

De Meetkamer

RINGKERNEN METEN, OF DE KUNST VAN HET NOG MEER
WEGLATEN

DOOR PA0HKZ

De Meetkamer

- Ferriet , ringkernen lastig te meten
- Resultaten vaak niet reproduceerbaar

De Meetkamer

Waarom het niet werkt

- Meerdere windingen, los draad, nooit hetzelfde
- Parasitaire capaciteit geeft ongewenste resonanties

De Meetkamer

Ideeën

- IN3OTD
- Whitham D. Reeve, Tom Hagen en Kurt Poulsen
MEASUREMENT TECHNIQUES AND APPLICATION OF COMBINED
PARALLEL/ORTHOGONAL MAGNETIC BIAS ON A FERRITE
TUNED RESONATOR IN LOW FREQUENCY RANGE (3-10 MHz)

De Meetkamer

IN30TD

- Coax met ferriet als diëlectricum



De Meetkamer

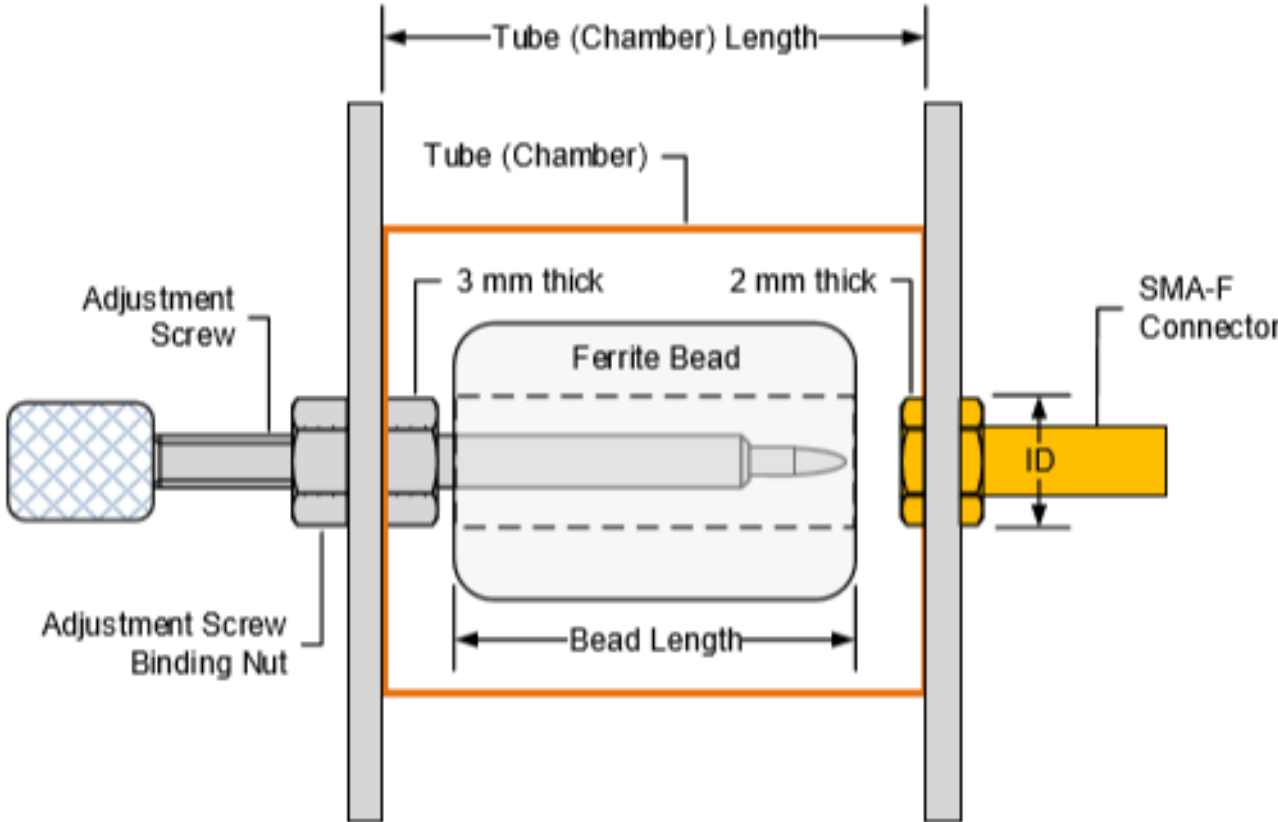
IN30TD

- Draadje



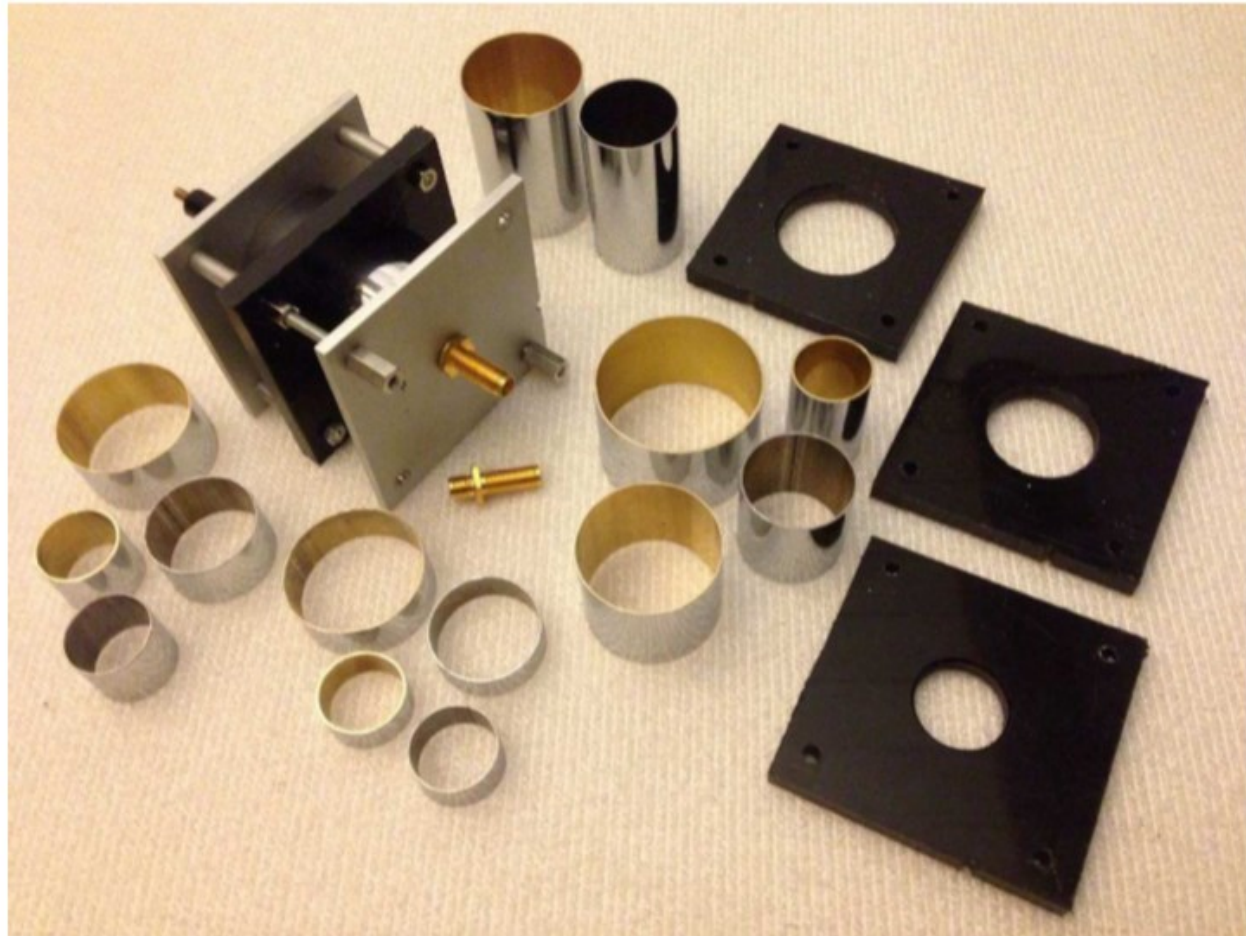
De Meetkamer

Whitham D. Reeve, Tom Hagen en Kurt Poulsen

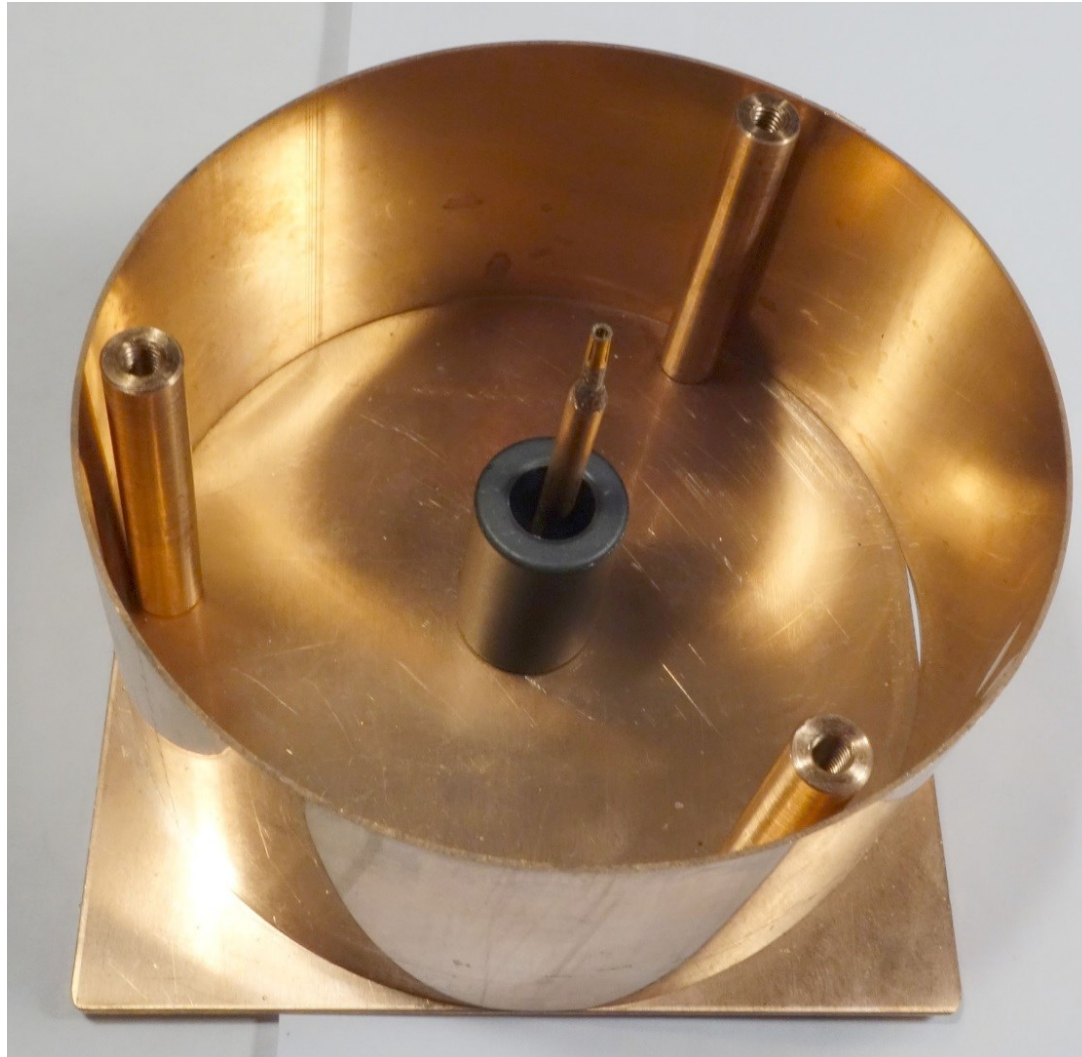


De Meetkamer

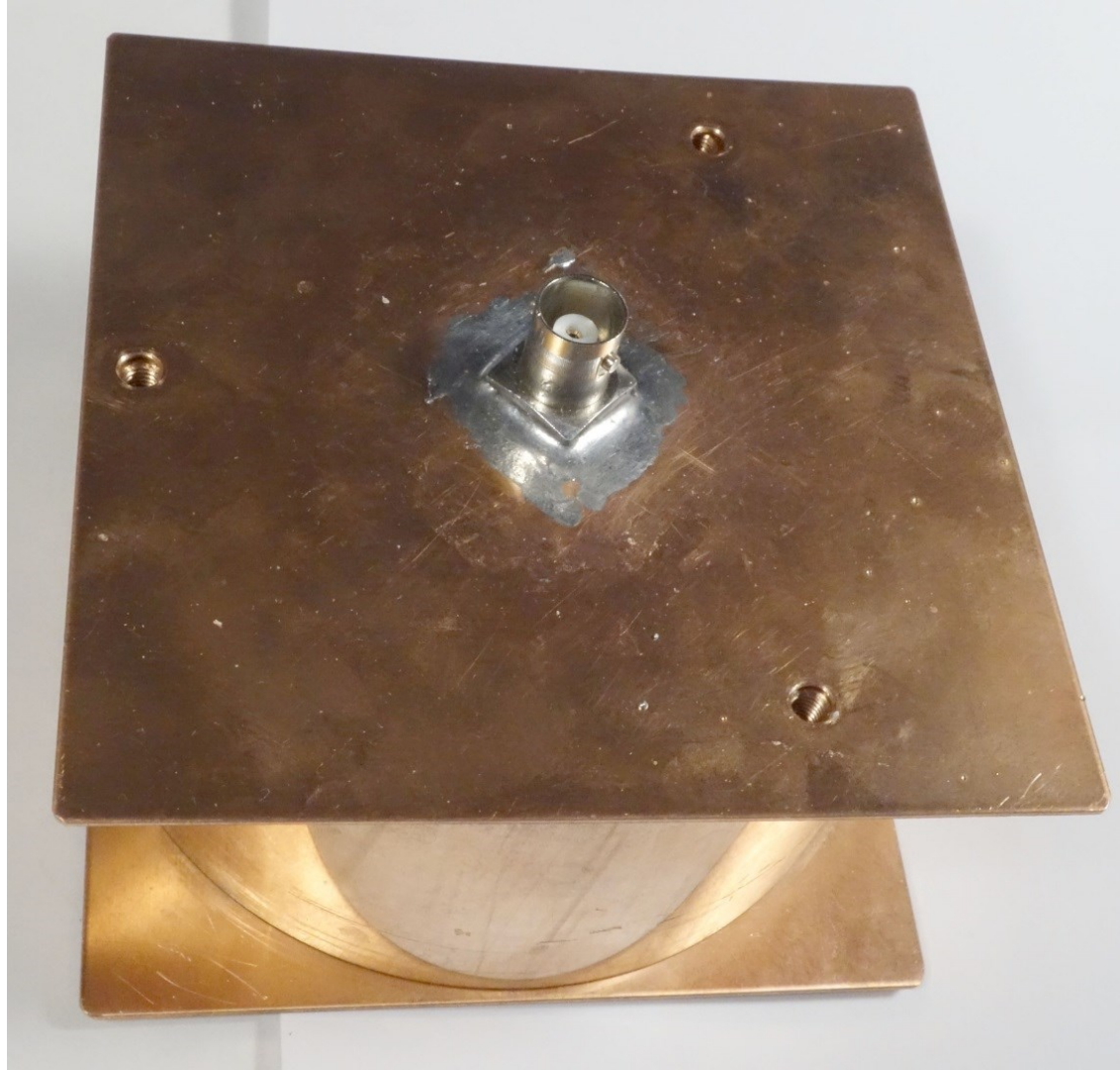
Whitham D. Reeve, Tom Hagen en Kurt Poulsen



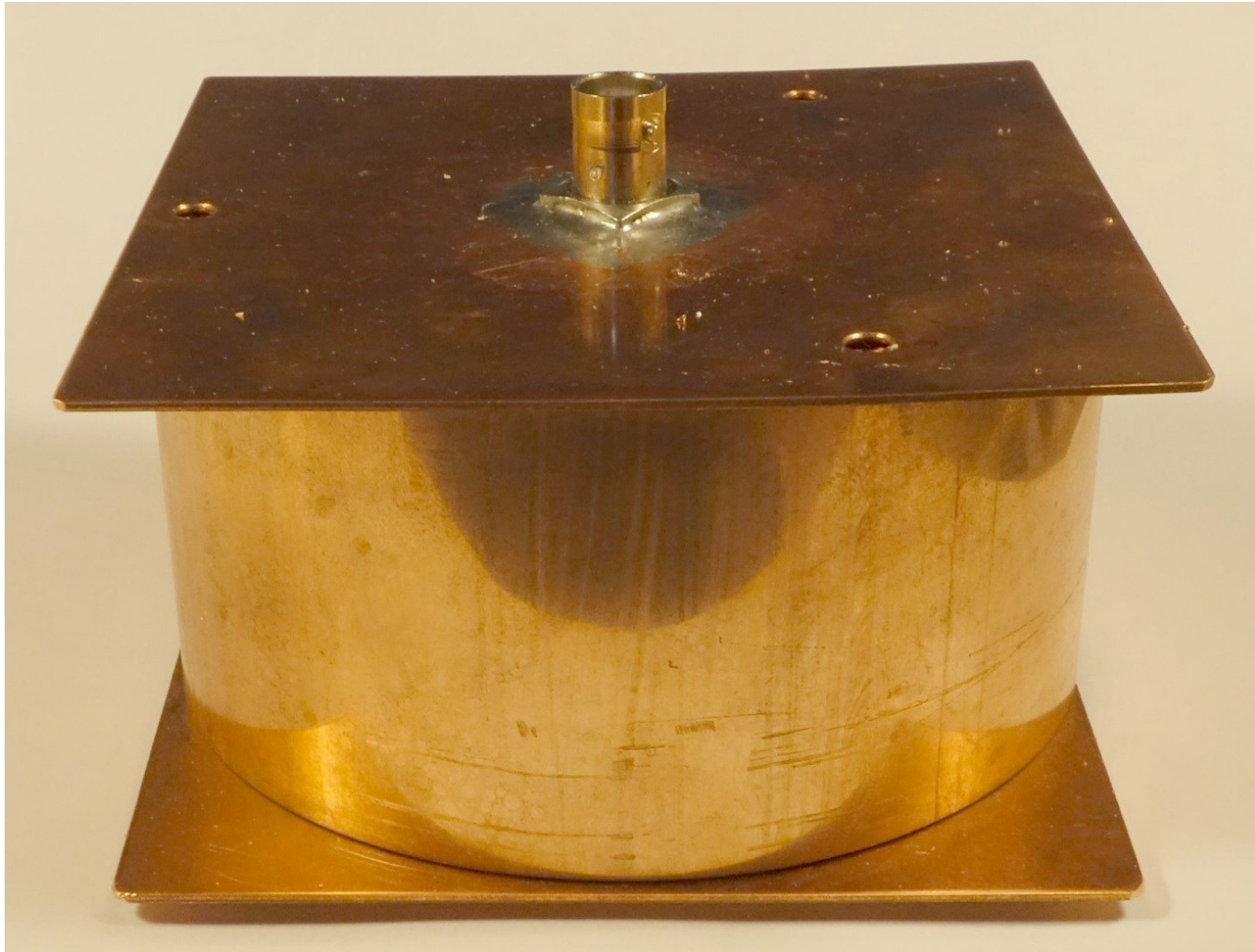
De Meetkamer van PA0HKZ



De Meetkamer van PA0HKZ



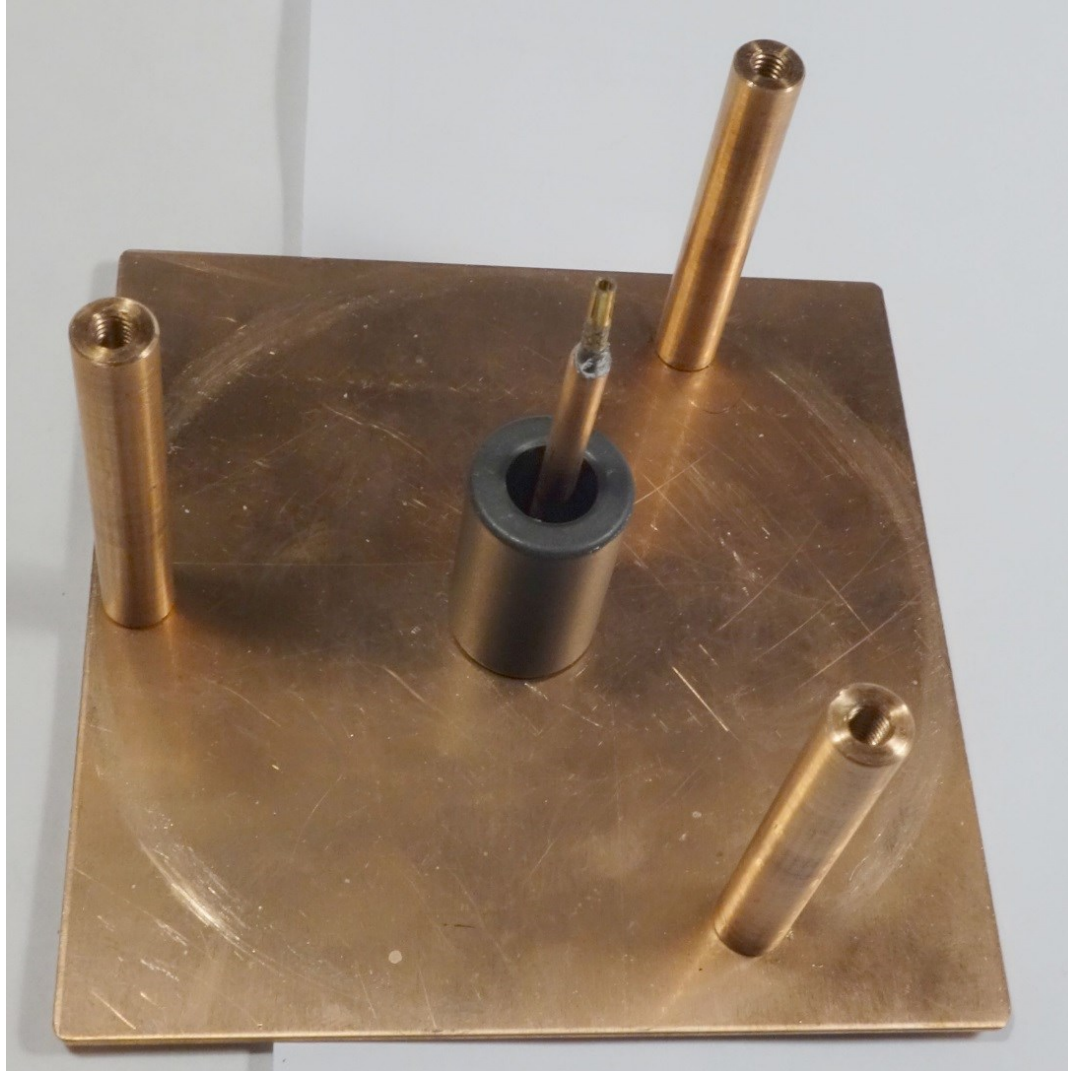
De Meetkamer van PA0HKZ



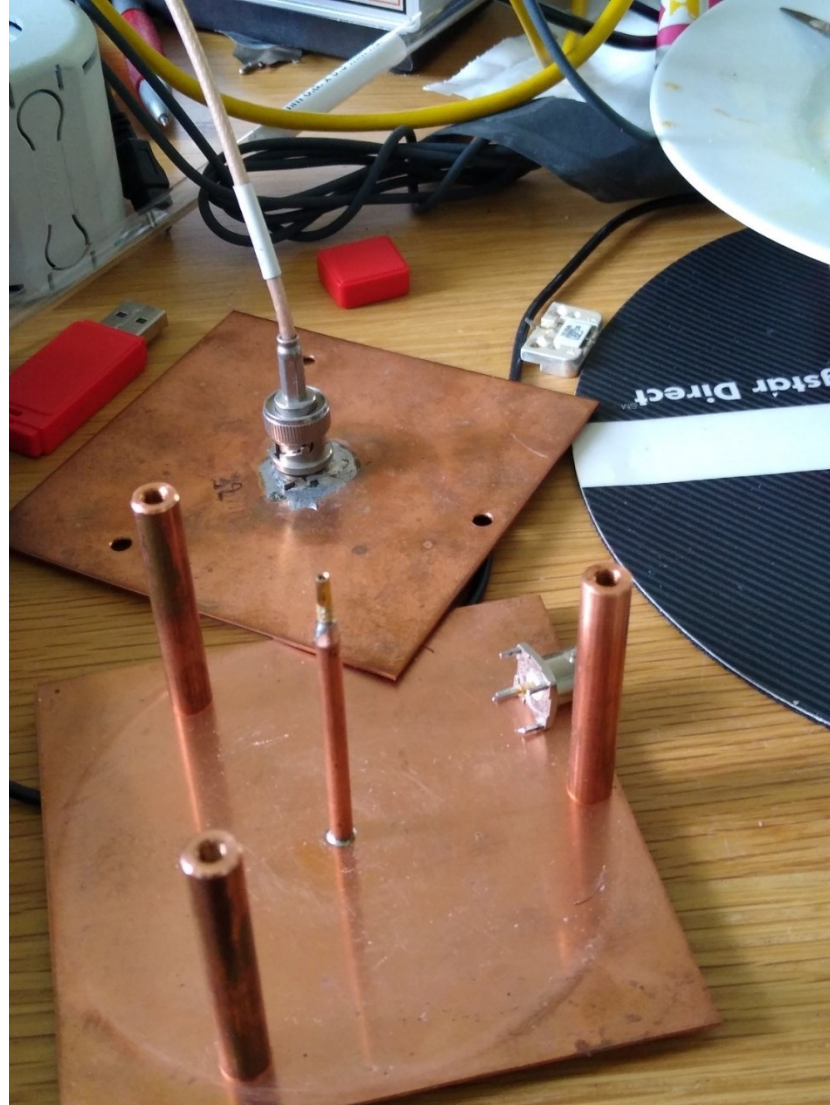
De Meetkamer

Al metende blijkt
dat de ring niks
toevoegt

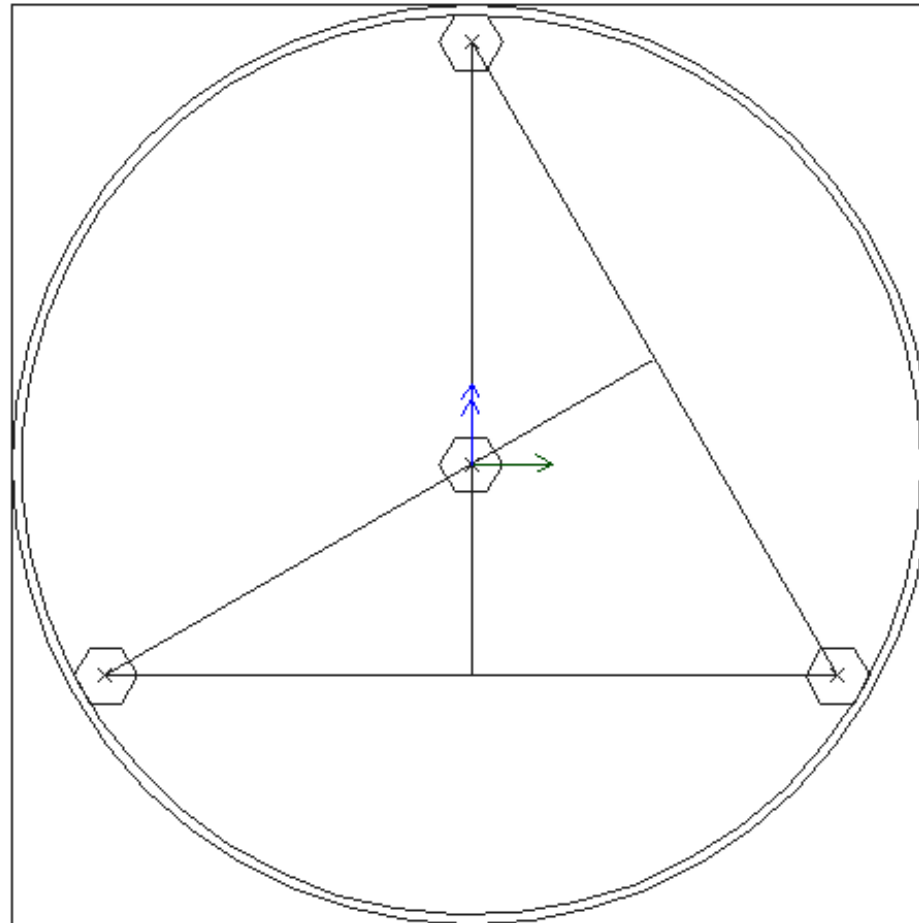
De Meetkamer van PA0HKZ



Meetkamer van PA0HKZ

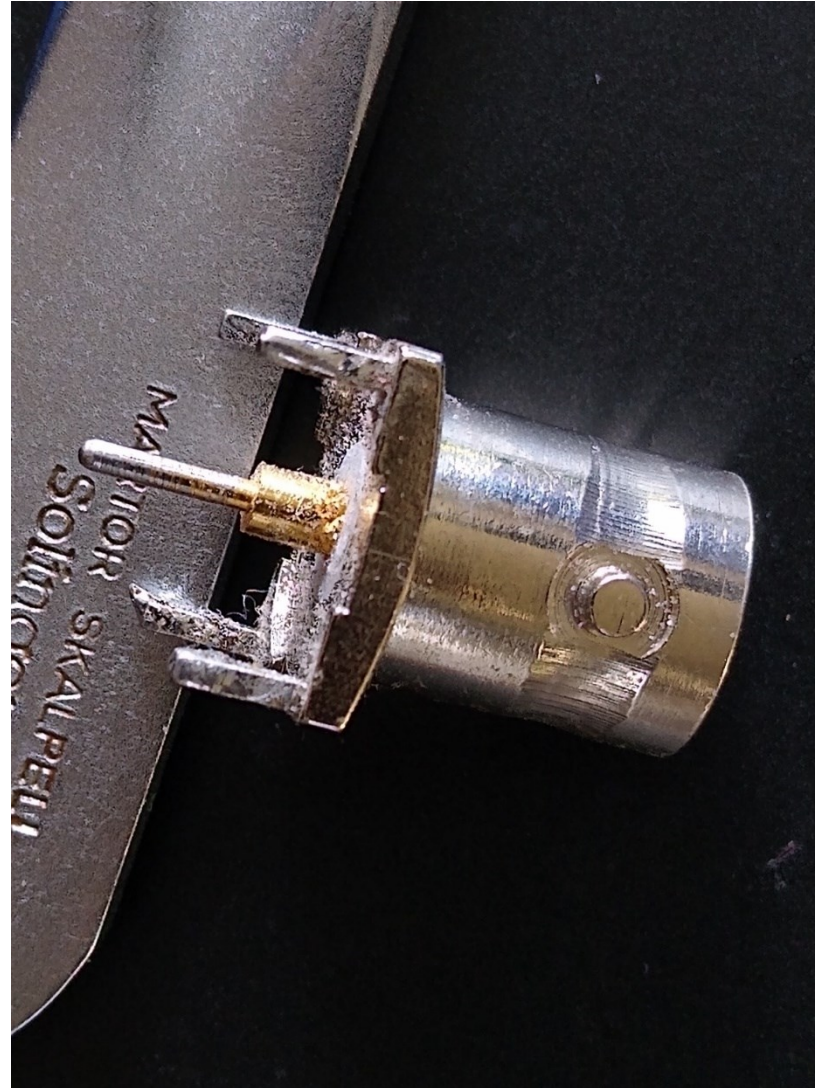


Meetkamer zelf bouwen



hoogte is $0,886 \times$ zijde

De Meetkamer van PA0HKZ



De Meetkamer van PA0HKZ



De Meetkamer

Stuklijst

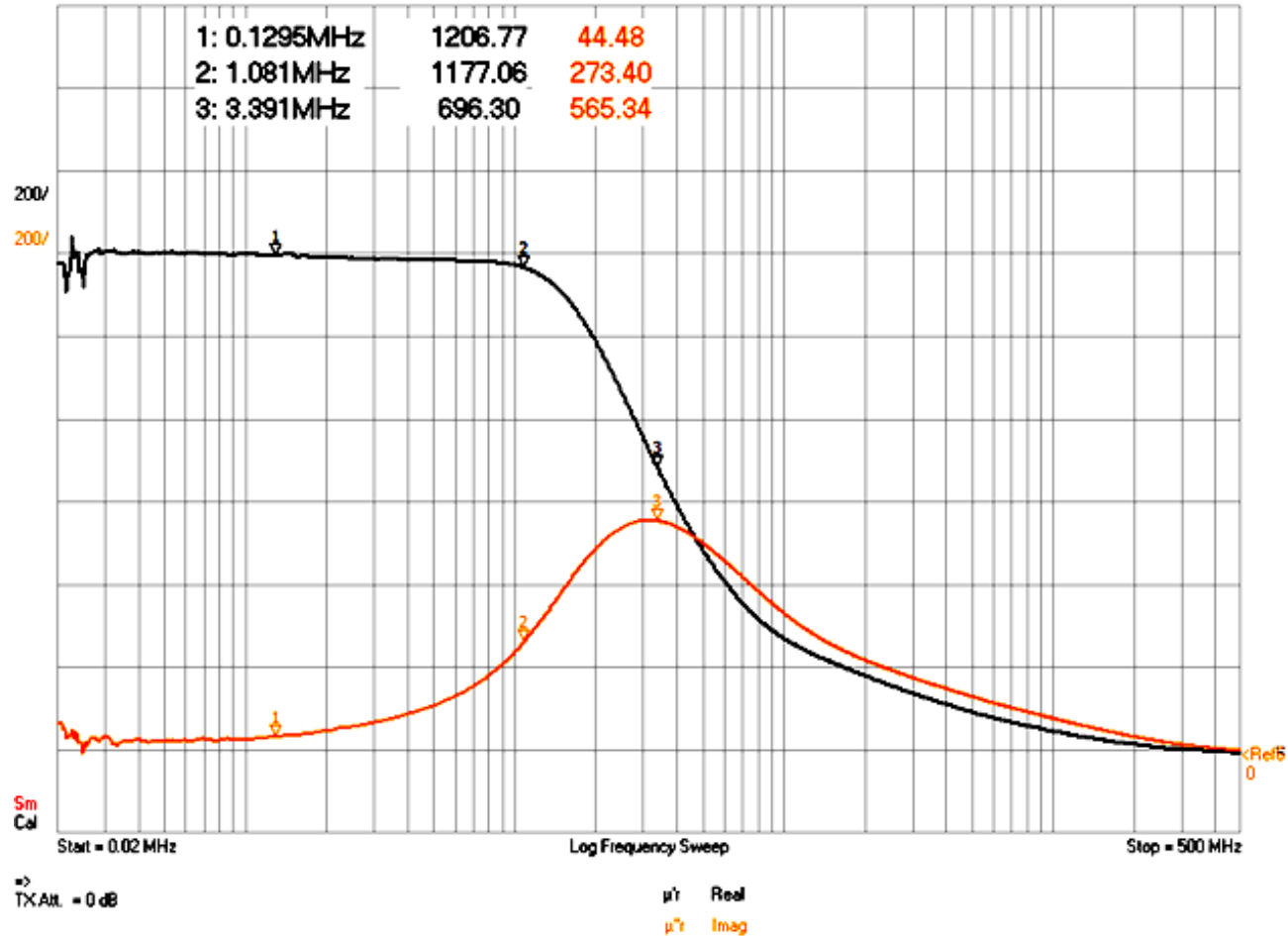
- 2 koperen of messing plaatjes 100x100x1,5
- 3 afstandbussen 6-kant sw6 x 60?
- BNC connector voor print montage
- (60mm 100 rond koperen regenpijp)
- 60 mm 3 of 4 mm rond koper staf

De Meetkamer

- We willen graag 'Fair Rite' grafieken.
- Maar dan mooier.

Meetkamer van PA0HKZ

DG8SAQ Vector Network Analyzer Software
5-4-2020 18:29:19 2631480102



Hulde aan professor Baier

- Vraag: Hoe bereken je μ' en μ'' uit S_{11} ?
- Miltje werd binnen een dag beantwoord.

Hi Henk,

IN3OTD uses two different methods to measure the core permeability:

- a) By inductance measurement of a coil
- b) By measuring wave parameters of a transmission line filled with the ferrite.

The math involved in b) is quite complex, i.e. you use some software like zplots to extract waveguide parameters and then calculate the permeability and dielectric constant from these.

The method a) is quite simple, though:

The inductance of a coil with n turns on a toroid is calculated to be

$L = \mu_0 \mu_r n^2 A / \text{Length}$, where

μ_0 = magnetic field constant = $4 \cdot \pi \cdot 10^{-7}$ Newton/Ampere²

μ_r = permeability = $\mu' + j \mu''$ which you are after

A = cross sectional area of the core

Length = magnetic path length, i.e. average circumference of the core

So, if you measure the impedance of a coil wound onto the core you will obtain $Z = j \omega L$

Actually, with a VNA you measure S11. But you can calculate Z from S11 with the VNWA function $s2z(s11)$.

So, you can solve the whole thing for μ_r :

$$\mu_r = s2z(s11) \cdot \text{Length} / (j \omega \mu_0 n^2 A)$$

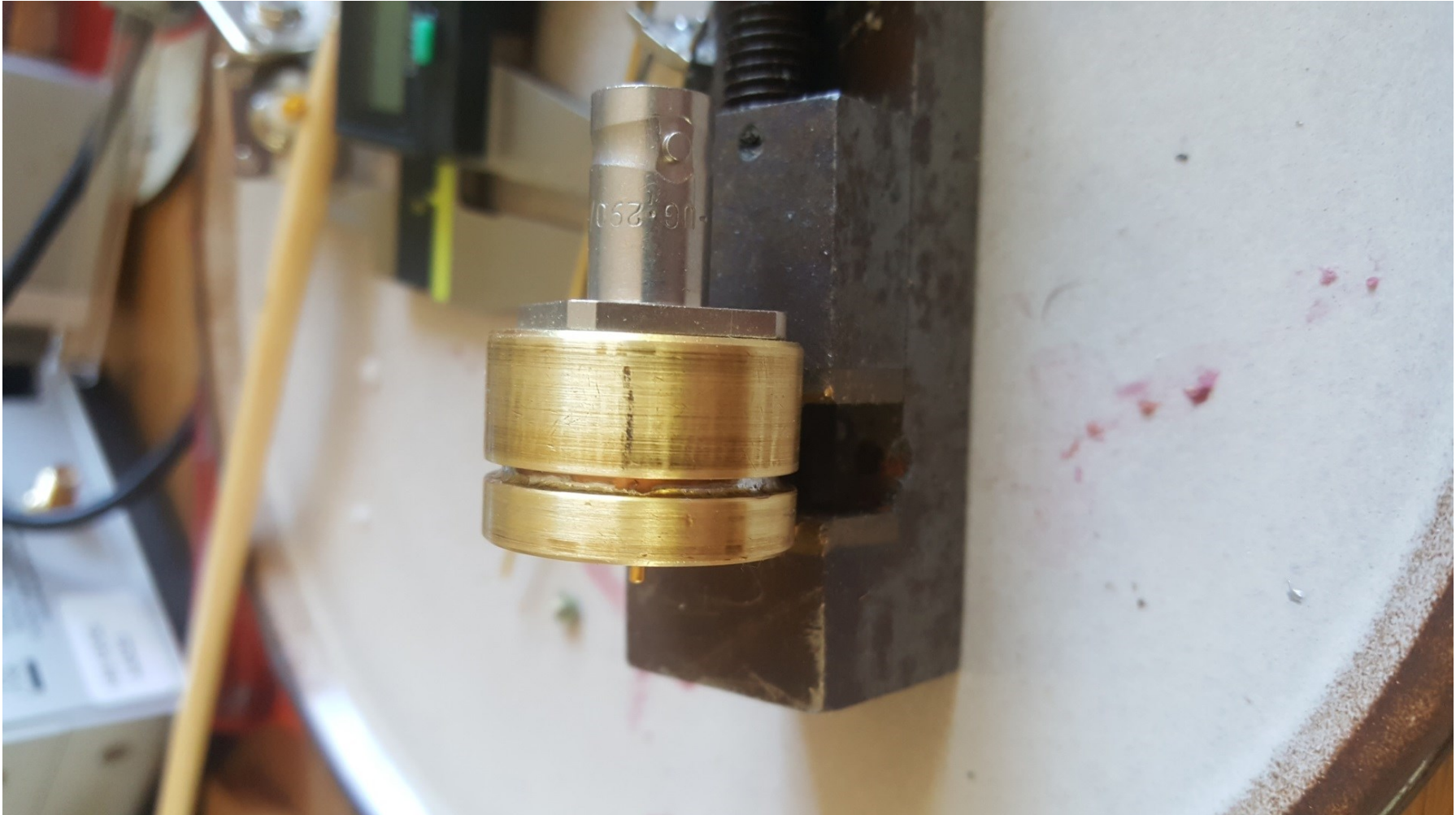
Copy above formula into a VNWA custom trace and display the real part and the imaginary part of the result.

Hope this is helpful.

Best regards,

Tom

De Minimeetkamer PA0HKZ



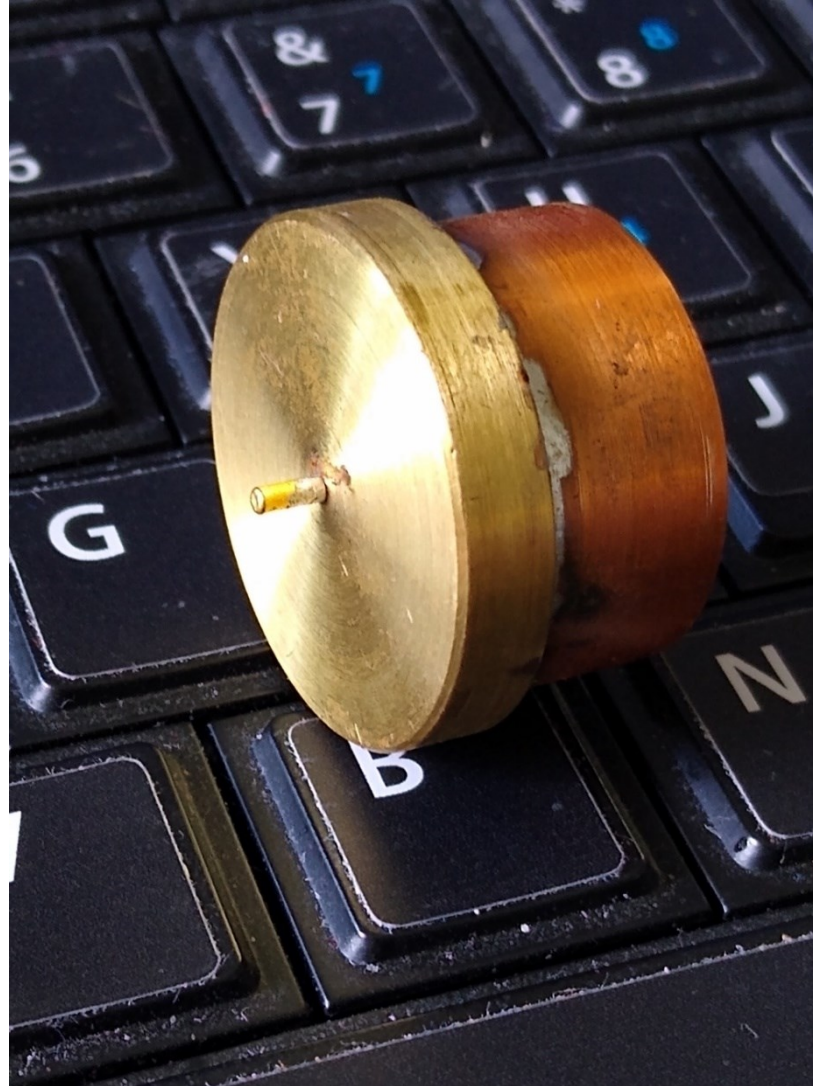
De Minimeetkamer PA0HKZ



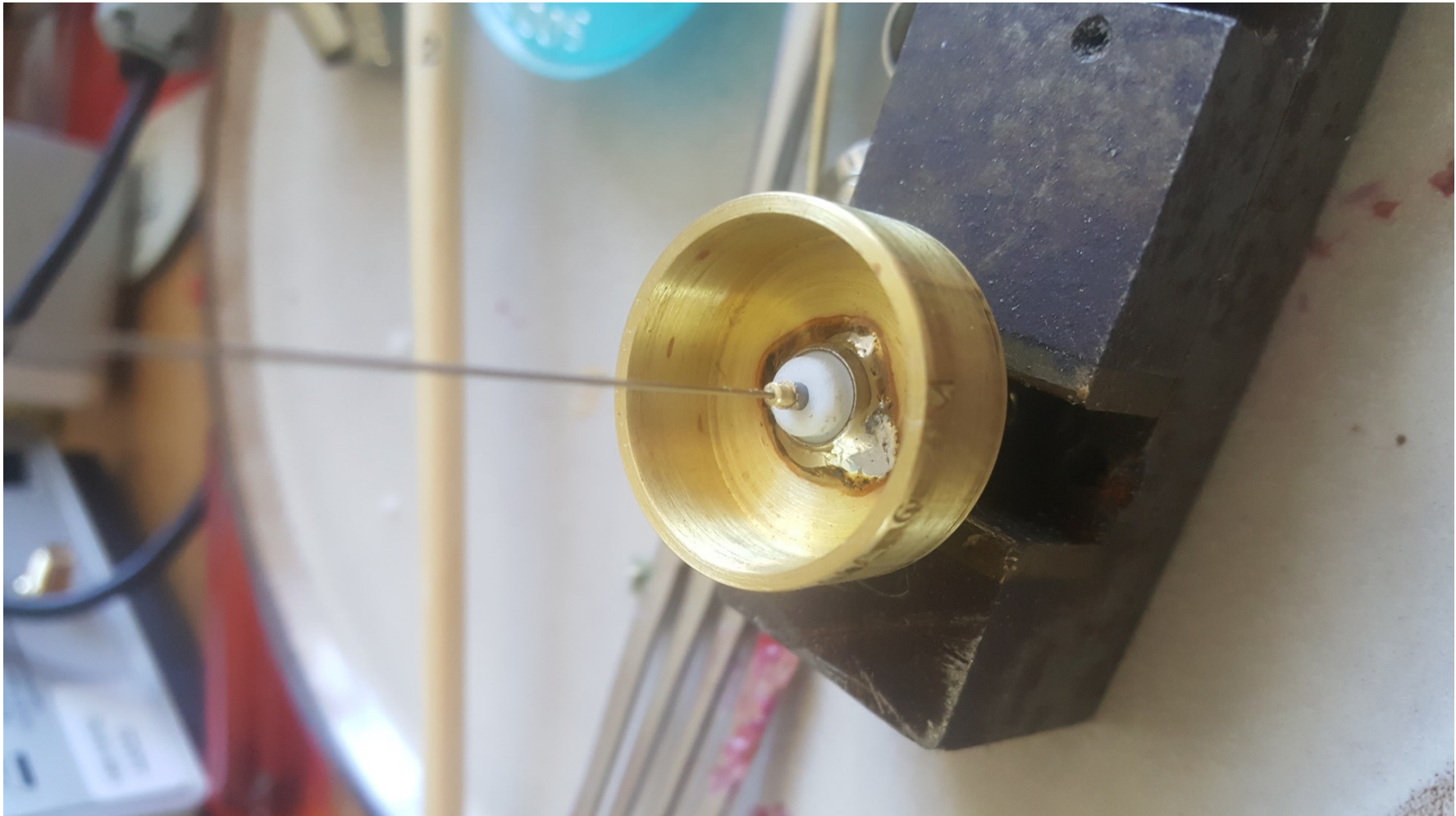
De Minimeetkamer PA0HKZ



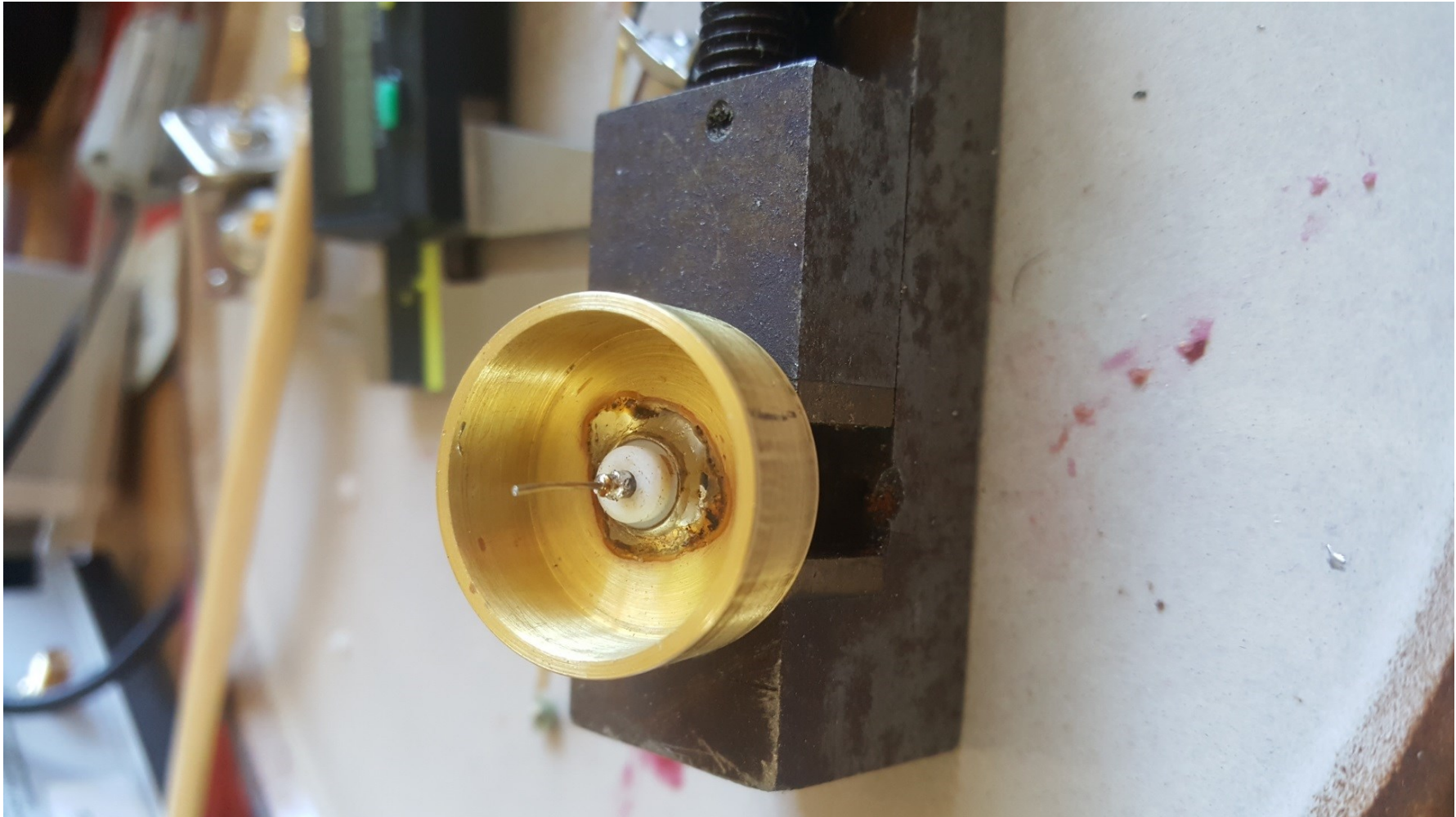
De Minimeetkamer PA0HKZ



De Minimeetkamer PA0HKZ



De Minimeetkamer PA0HKZ



De Minimeetkamer PA0HKZ



De Meetkamer

Mini meetkamer PA0HKZ met mini kerntje

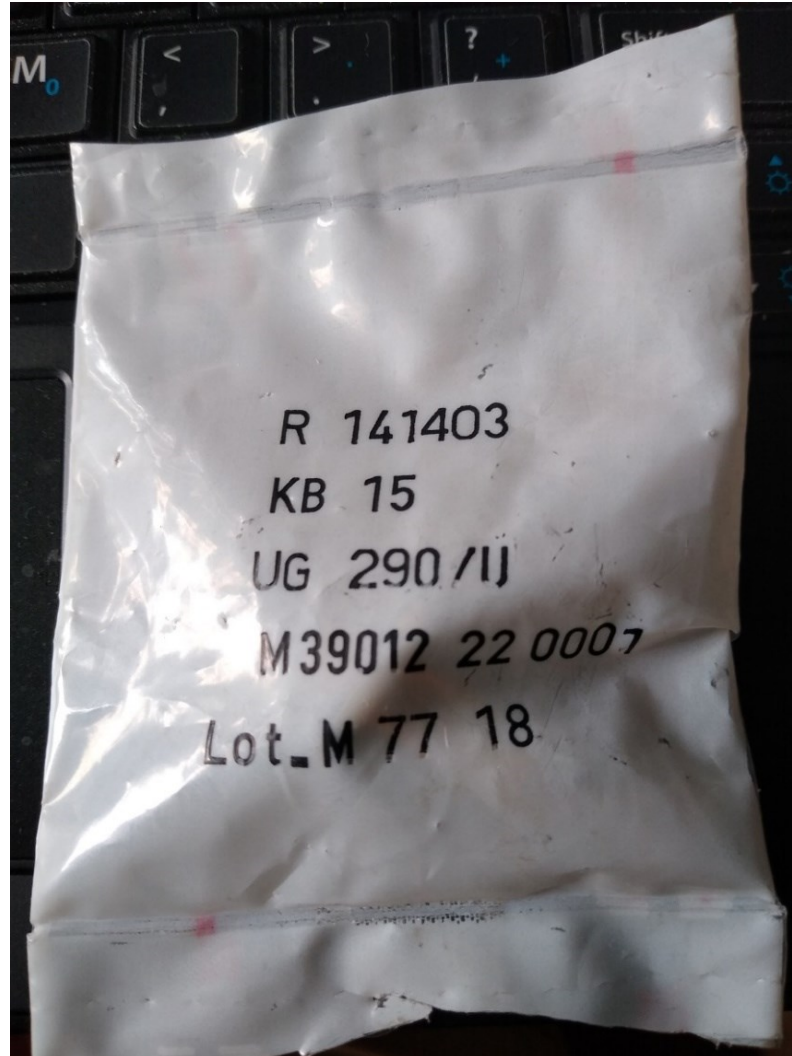


De Meetkamer

Stuklijst minimeetkamer

- 22 mm waterleidingbuis 13,2 mm lang
- 2 einddoppen 22 mm
- BNC connector chassismontage
- Test connector 0,5mm
- Stukje buis 0,5mm Zilver-Nikkel, paar cm

De Minimeetkamer PA0HKZ



De Meetkamer

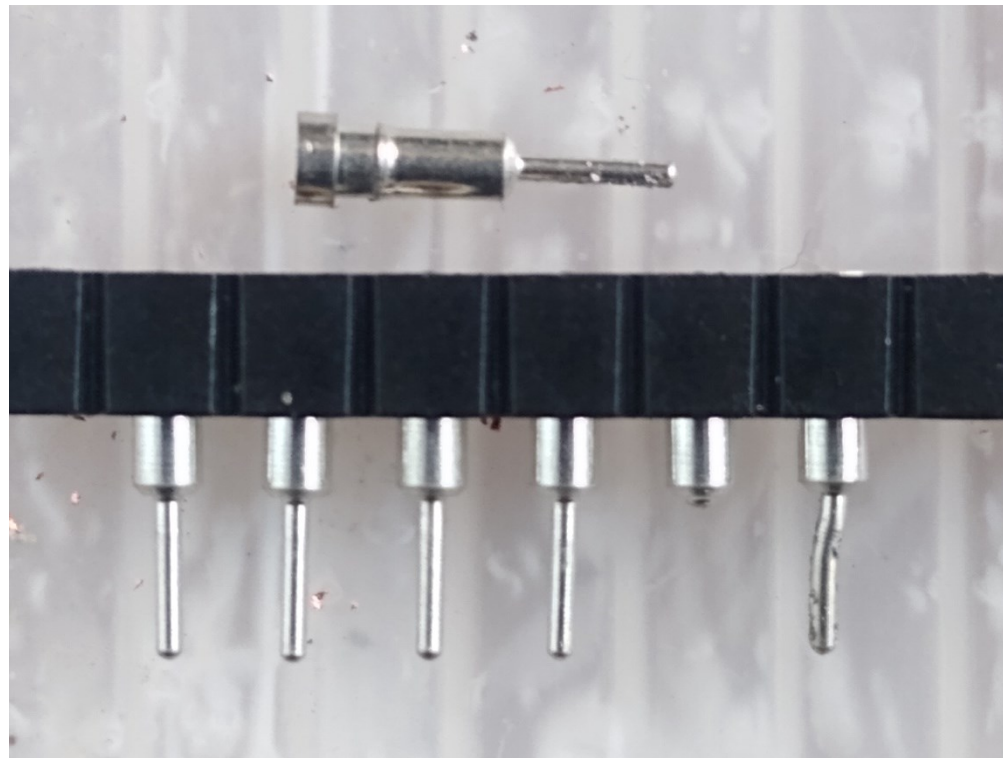
Eenvoudige Mini meetkamer PA0HKZ



De Meetkamer

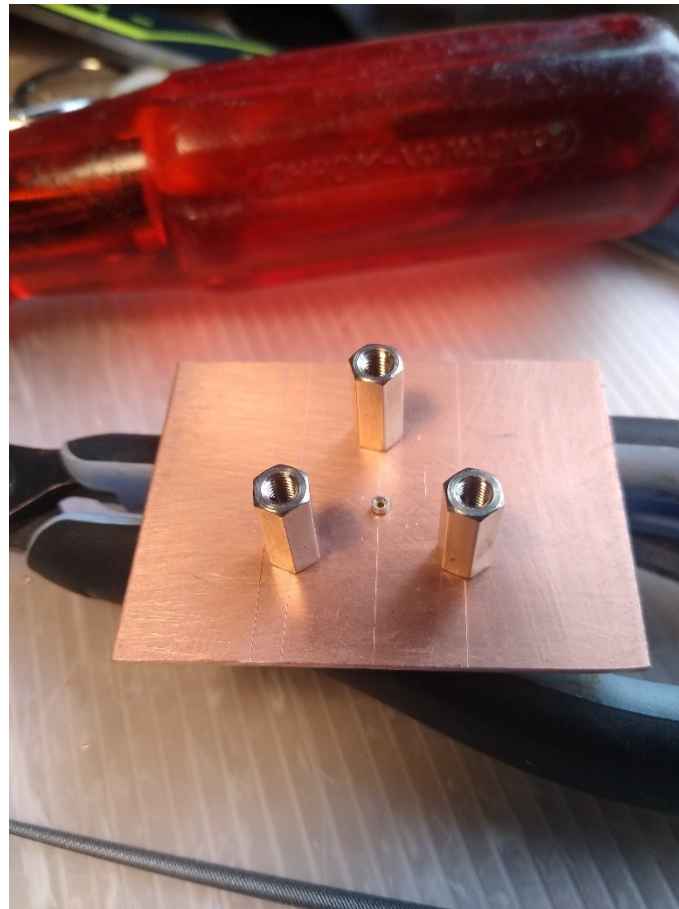
Eenvoudige Mini meetkamer PA0HKZ

IC pen



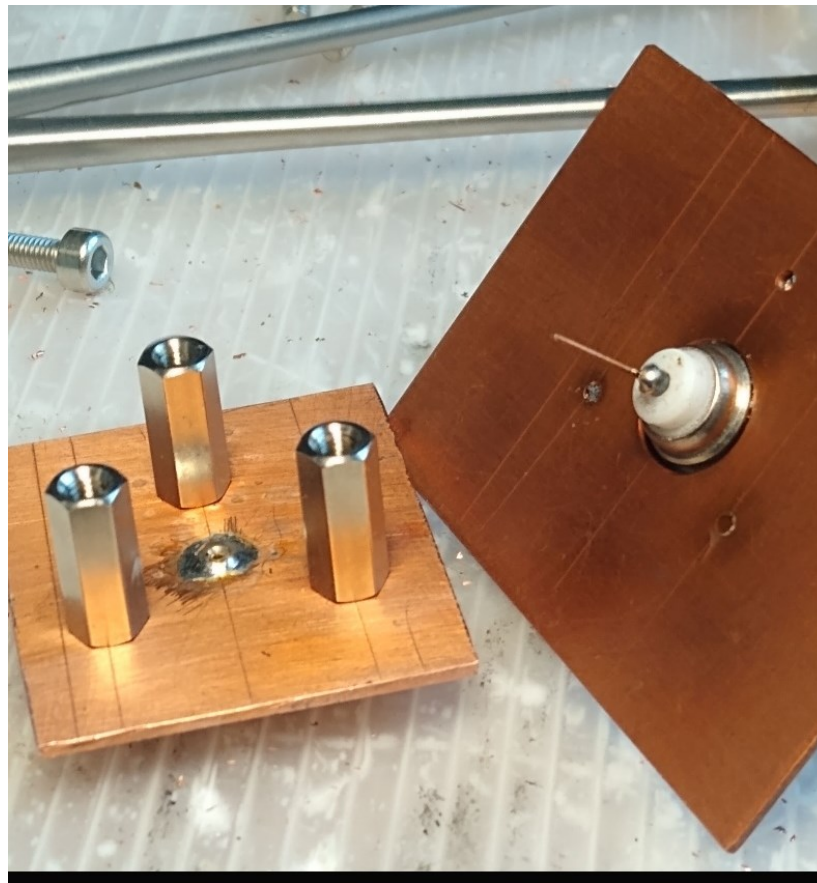
De Meetkamer

Eenvoudige Mini meetkamer PA0HKZ



De Meetkamer

Eenvoudige Mini meetkamer PA0HKZ



De Mini Meetkamer stuklijst

Eenvoudige uitvoering



3 standoffs van de gewenste maat

1 gedraaid pennetje van een Ic-voetje

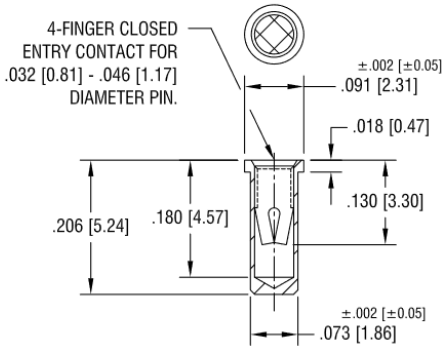
1 BNC connector , Teflon !!!

3 boutjes

Plaat

De Meetkamer


Eenvoudige Mini meetkamer PA0HKZ



- NOTES:
- 1. BODY:
MAT'L - BRASS
SPRING CONTACT:
MAT'L - BERYLLIUM COPPER
 - 2. MOUNTING HOLE DIA.: .076 [1.93]

KEYSTONE ELECTRONICS CORP. ASTORIA, N.Y. 11105-2017			
PART NAME MICRO JACK, SOLDER MOUNT			
MATERIAL AS NOTED			
FINISH GOLD PLATE	DRN BY BOONE	DATE 2.26.02	
	APPD LN	SCALE 6X	
TOLERANCES DECIMAL $\pm .005$ [± 0.15] ANGULAR $\pm 1^\circ$ UNLESS OTHERWISE SPECIFIED	CODE C/M	DWG NO. 1417	

ATE	DESCRIPTION	REV.

 Mouser 534-1417
 Per stuk te bestellen.
 De 534-1413 is een maatje kleiner. Farnell heeft ze ook.

 501-R141404000 is de BNC chassis connector,
 501-R141426000 de printuitvoering.

Veel plezier met meten!

https://reeve.com/RadioScience/Radio%20Astronomy%20Publications/Articles_Papers.htm