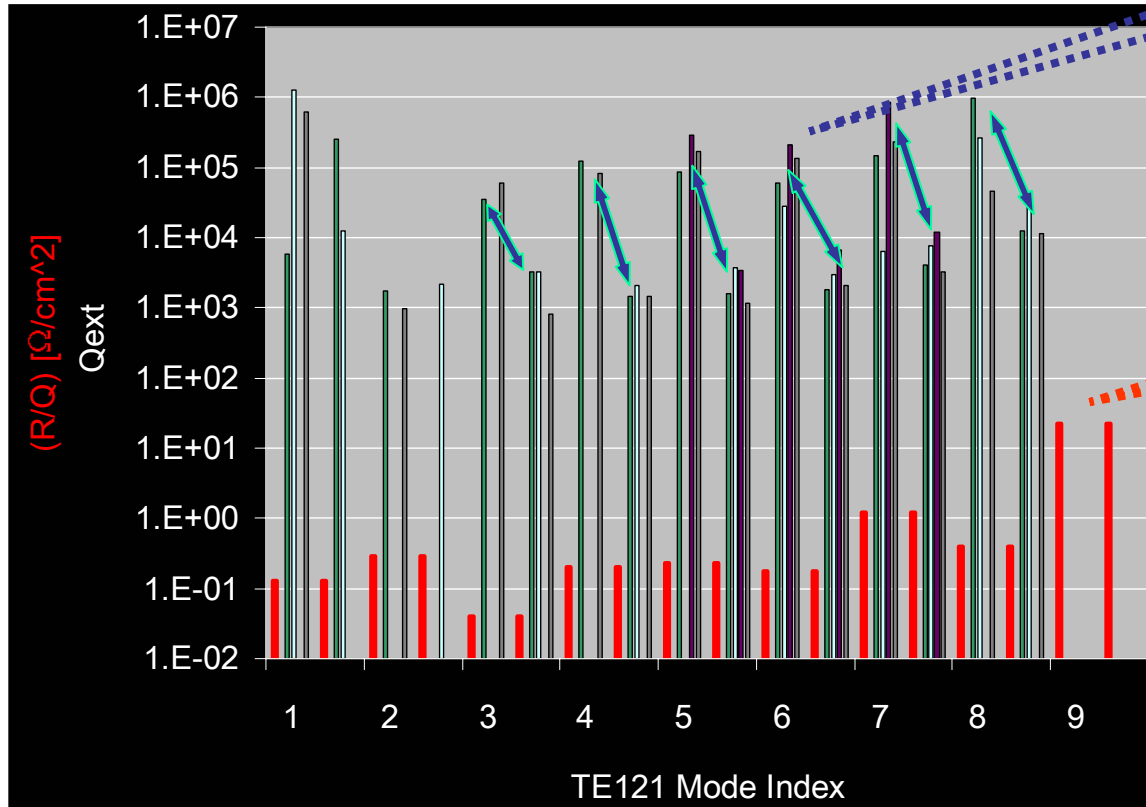


# HOM Coupler developments @ DESY

1. Mode coupling, orientation of HOM Antenna
2. Feed through
3. Bigger distance on coupling capacity
4. Elimination of capacitive coupling
5. Lower field at antenna tip
6. Conclusion

# HOM statistics : measured at 2K

$Q_{\text{ext}}$  of 3rd dipole passband **TE121**  
(cavities measured in the horizontal cryostat CHECHIA)



Big difference in  $Q_{\text{ext}}$   
of both polarization

Hard to find due to overlapping  
and frequency shifting when both  
beam tubes closed with flanges

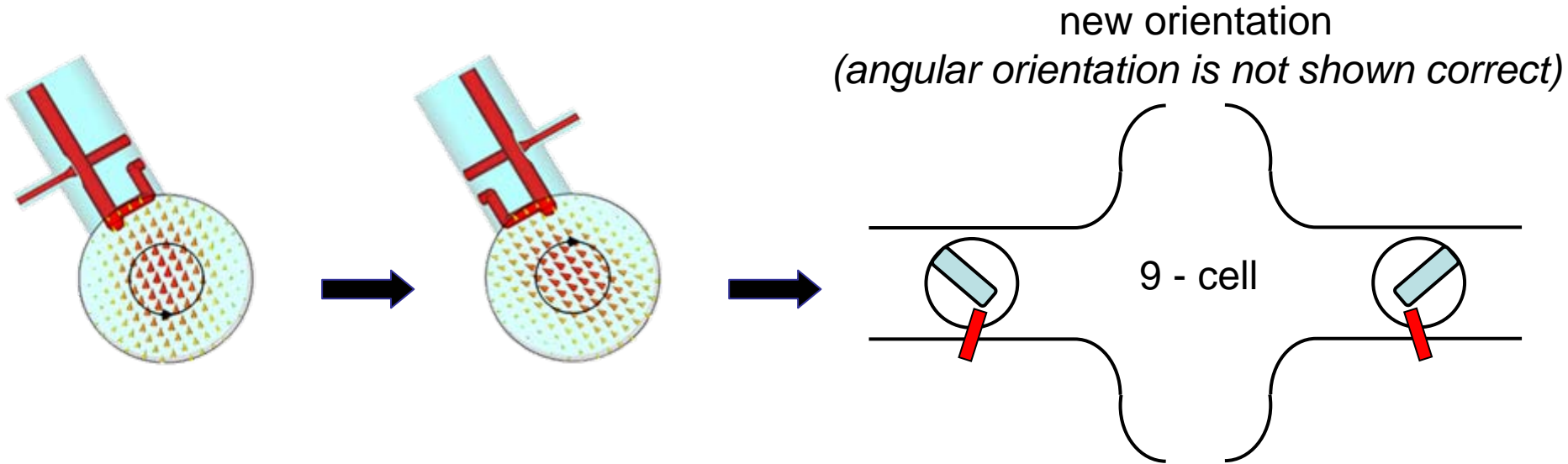
Also many  
measurements in  
the TTF linac

Jacek Sekutowicz

# Change of antenna orientation

*Insufficient damping of one polarization was first observed by Saclay group using the charge modulation method.*

*Computer simulation (M. Dohlus) mirrored HOM coupler should provide better damping.*

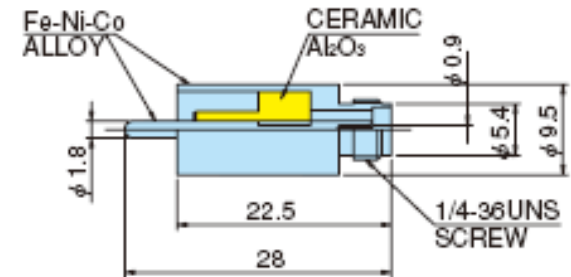


*New 30 cavities have the mirrored HOM coupler. Test in 2006.*

J. Sekutowicz  
M. Dohlus

# Feed through, 1<sup>st</sup>

SMA-R -Ti



from stock, but:

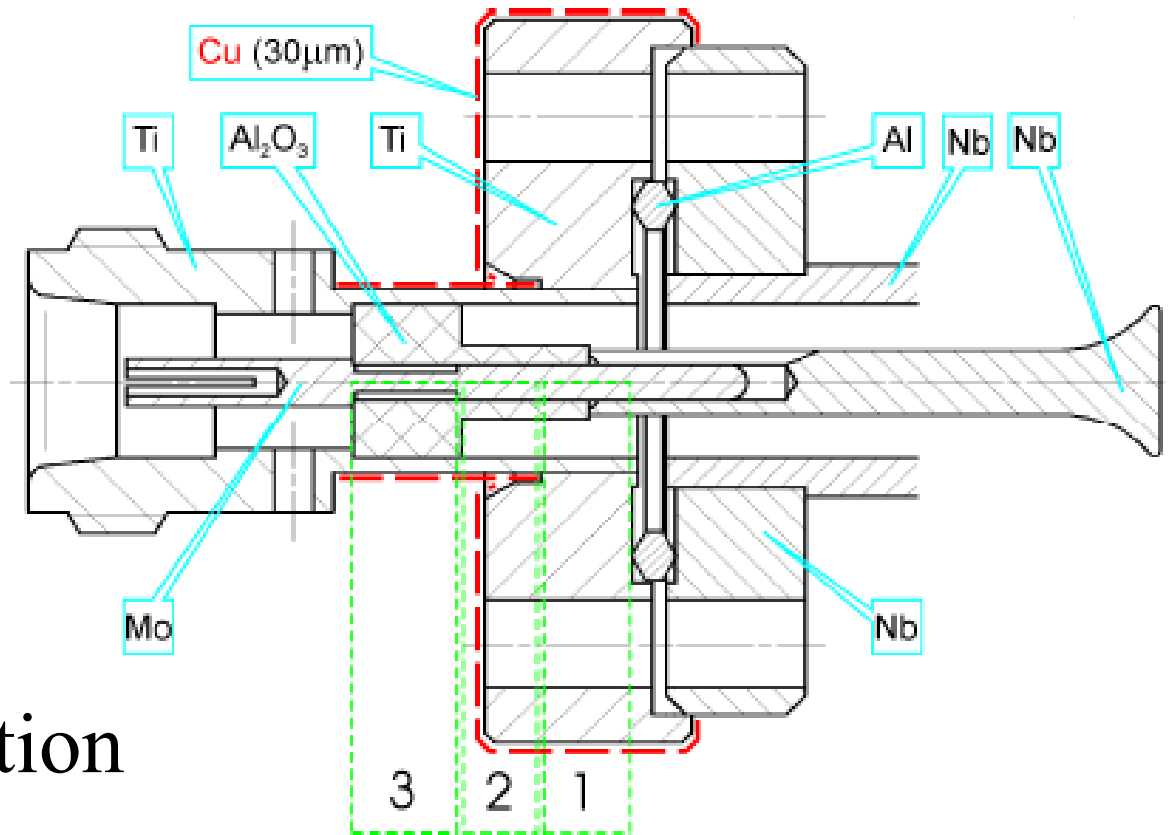
- outer conductor is Ti
- inner conductor is Mo
- welded to the Ti-flange
- all copper plated
- used for the 1<sup>st</sup> cavity production

# Feed through 2<sup>nd</sup>



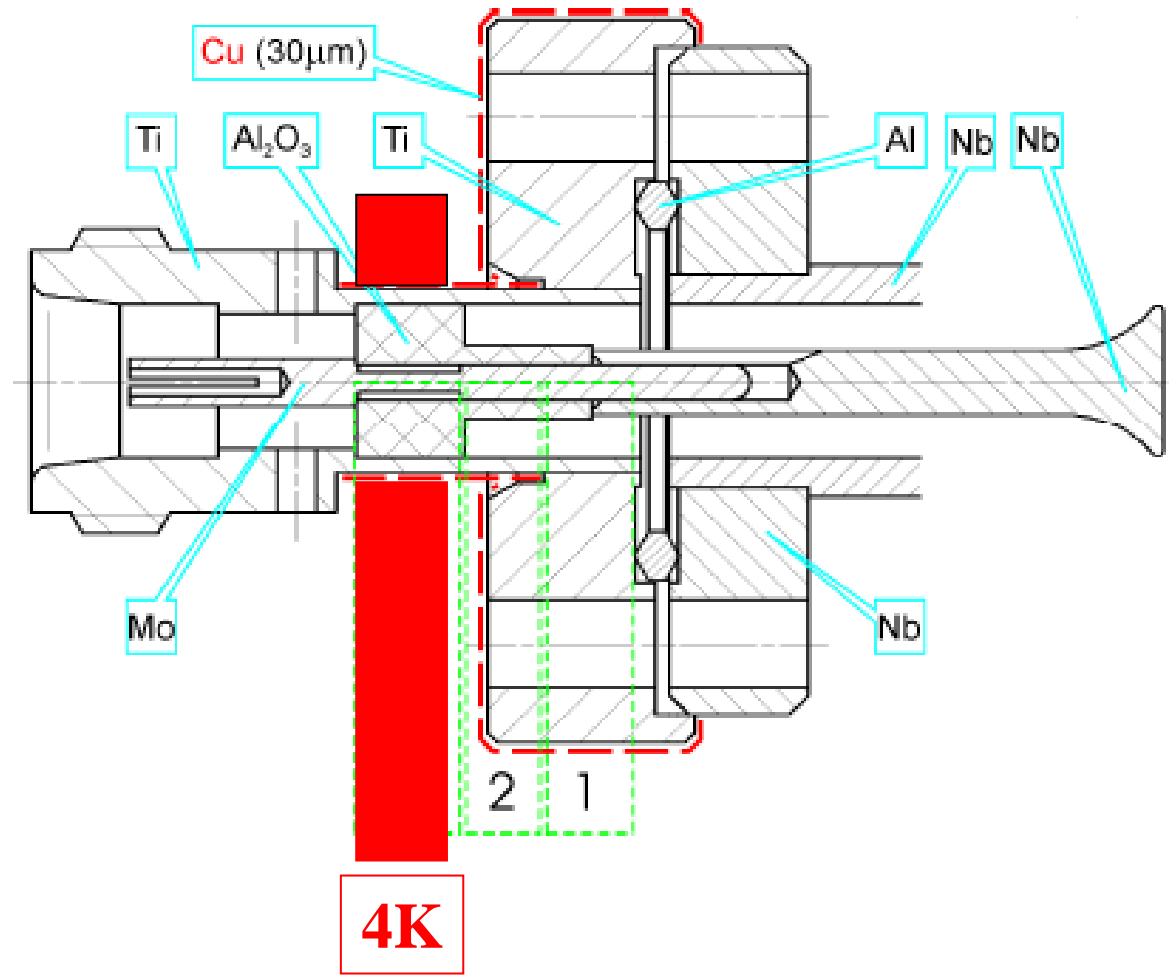
SMA-R-Ti, but:  
• N – connector

used for the  
2<sup>nd</sup> cavity production



# Feed through 3<sup>rd</sup>

- no copper plating
- thermal anchor on the feed through
- 3<sup>rd</sup> cavity production in module 6

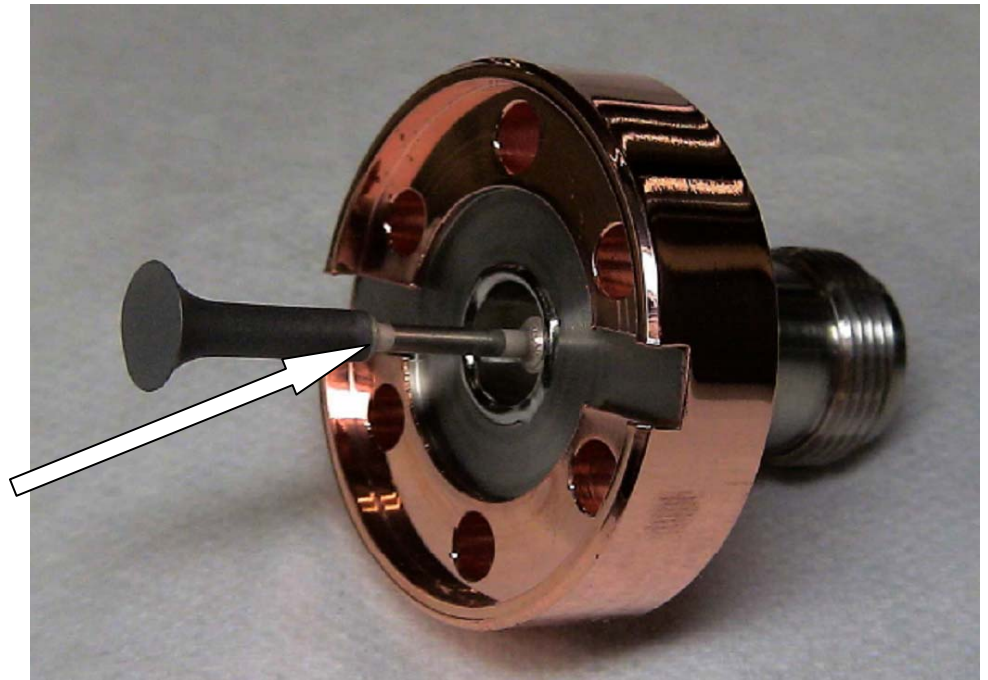


# Feed through, 4<sup>th</sup>

 / DESY development

Nb antenna tip brazed

- not jet used / tested



# Feed through, 5<sup>th</sup>

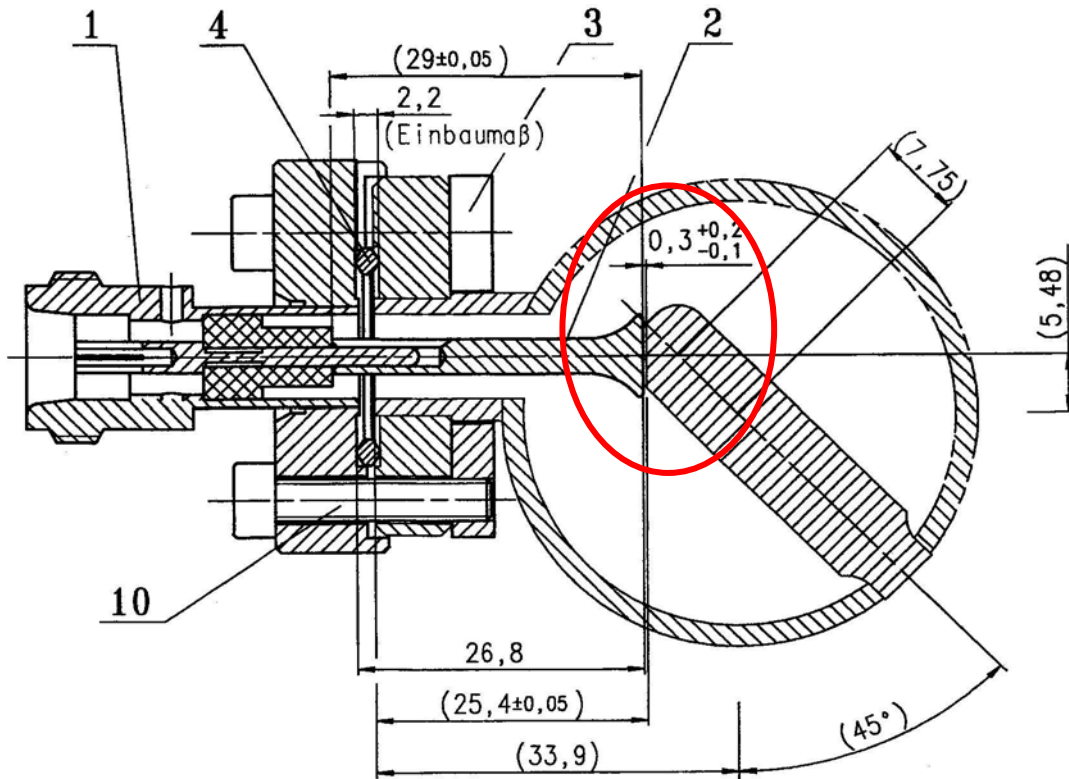
Jefferson Lab  
development

- higher thermal conductivity
- cw test at DESY on a 9-cell cavity this summer



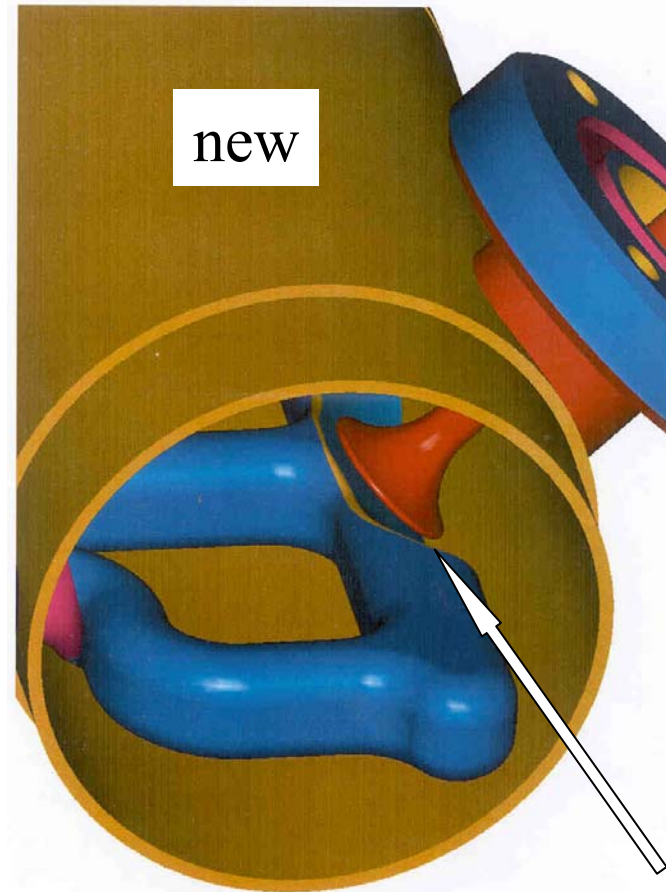


# Distance between inner conductor and antenna tip, 1<sup>st</sup>



- very small distance: 0.3 mm
- hard to adjust

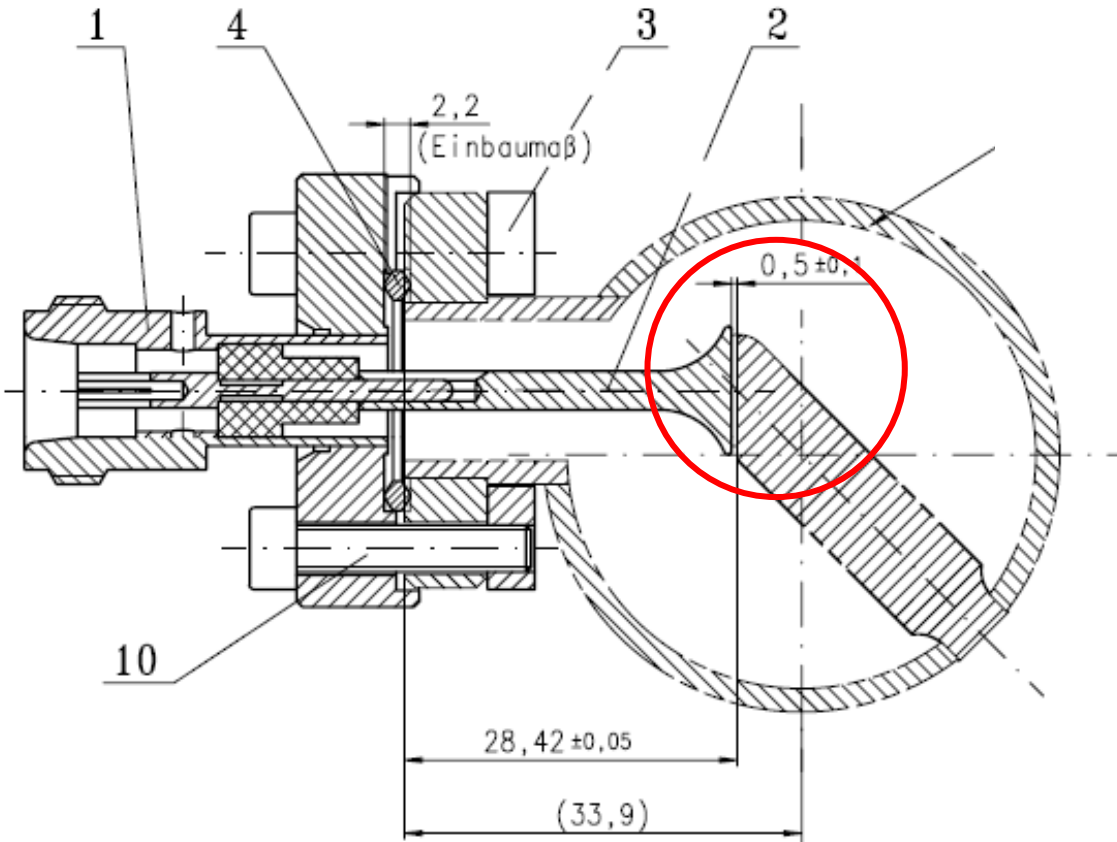
# Distance between inner conductor and antenna tip, 2<sup>nd</sup>



bigger capacitor surface  
→ bigger distance

# Distance between inner conductor and antenna tip, 3<sup>rd</sup>

Schnitt A - A



changed from

- 0.3mm  
(1<sup>st</sup> and 2<sup>nd</sup>  
cavity  
production)
- to 0.5mm  
(3<sup>rd</sup> production)

→ easier to adjust

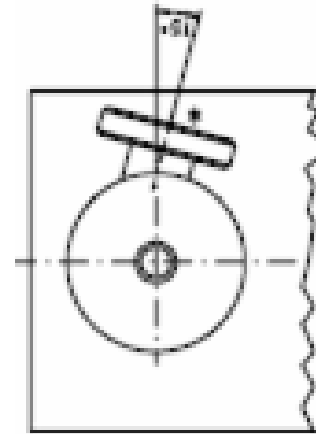
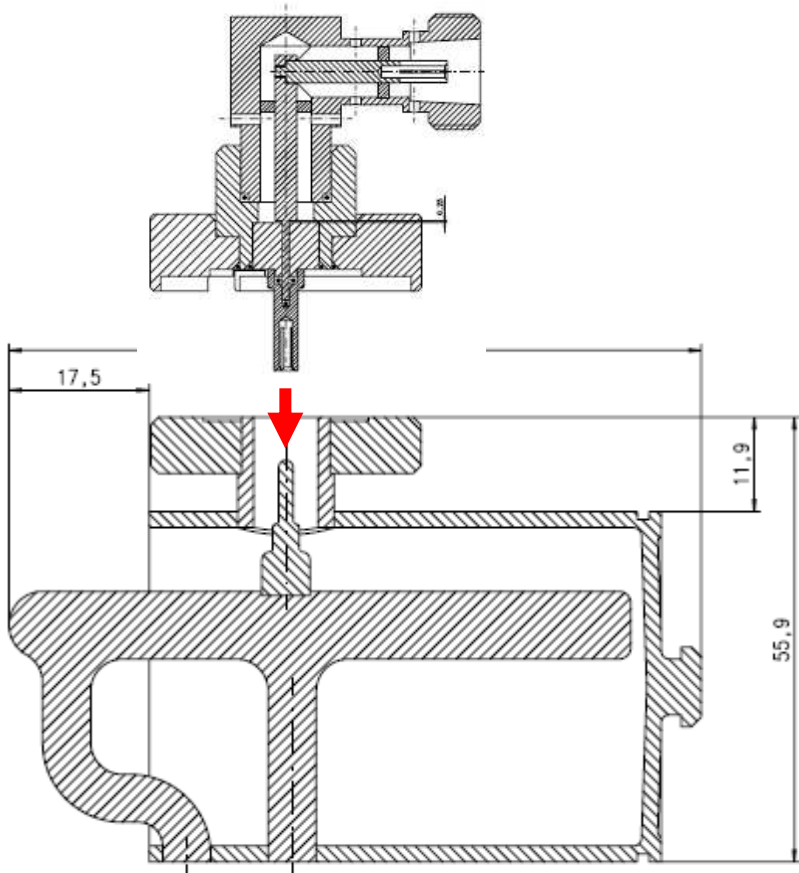
# Elimination of capacitive coupling by straight connection to inner conductor

pro

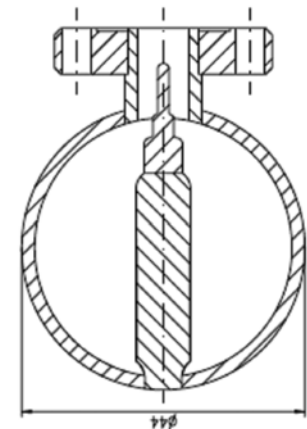
- no heating of the antenna tip
- no adjustment necessary
- simplified fabrication

con

- reliable contact necessary
- possible particle source

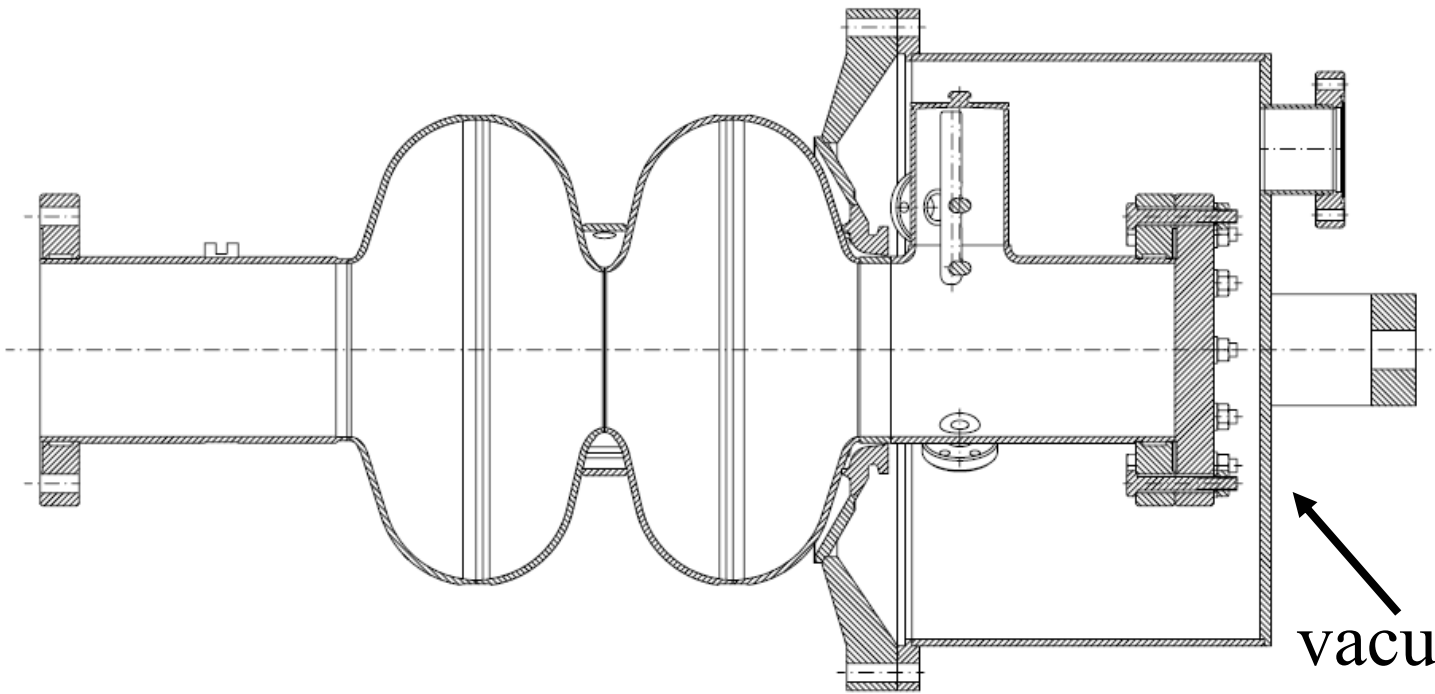


old



new with straight connection

# Direct connection to inner conductor will be tested on 2-cell cavity



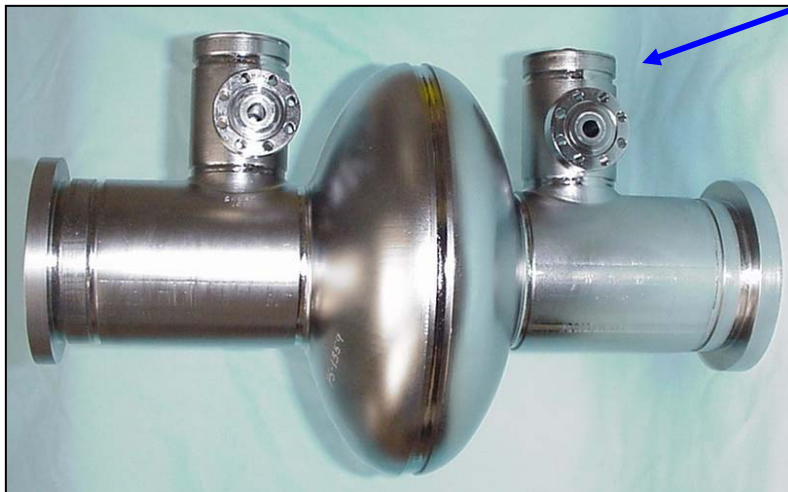
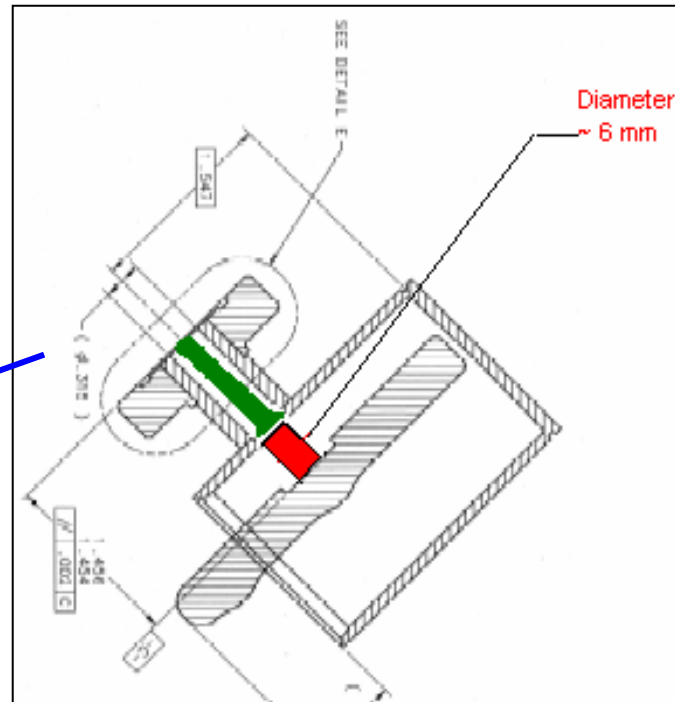
test scheduled for summer 06

vacuum cap for  
separation of the  
liquid helium in  
vert. test



# Modified HOM Coupler Tests at JLab

- lower field at the antenna tip  
→ less thermal load



P. Kneisel, J. Sekutowicz

# Conclusion

- thermal load on antenna tip has to be minimized
- SC niobium antenna is a must (used at DESY)
- thermal anchors at coupler body (all TTF modules and feed through (module 6) are in use
- development started:
  - better feed through
  - better coupling
  - simplified production
  - tests have to be done