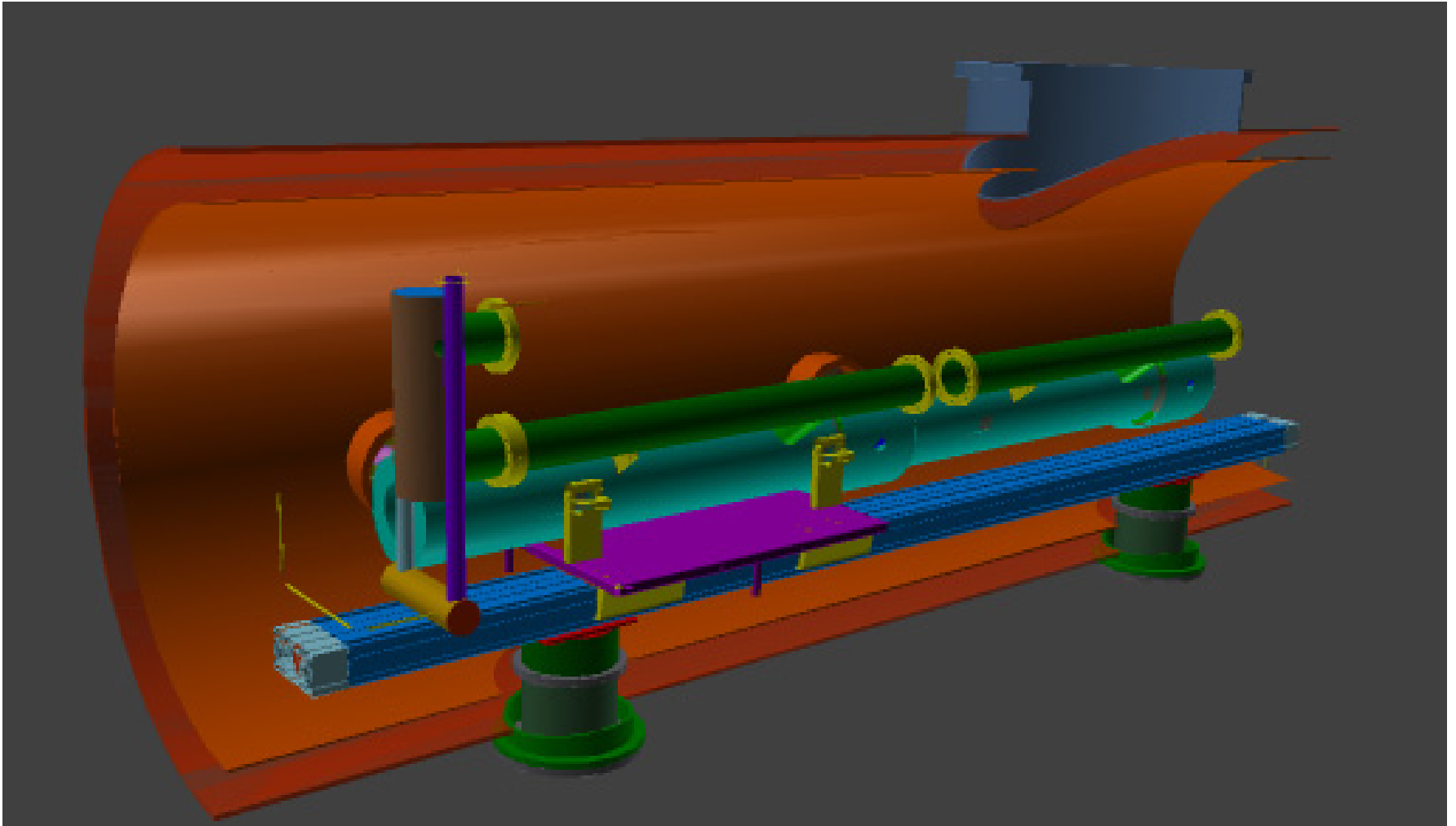
## Higher Gradients at ELBE

G. Staats, H. Büttig, M. Freitag, A. Winter from FZD  
O. Kugeler, A. Neumann, A. Frahm, M. Schuster from BESSY

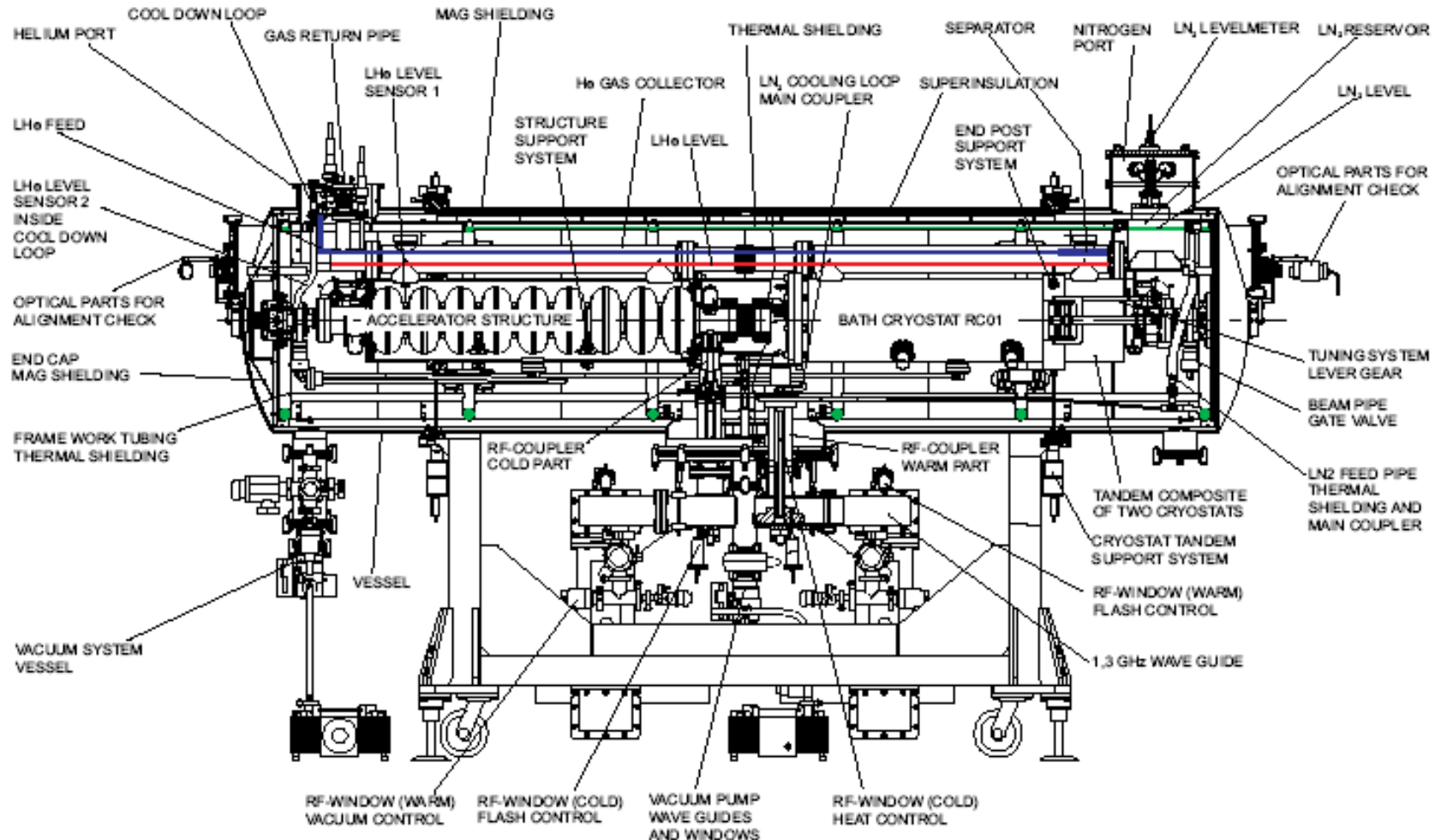
## HoBiCaT Test bench (cleaned, long time ago)



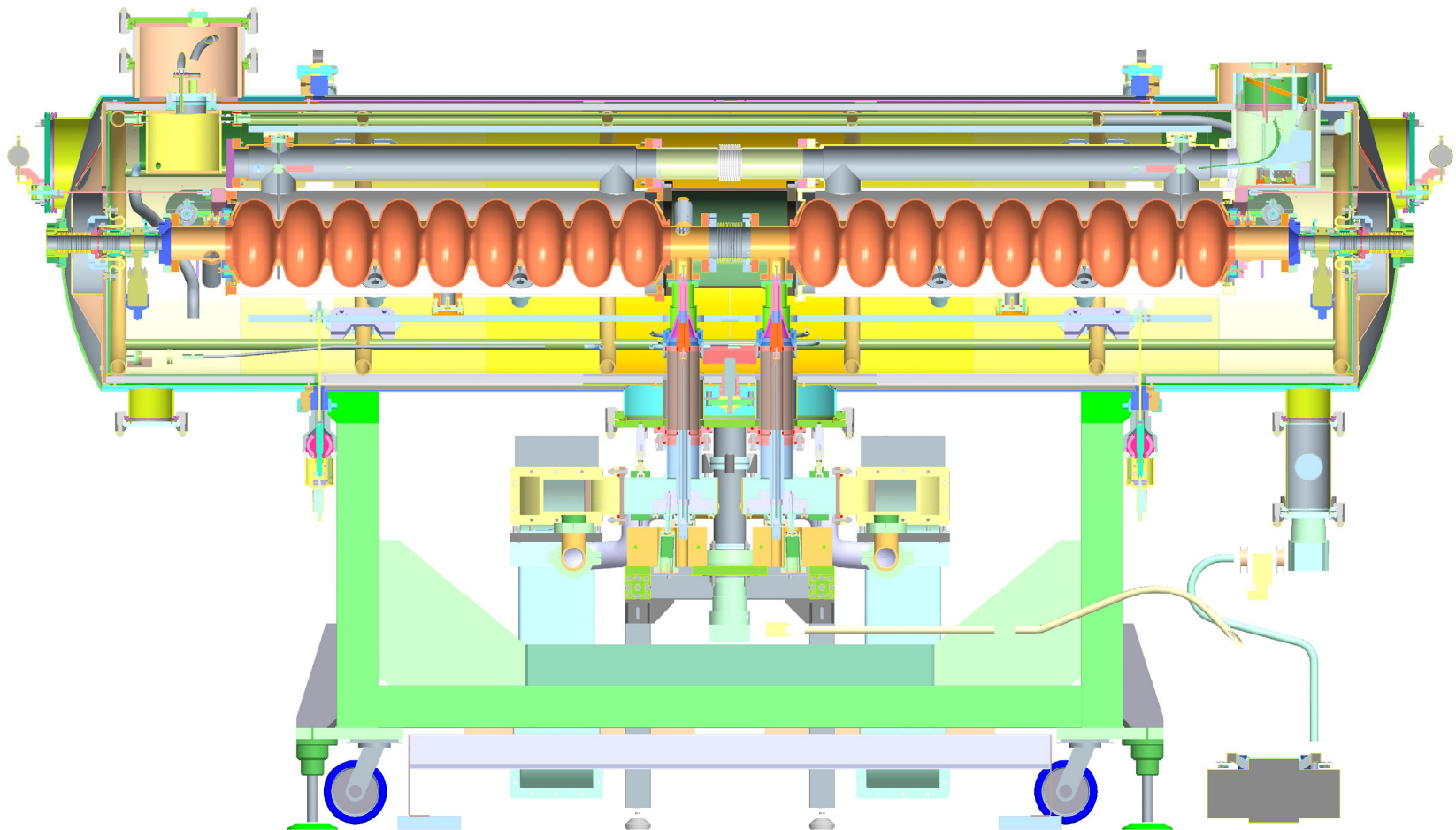
## Cavities at HoBiCaT



## Cavities at ELBE



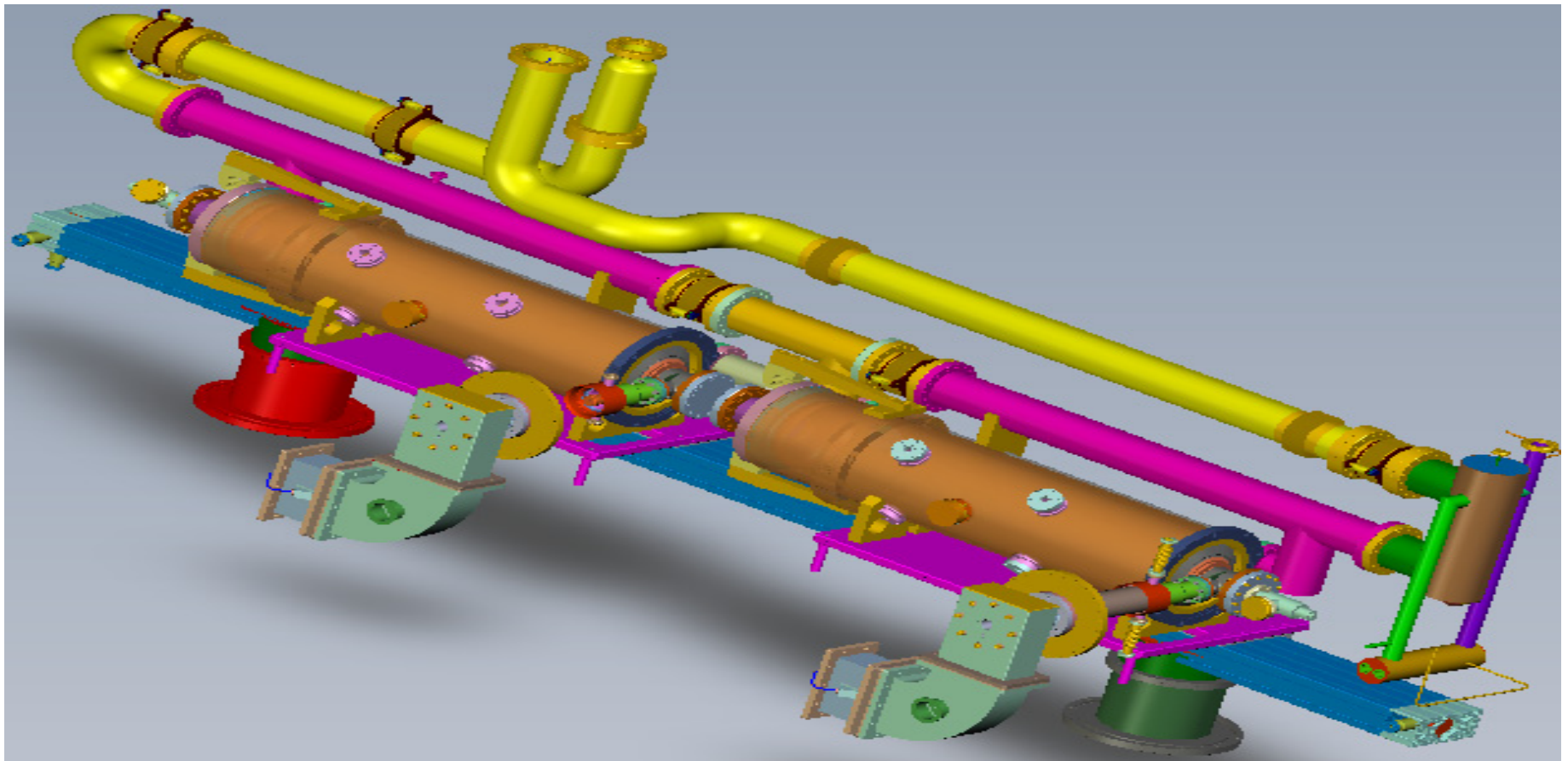
# Cavities at ELBE



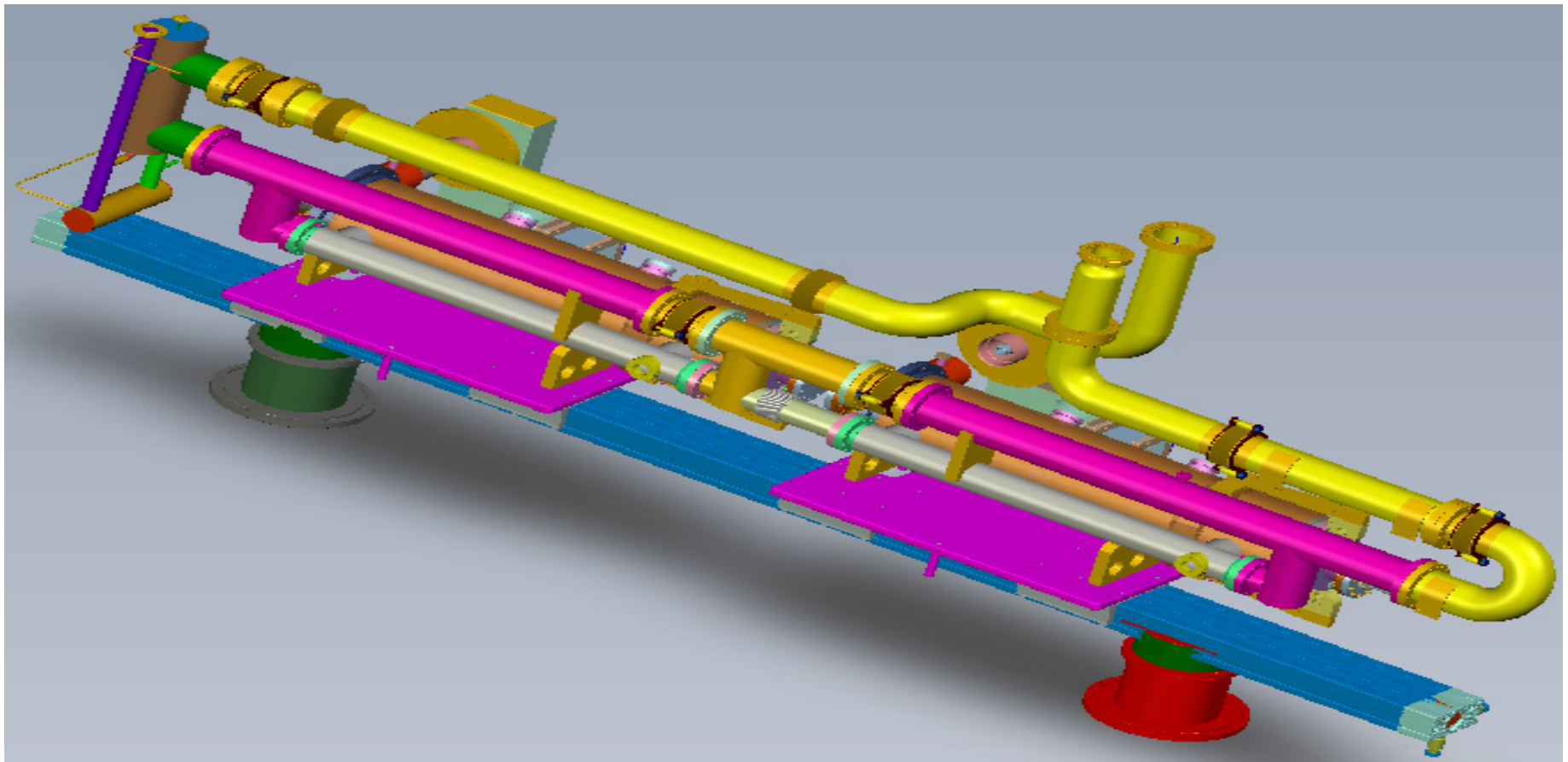
## Problems

- HoBiCaT use TTF3 coupler (variable tip), ELBE use Stanford design (fixed tip)
- RF coupler position different, ELBE at bottom, HoBiCaT at side
- Rotation of 90 deg leads to horizontal two phase tube
- Problem solved by additionally two phase tube, connected with the original tube
- Thermal transport capacity of this new tube are unknown at the beginning
- Interlock sensors must be integrated in HoBiCaT

# Construction

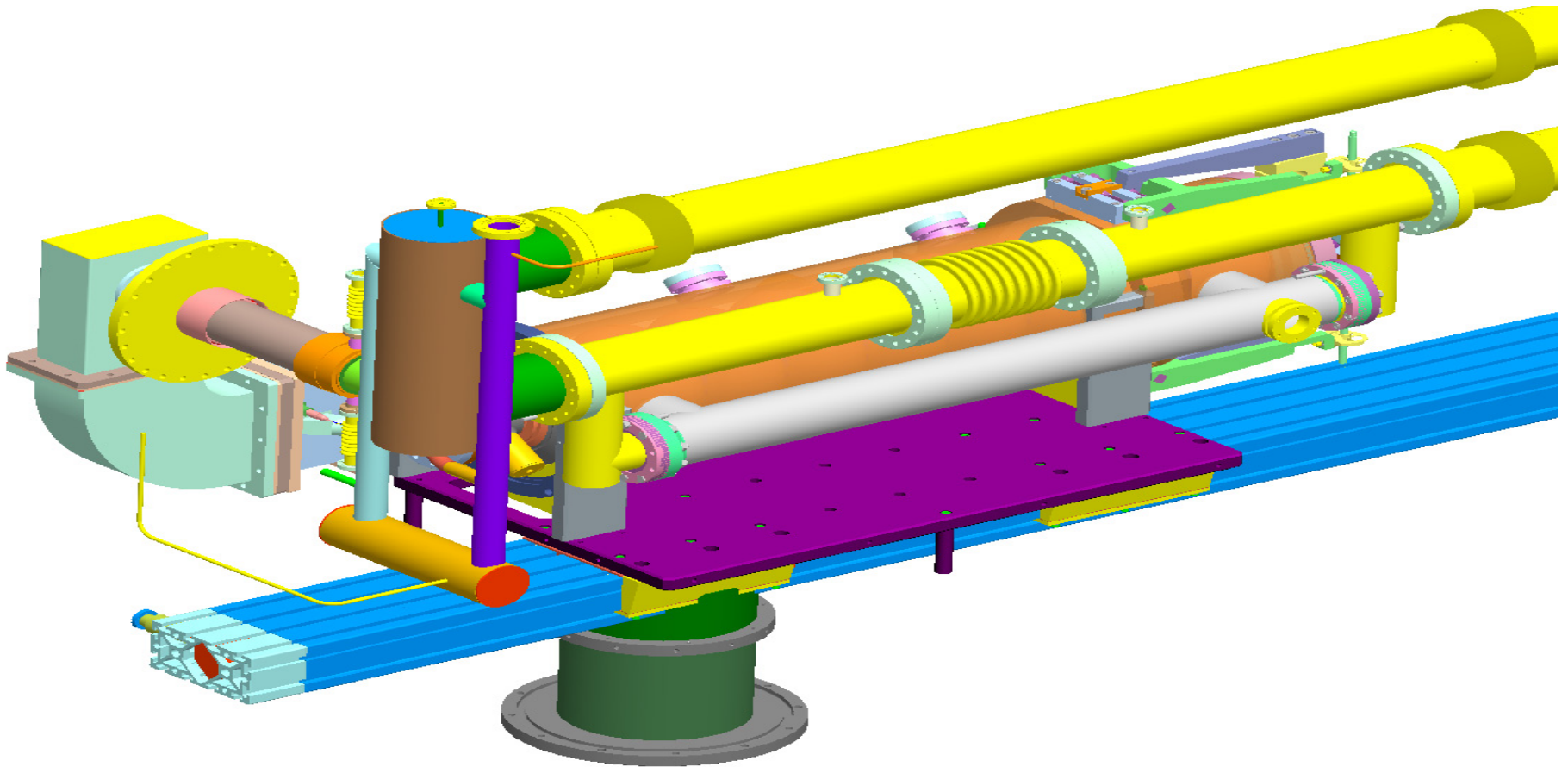


# Construction

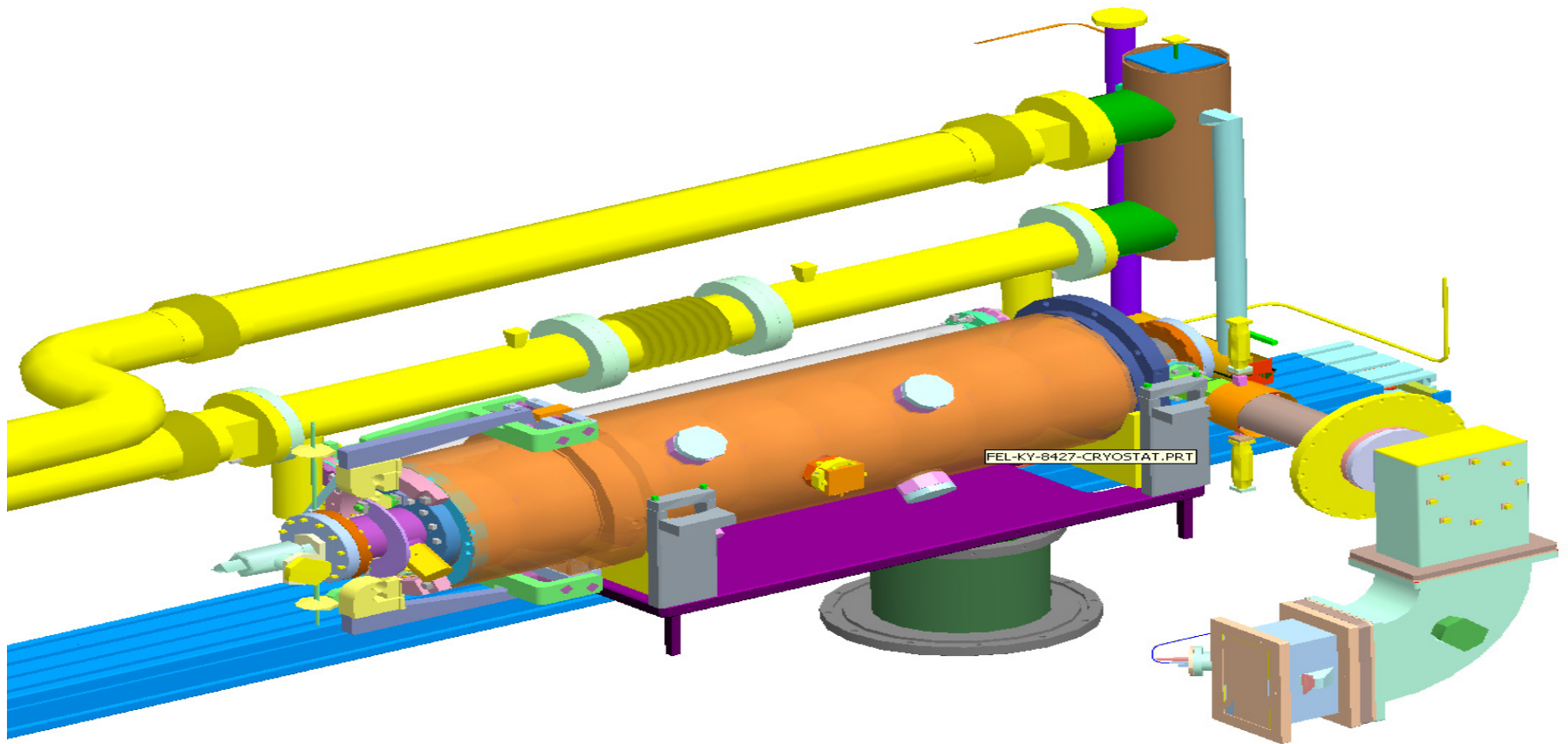




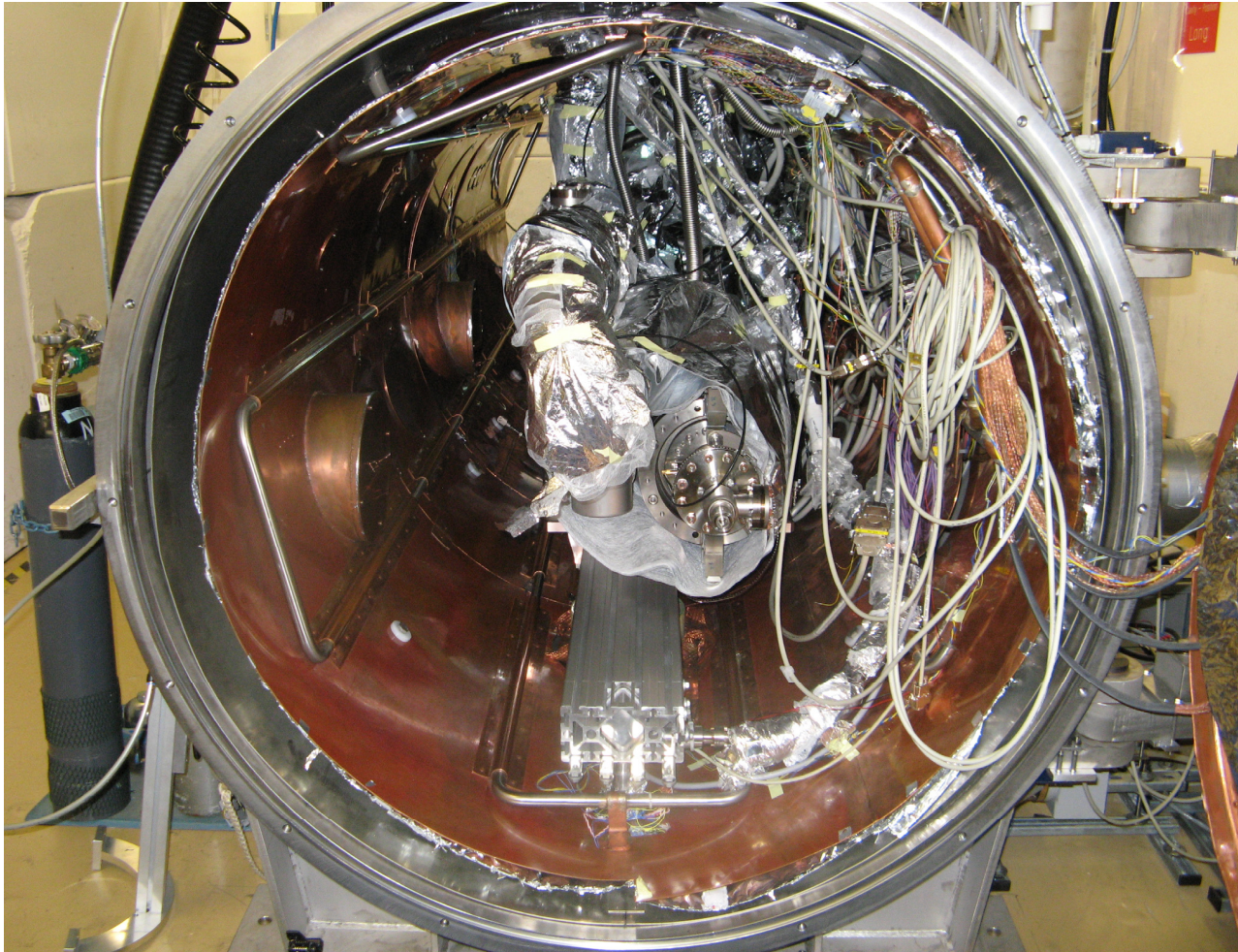
## Construction in Detail



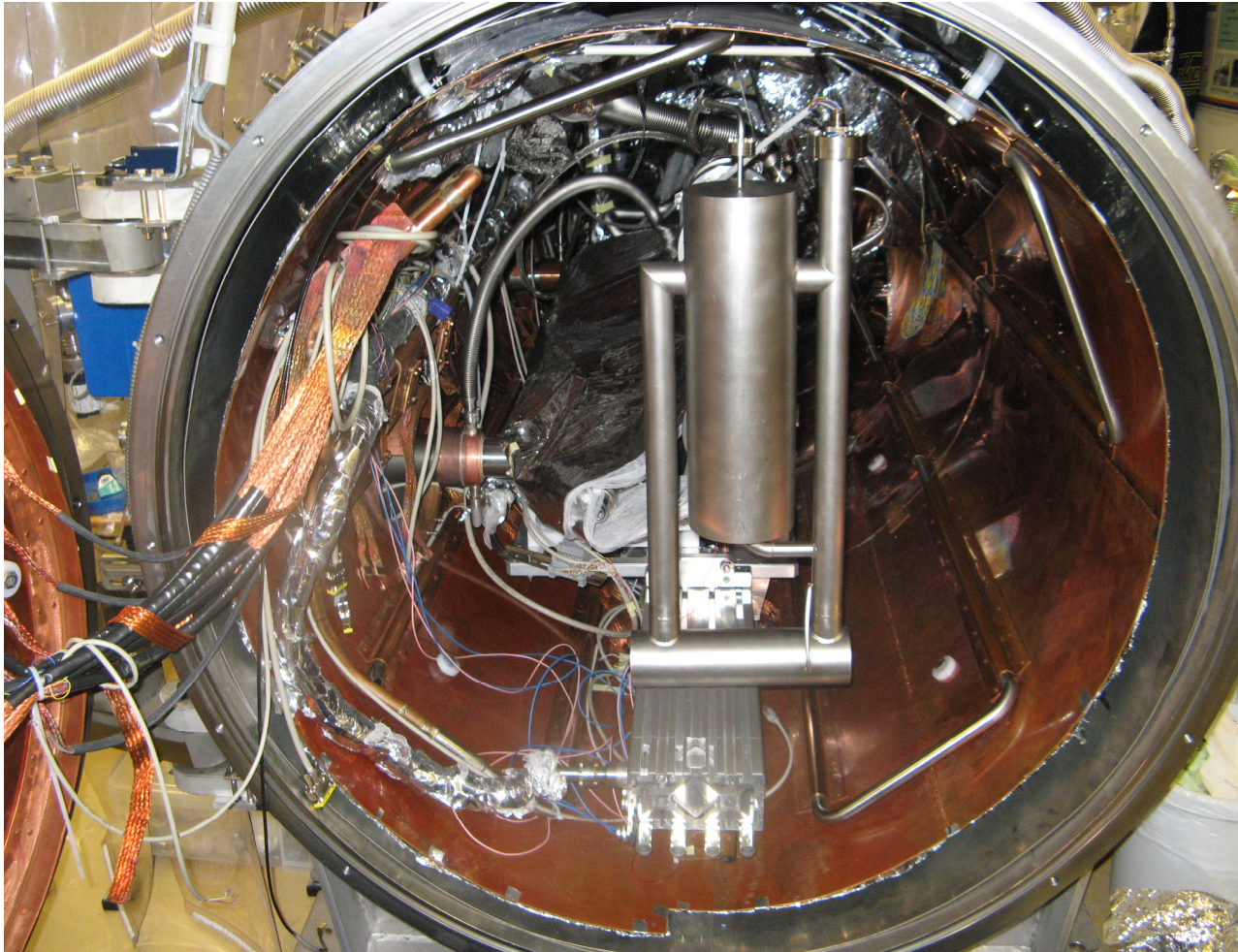
## Construction in Detail



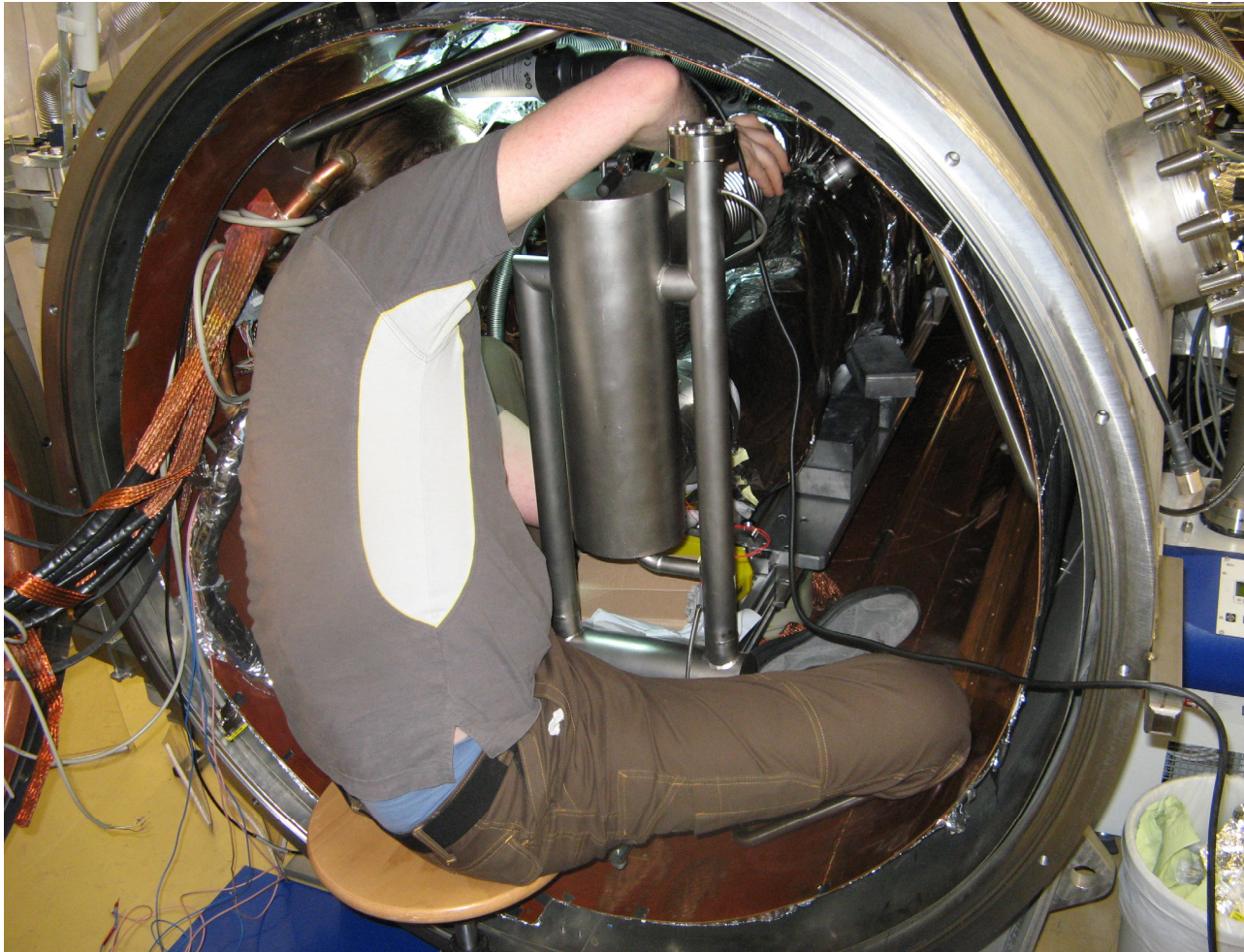
## Real Life - First Cavity



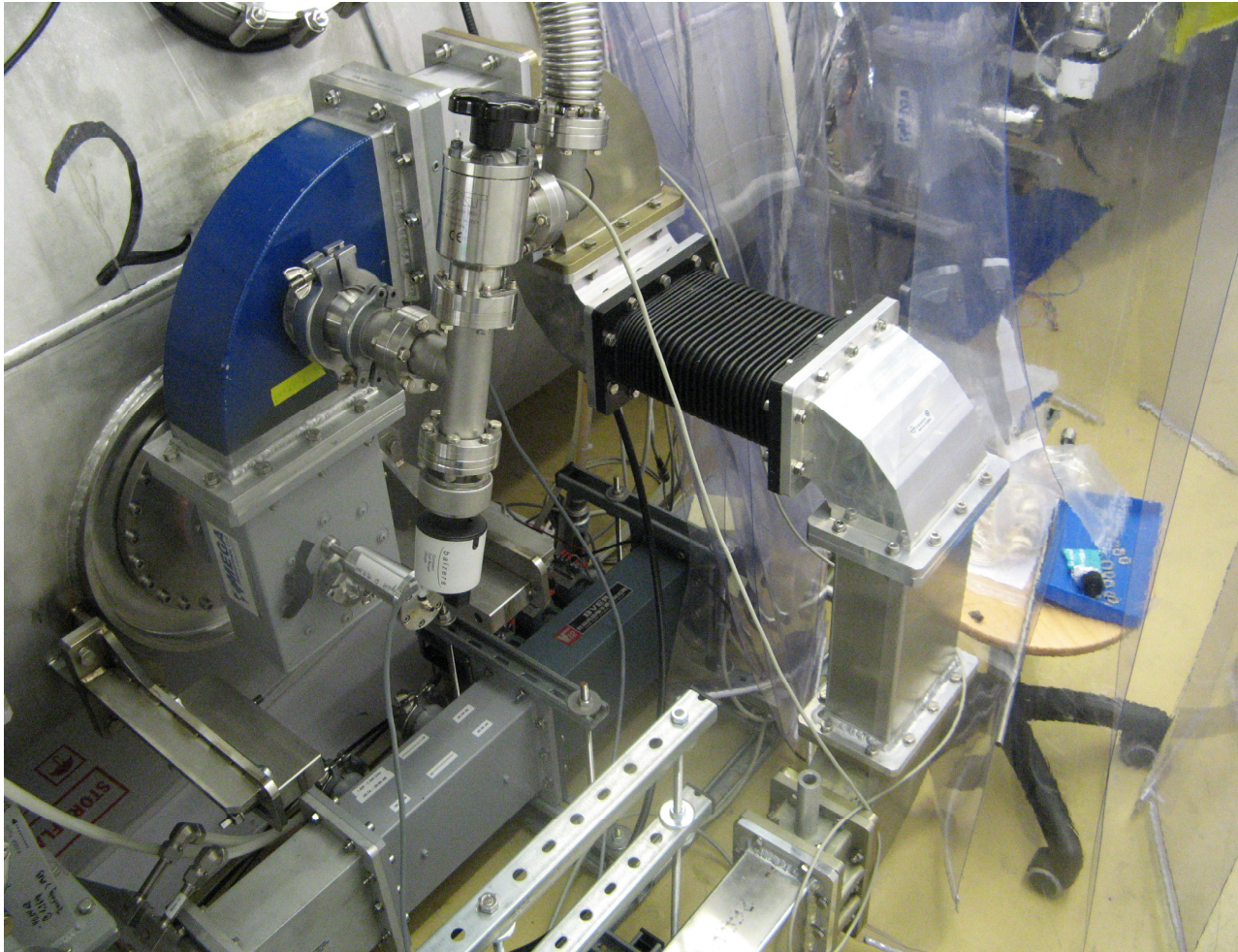
## Real Life - Second Cavity



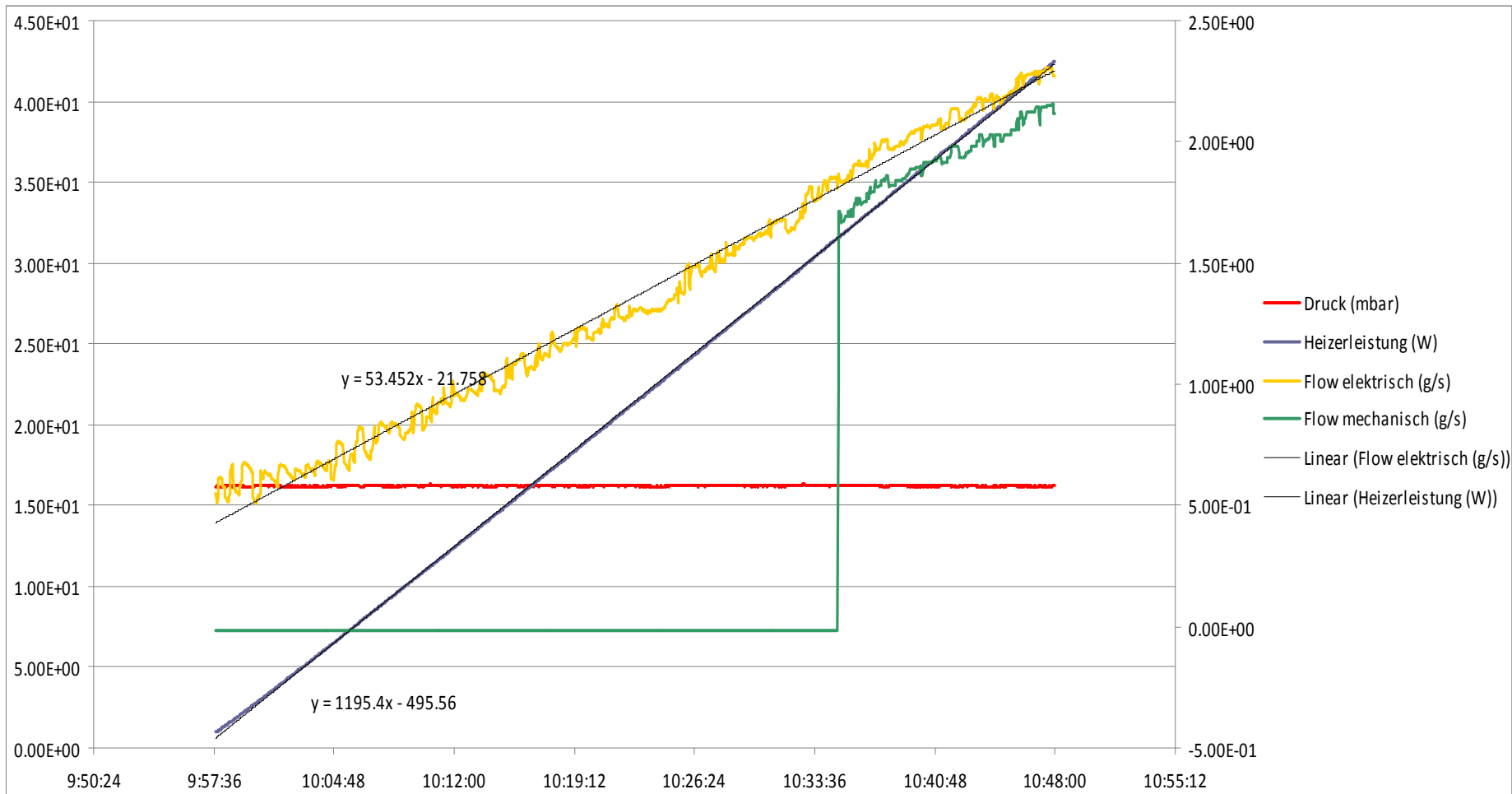
## Second Cavity with Service 😊



## RF Connections & Sensors



## Thermal Capacity of the new horizontal LHe-Tube



## Influence of 3stub-Tuner

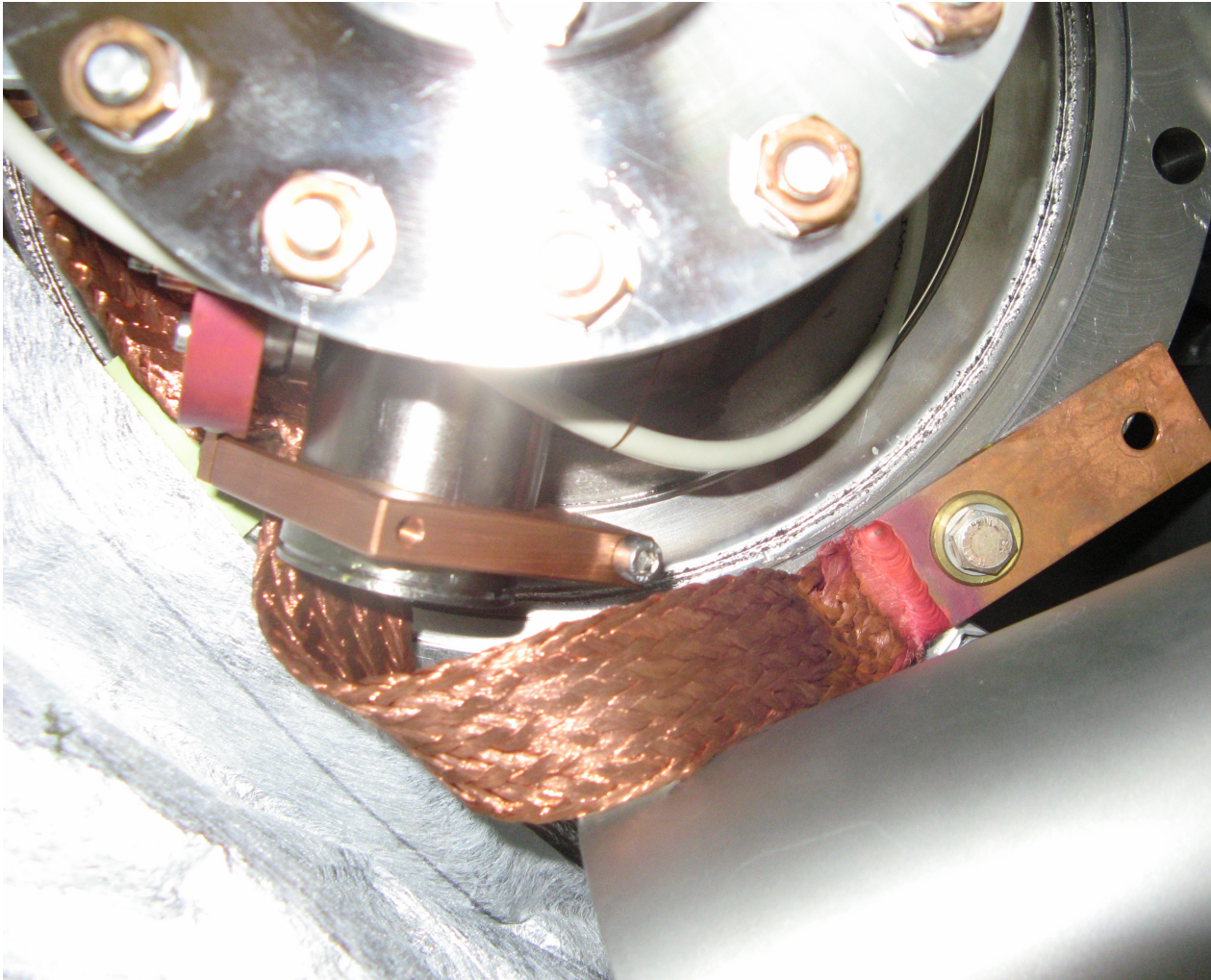
- Measurements are only possible with fixed coupler length
- Without 3stub tuner most of the RF is reflected
- Using 3-stub tuner leads to additionally unknown losses
- Problem: determining the losses
- Solution: changing frequency to off-band, measure the reflected power and calculated the matching losses of the 3stub network
- In this way the electrodynamic Q can be corrected



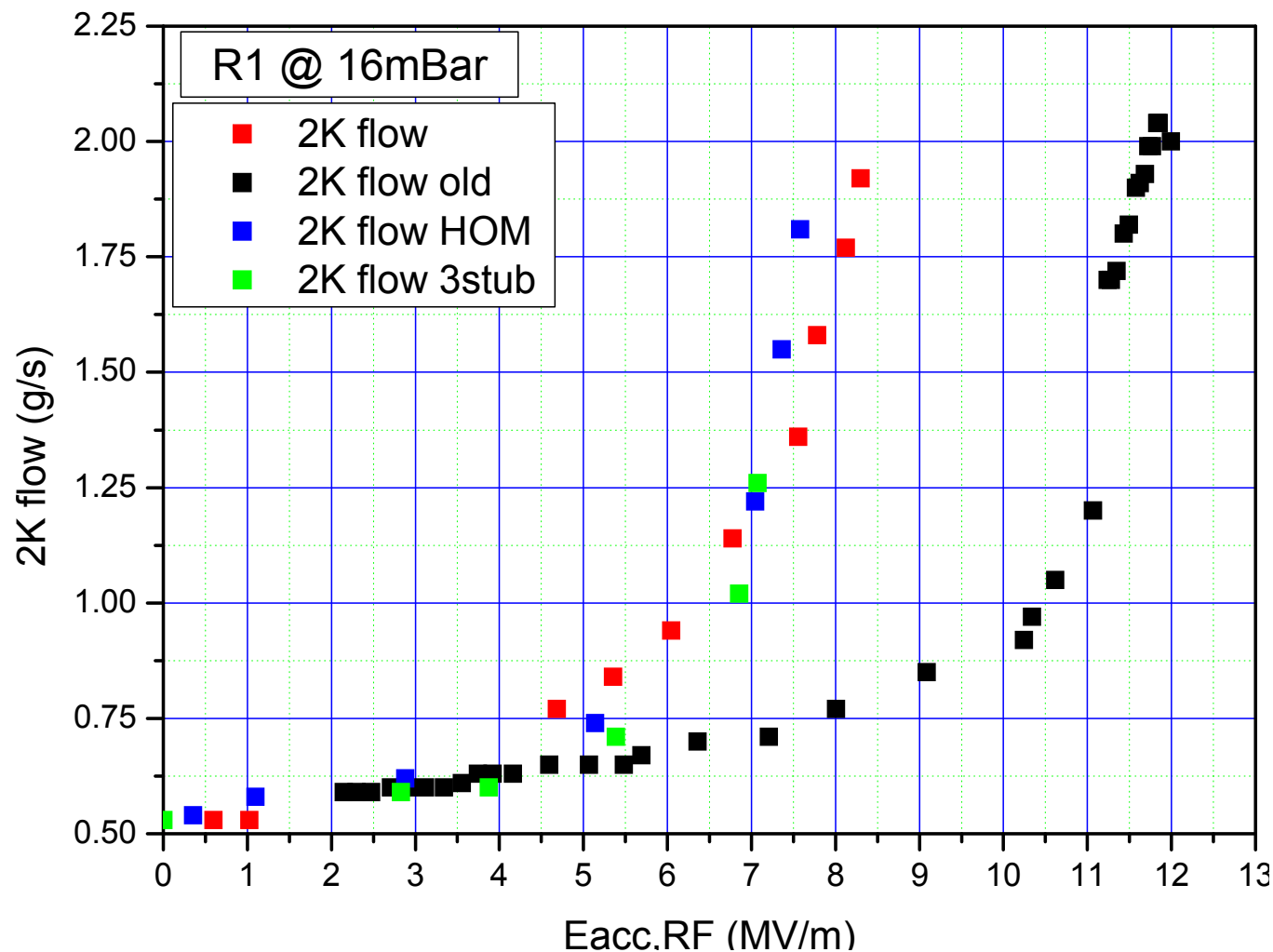
## Influence of HOM-Cooling

- Temperatures on all 4 HOM couplers are measured
- In the first session no additionally cooling was used
- HOM coupler heats up to 50K
- In the second session the HOM coupler was connected with the cavity tank by copper braids
- HOM cooling was much better, especially at the Sapphire HOM's
- Measurement of HOM signals not possible due a mistake by RI, mounting HOM's in wrong direction

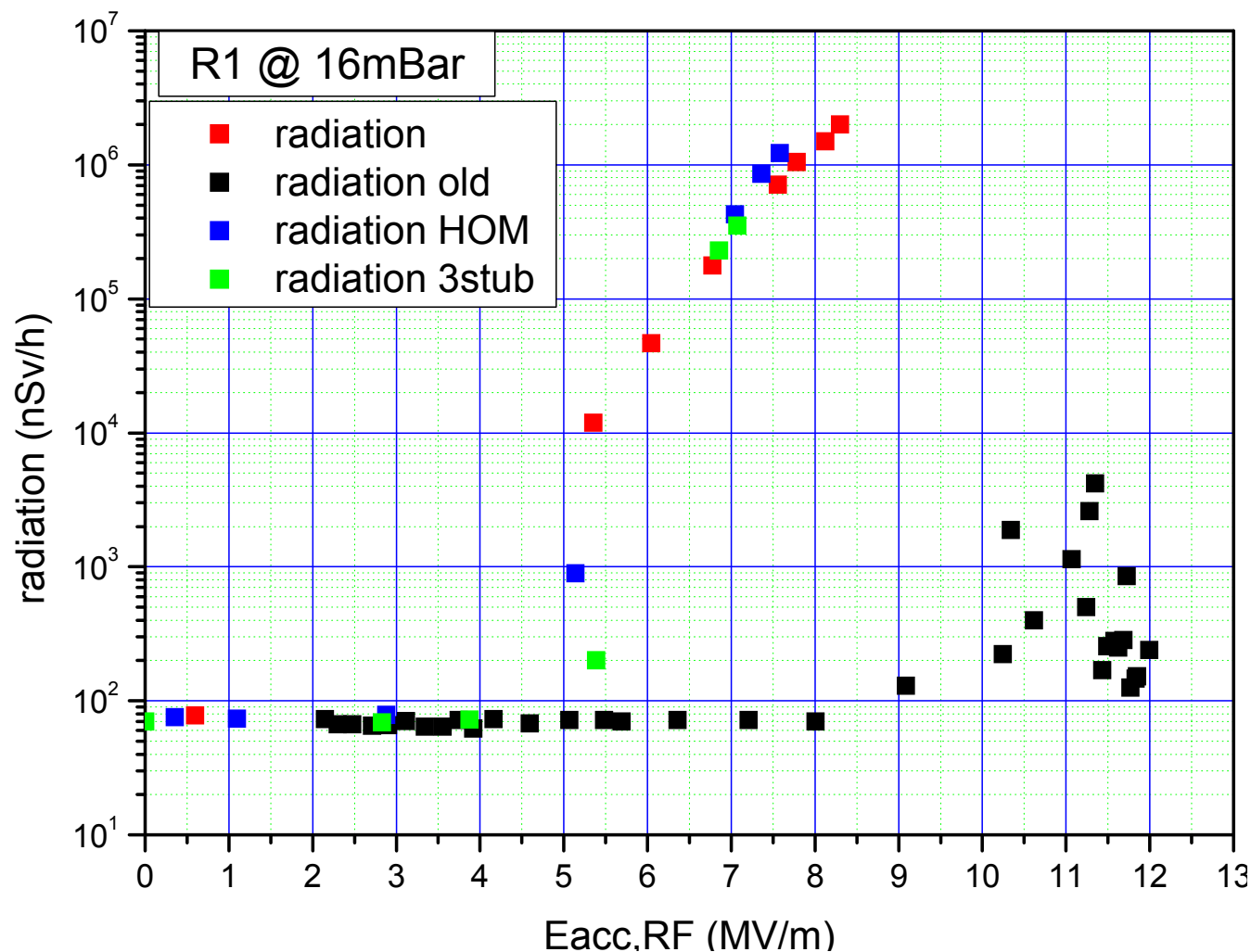
## Picture of HOM-Cooling by Braids



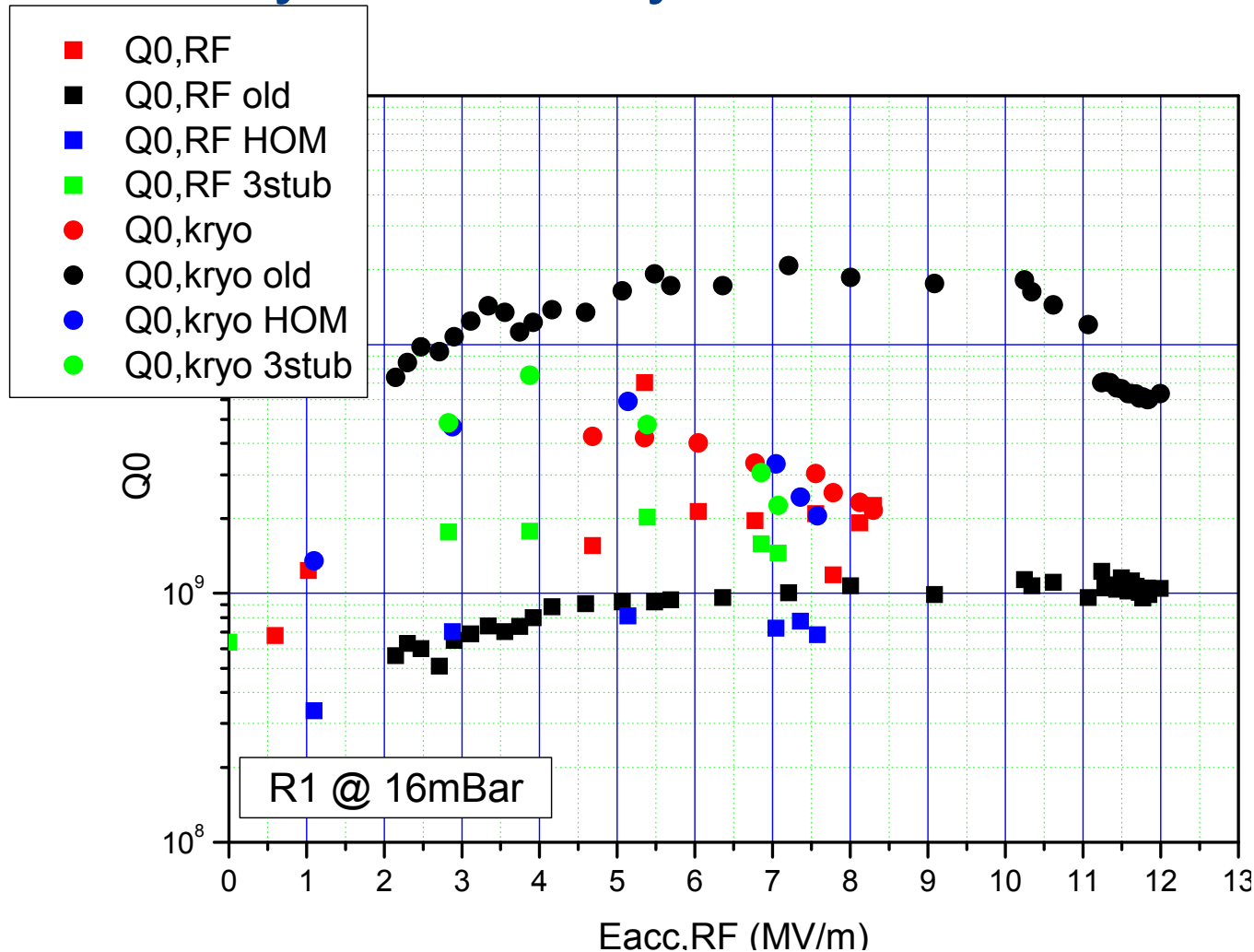
## Results Cavity 1 – 2K Flow



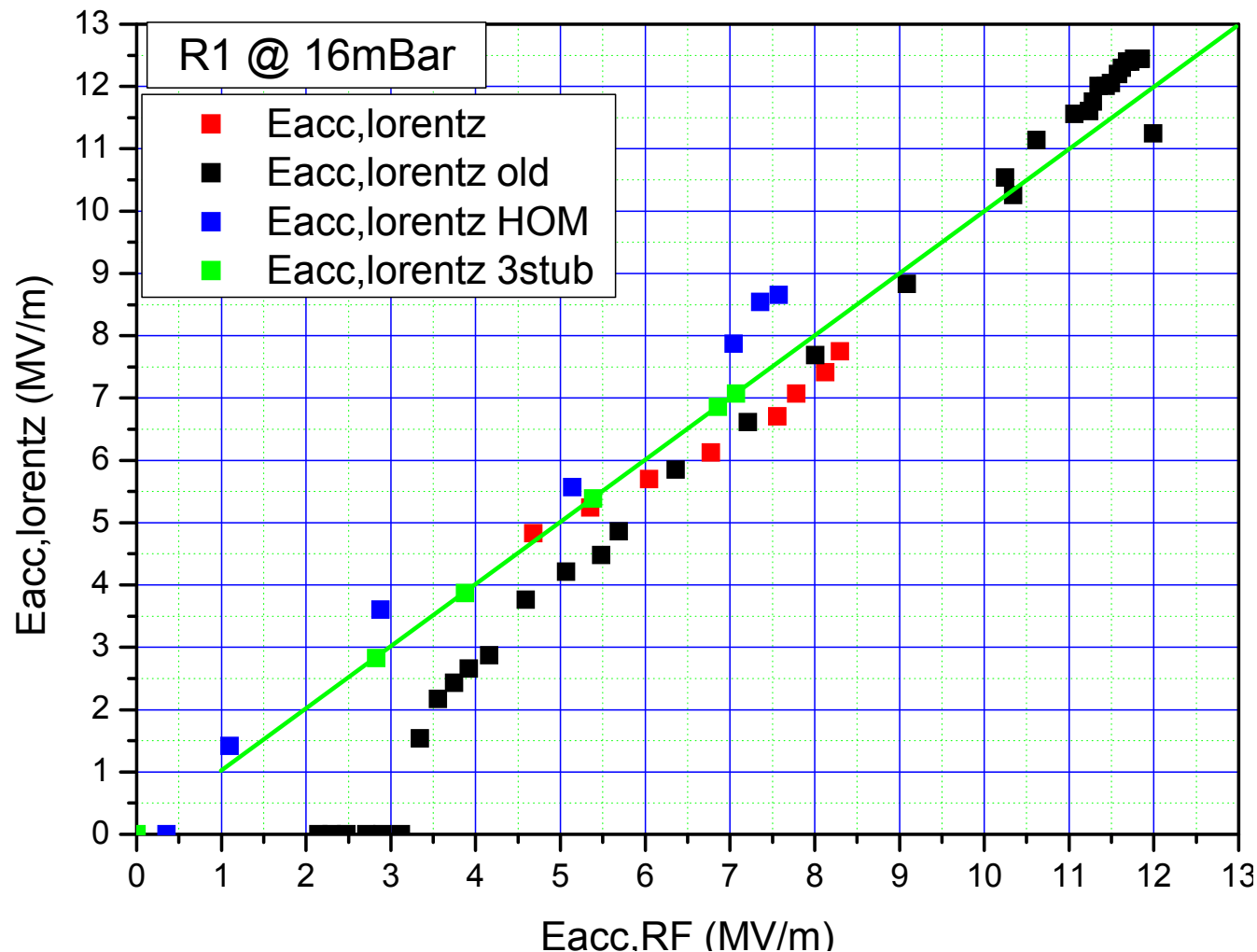
## Results Cavity 1 - Radiation



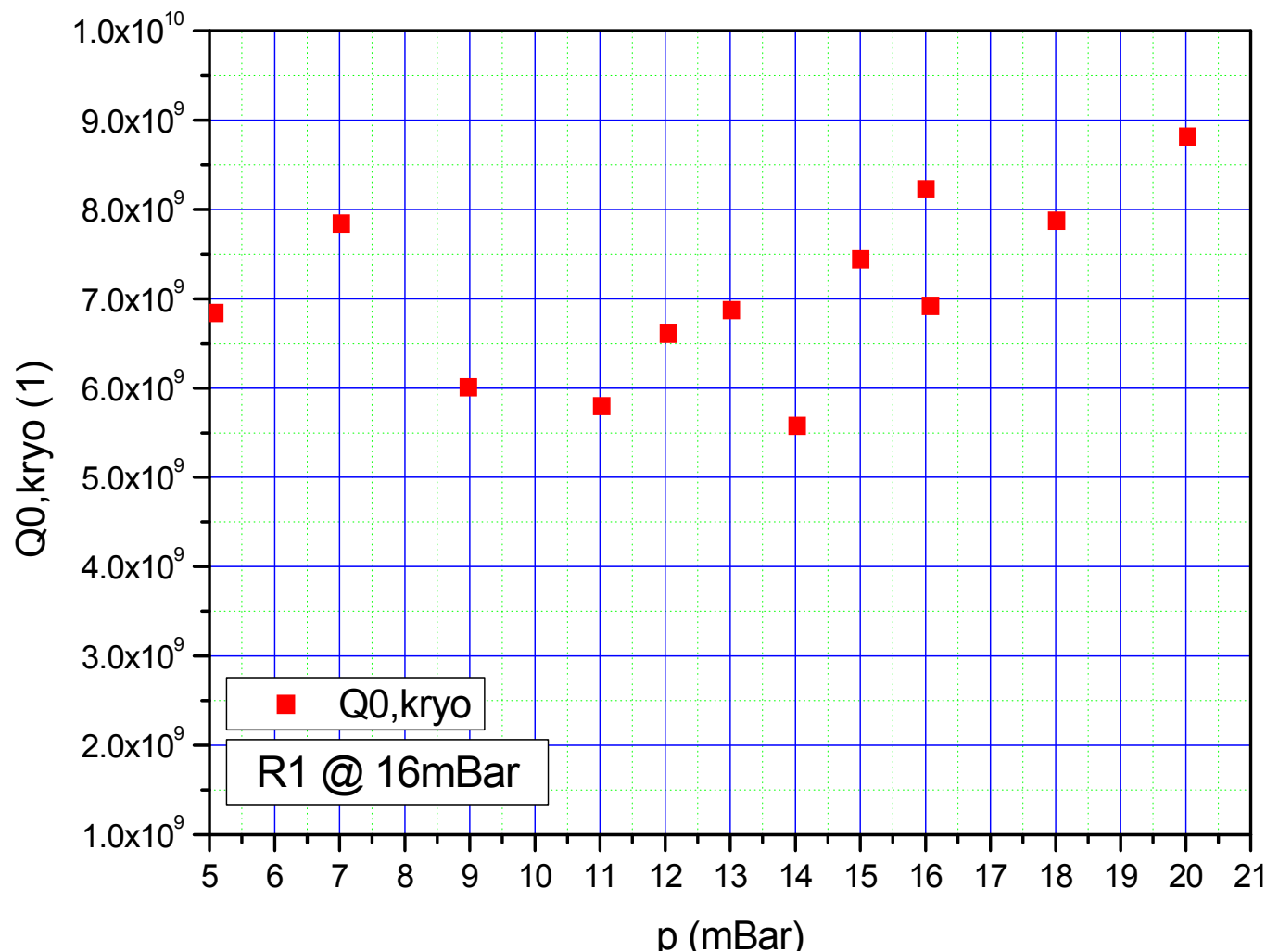
## Results Cavity 1 – Quality Factor



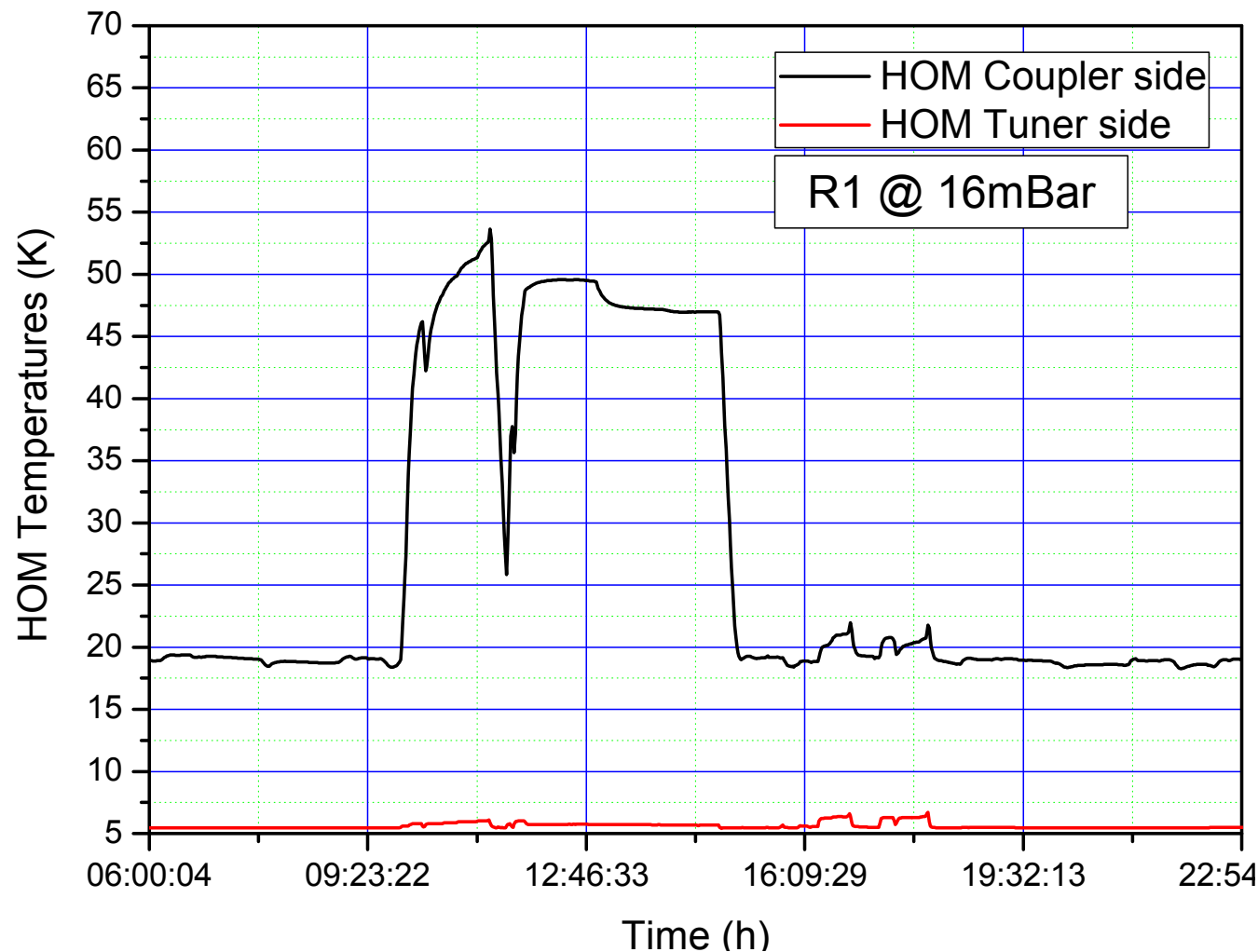
# Results Cavity 1 – Lorentz Force Detuning



# Results Cavity 1 – Quality Factor over Pressure

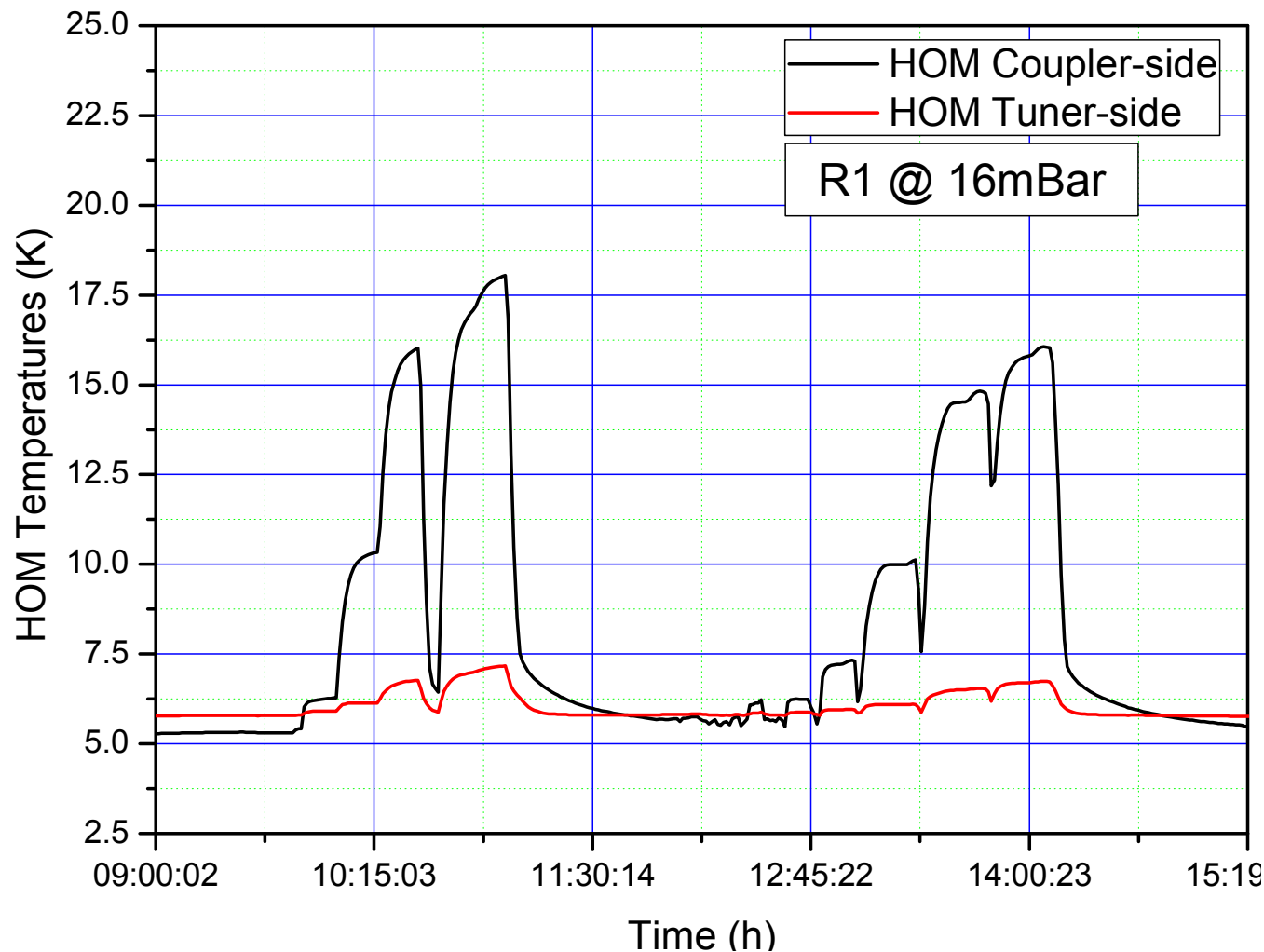


## Results Cavity 1 – HOM Temperatures without Braids

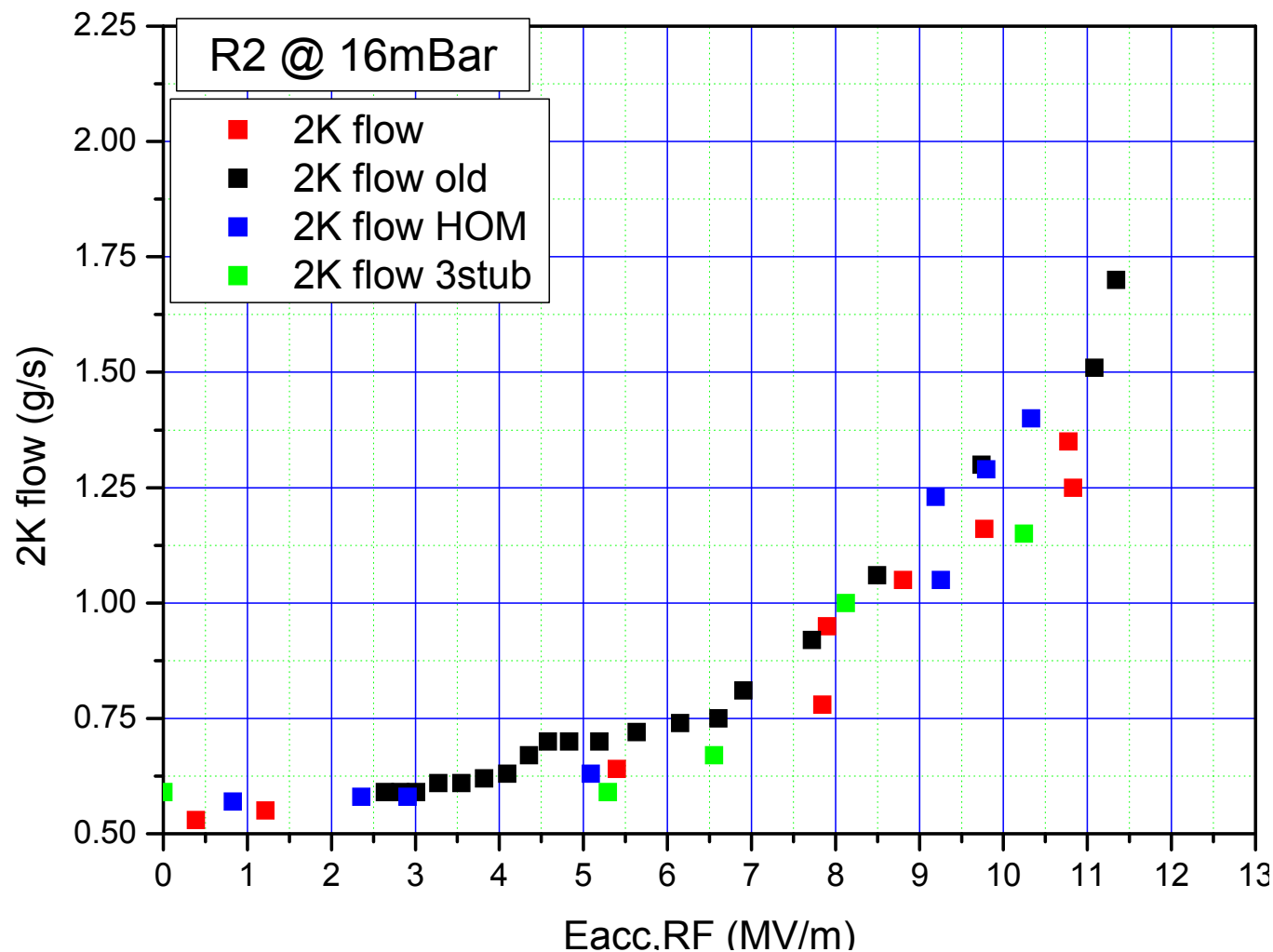




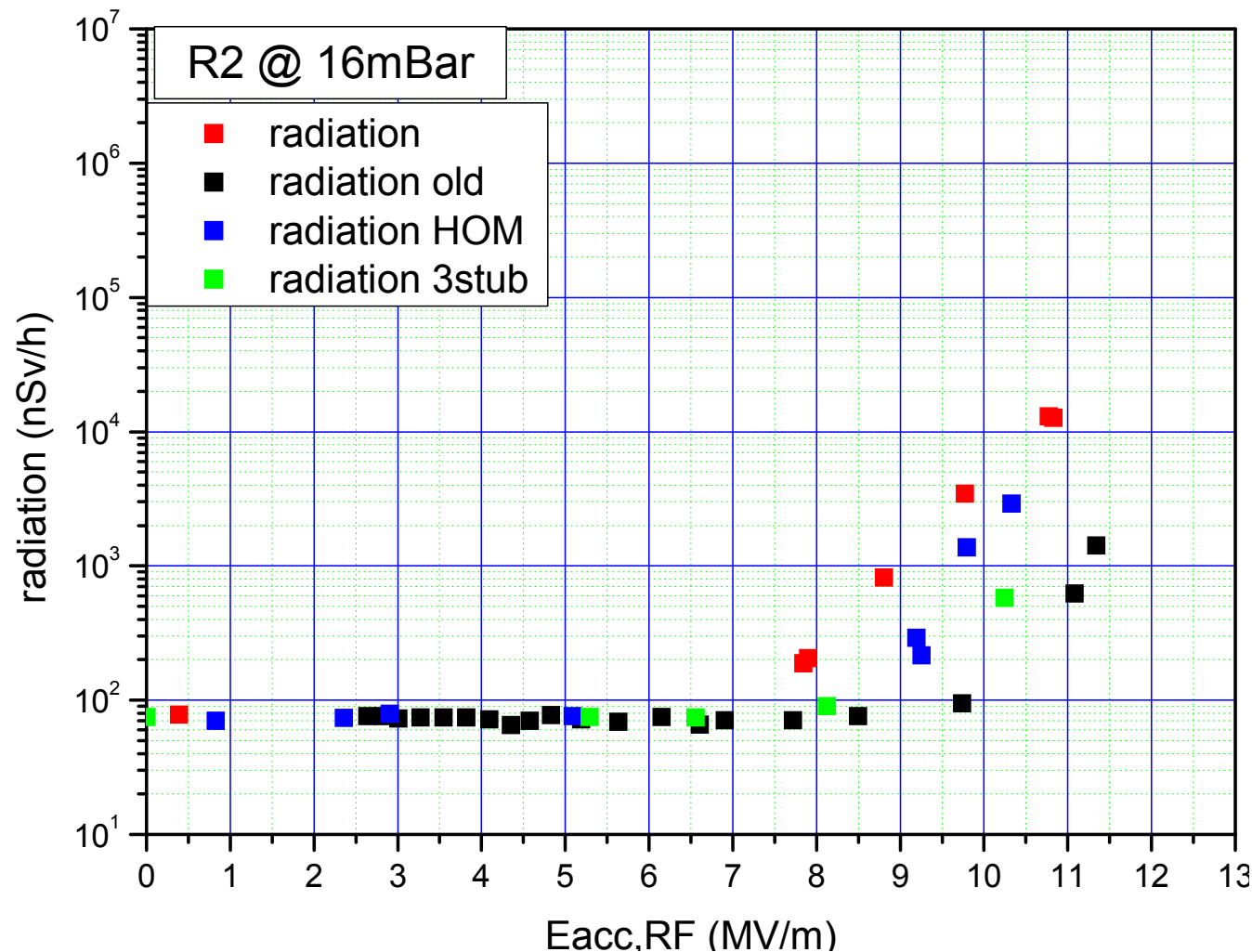
# Results Cavity 1 – HOM Temperatures with Braids



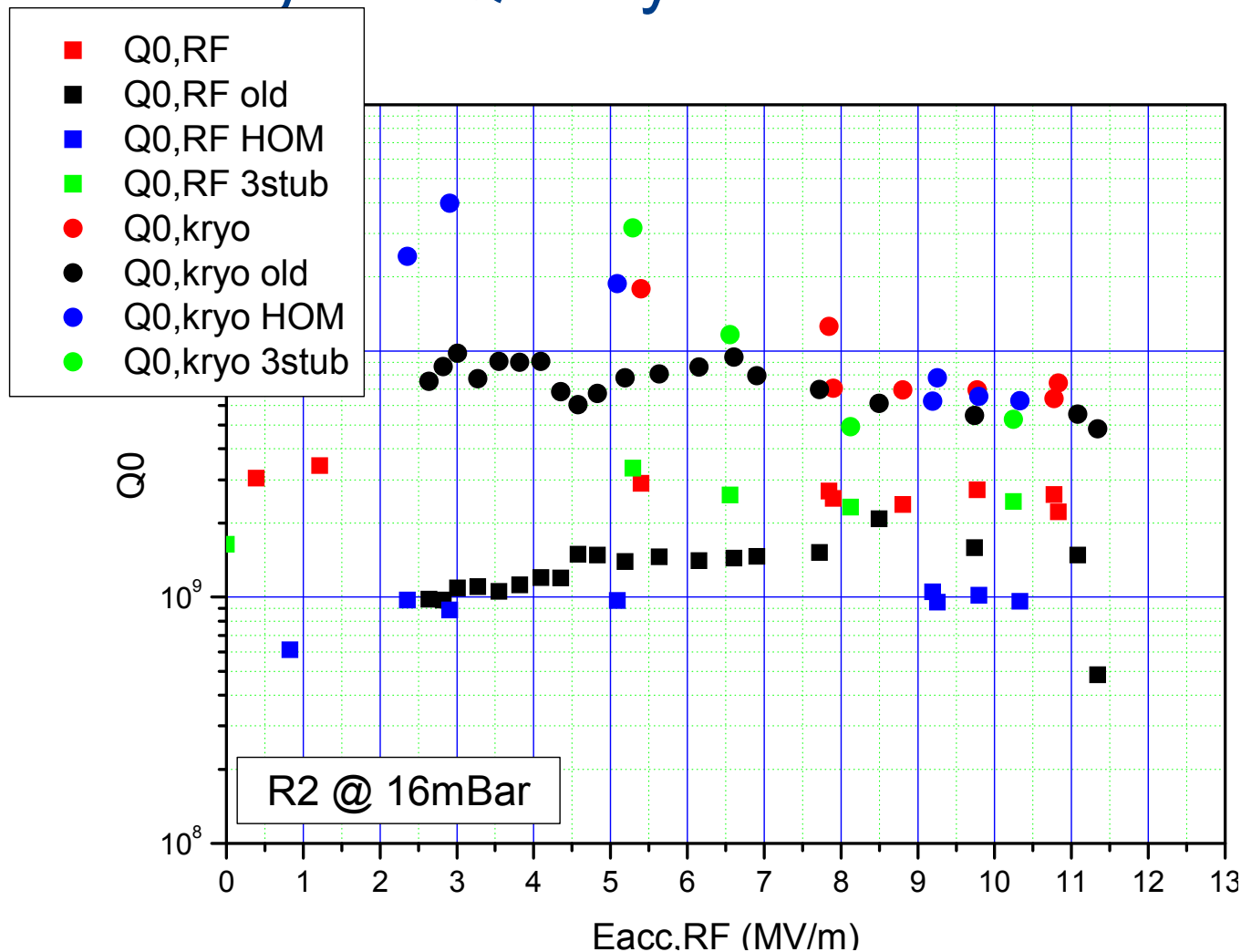
## Results Cavity 2 – 2K Flow



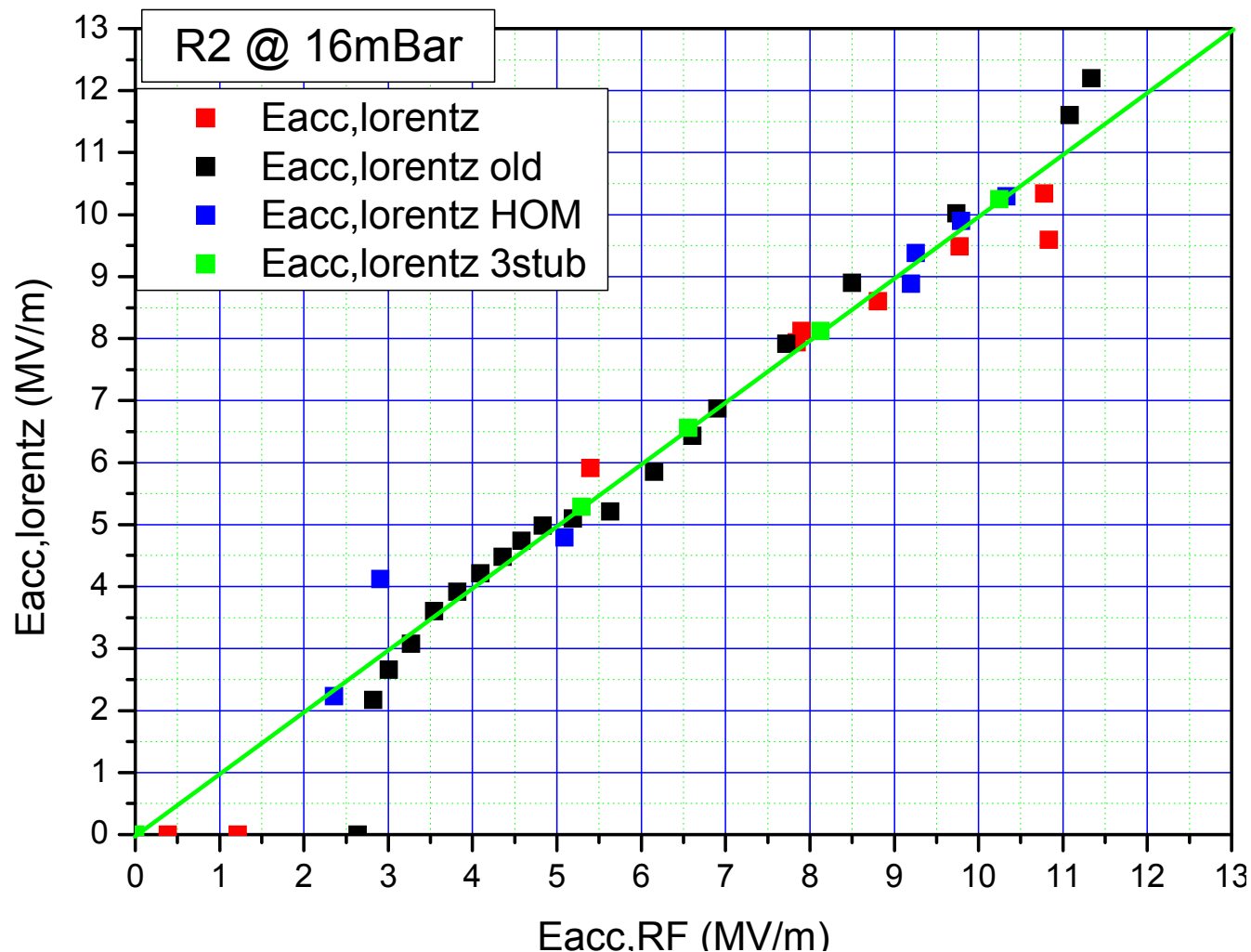
## Results Cavity 2 - Radiation



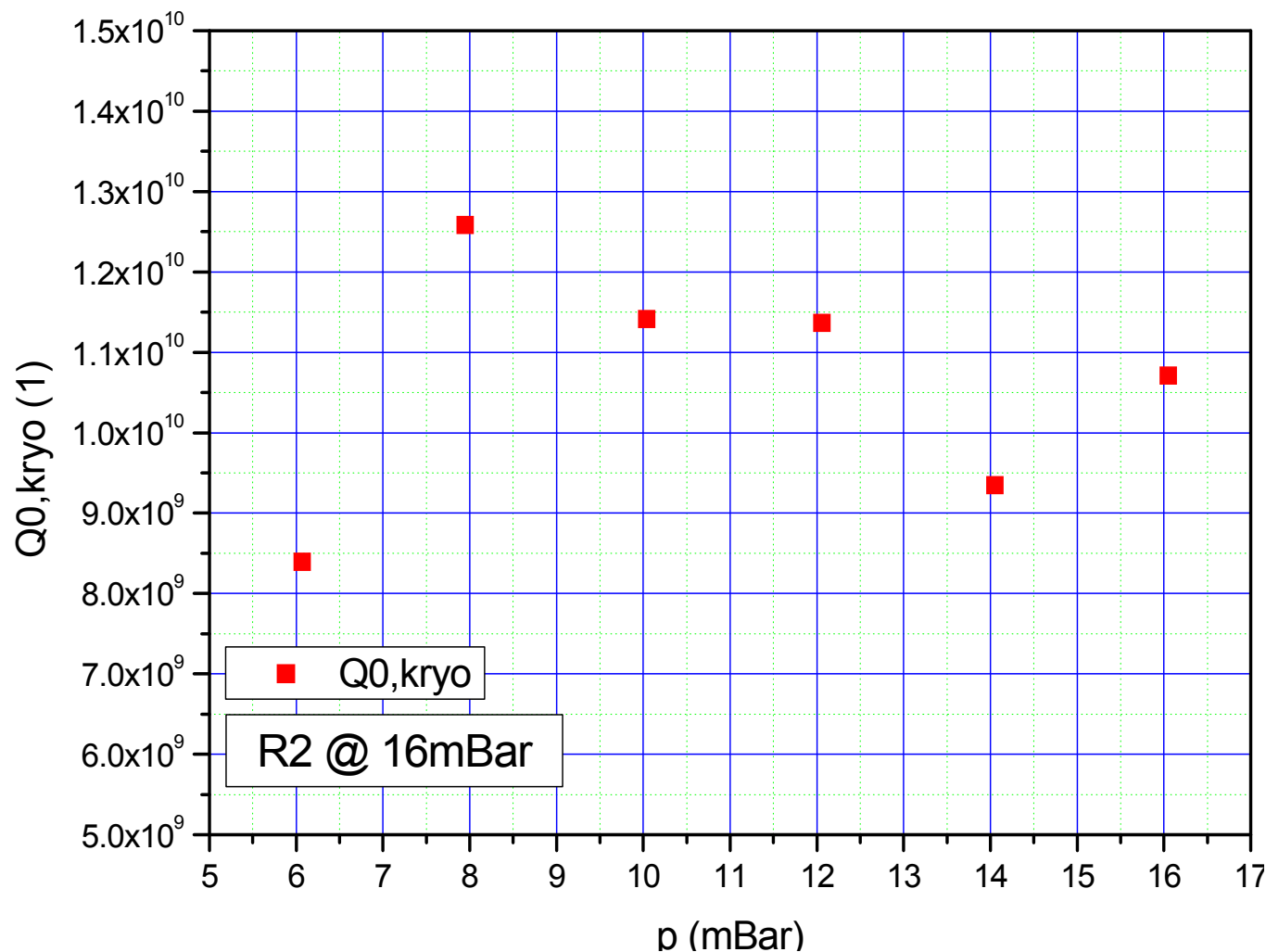
## Results Cavity 2 – Quality Factor



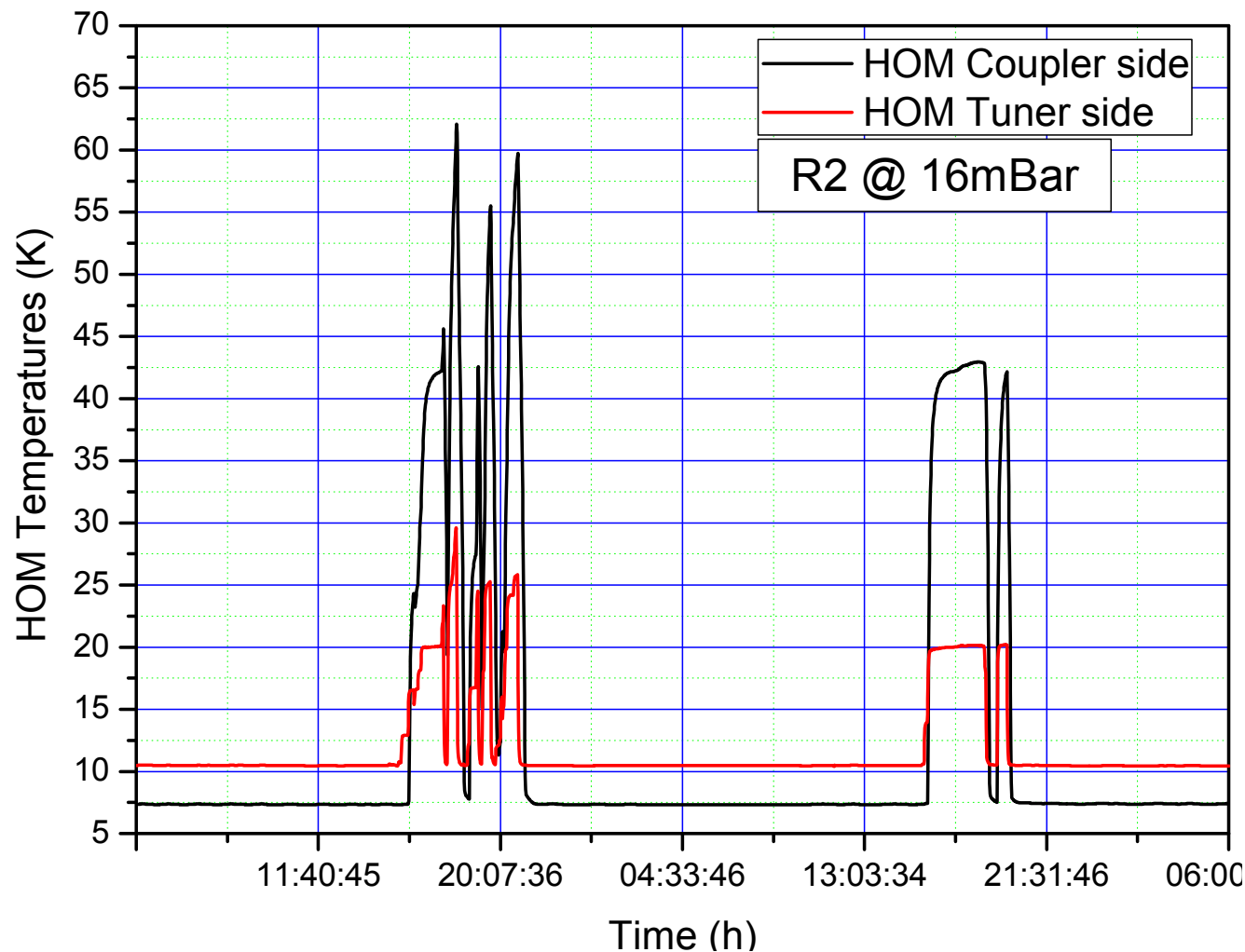
# Results Cavity 2 – Lorentz Force Detuning



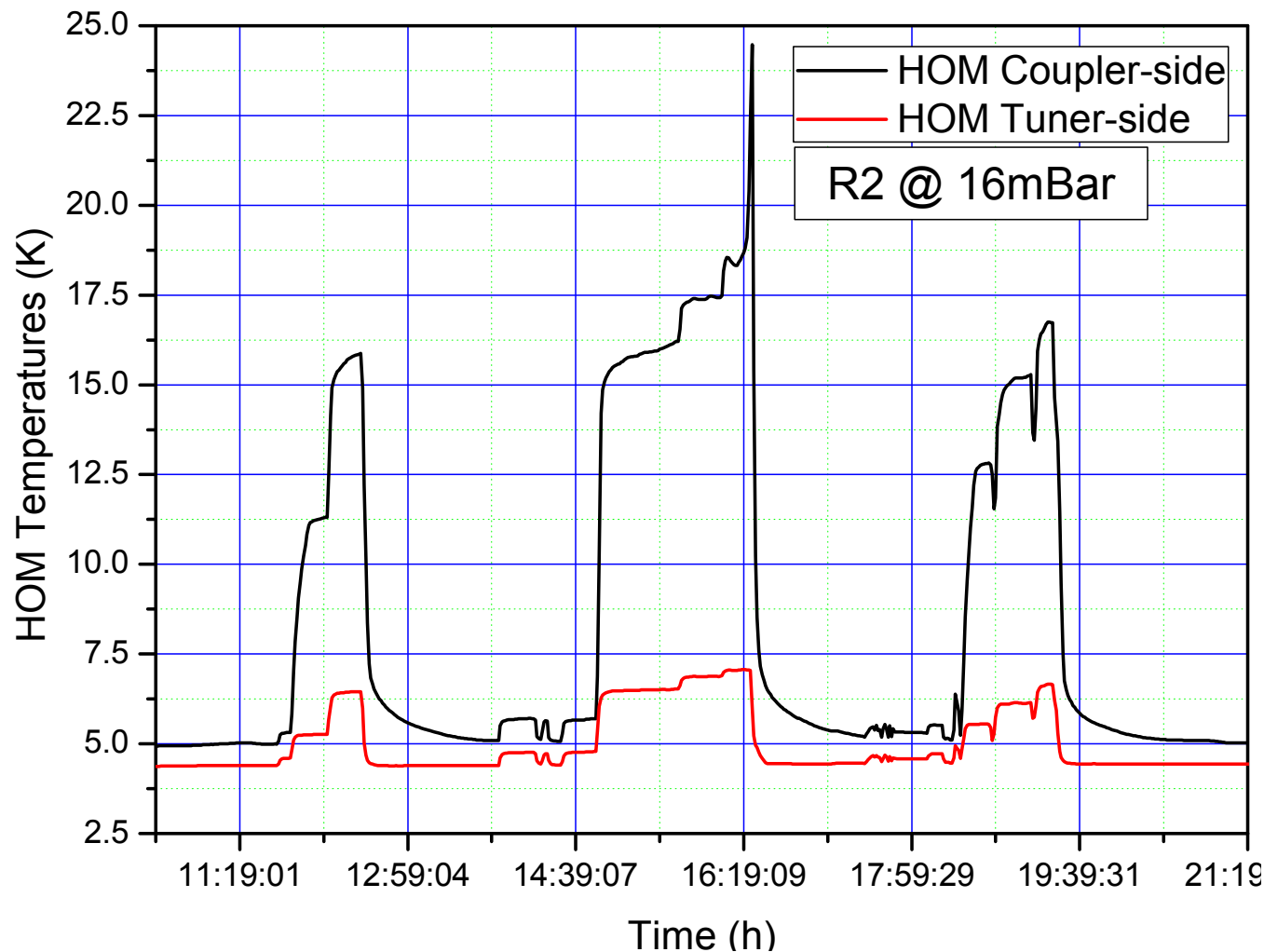
## Results Cavity 2 – Quality Factor over Pressure



## Results Cavity 2 – HOM Temperatures without Braids

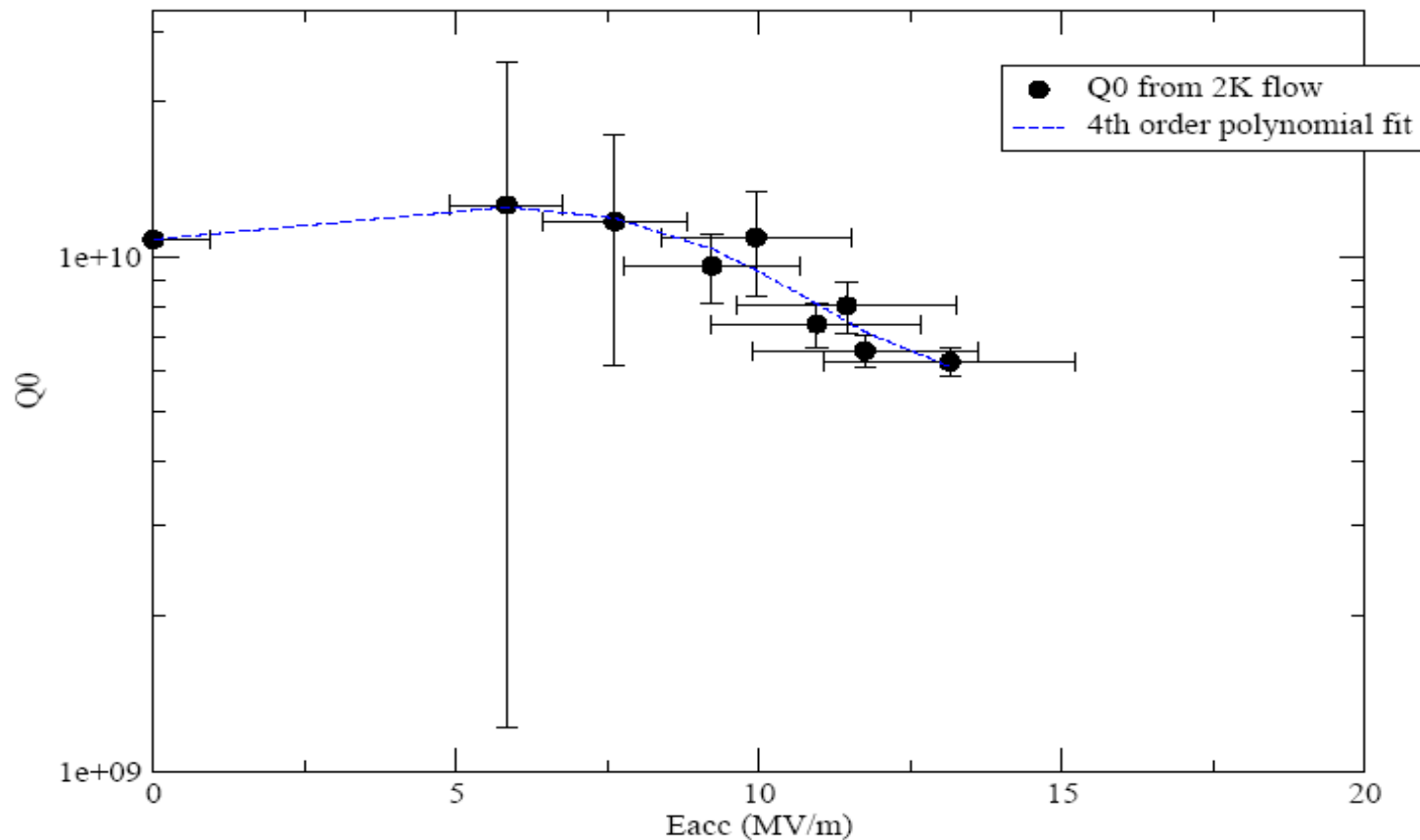


# Results Cavity 2 – HOM Temperatures with Braids





## Error Discussion



## Problems & Further Work

- Coupler vacuum could be better again
- Interchanging of both HOM-coupler necessary due the RI mistake
- Better using Sapphire HOM-couplers on all positions
- LHe control loop time constant is very big, better using an additionally heater for controlling the fuel level
- Worse Results, therefore better cleaning now at DESY (gracefully sponsored by RI :-)
- No further measurements at HoBiCat possible
- Building Module III without measurement

## Thanks to

- Armin for the construction
- Oliver for the cappuccino
- Hardy & Andre for troubleshooting
- HoBiCaT-Micha for the vacuum
- ELBE-Micha for the cavity preparation