DUAL 23 and 70cm FEED SYSTEM

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VK3UM

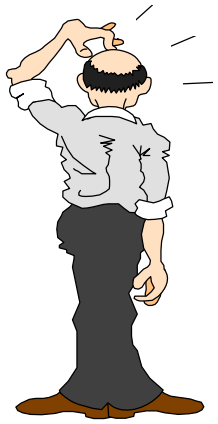
CHOICE OF 23cm FEED

Dish has a 0.43 F/D

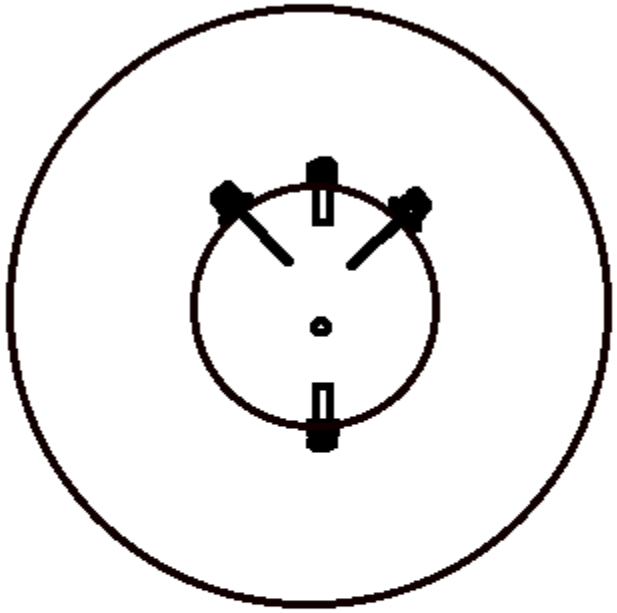
- Optimum Illumination … VE4MA
  (is adjustable to suit F/D)

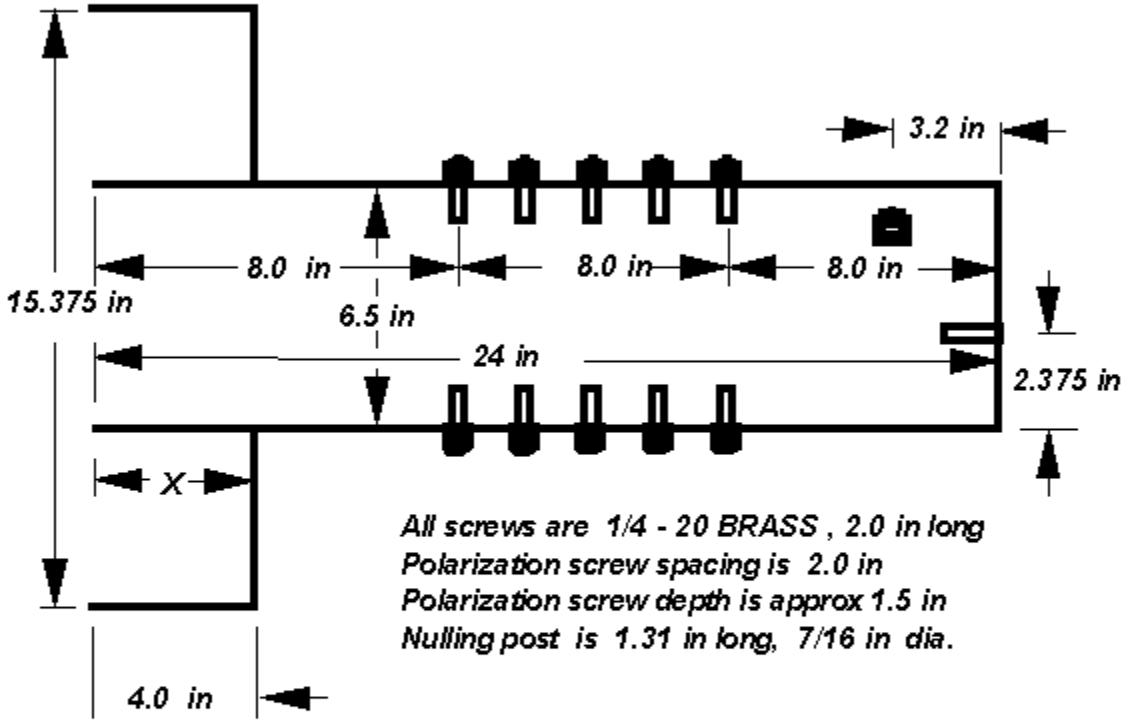
or

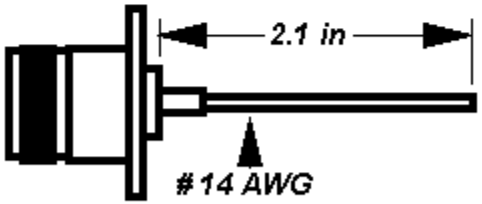
- W2IMU … will under illuminate
  (fixed .. best for ~0.5 - 0.6 F/D)



VE4MA 1296 MHz CIRCULAR POLARIZATION FEEDHORN







UG 58A/U

All screws are 1/4 - 20 BRASS , 2.0 in long
Polarization screw spacing is 2.0 in
Polarization screw depth is approx 1.5 in
Nulling post is 1.31 in long, 7/16 in dia.

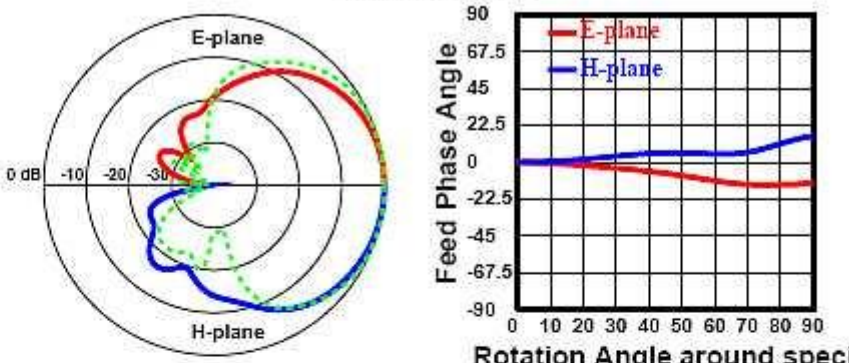
Distance X can be varied for different f/D ratios
X is 4.0 in for f / D of 0.4
Polarizer screws should be optimized after X is set
Drawing Not To Scale

VE4MA 96 02 27

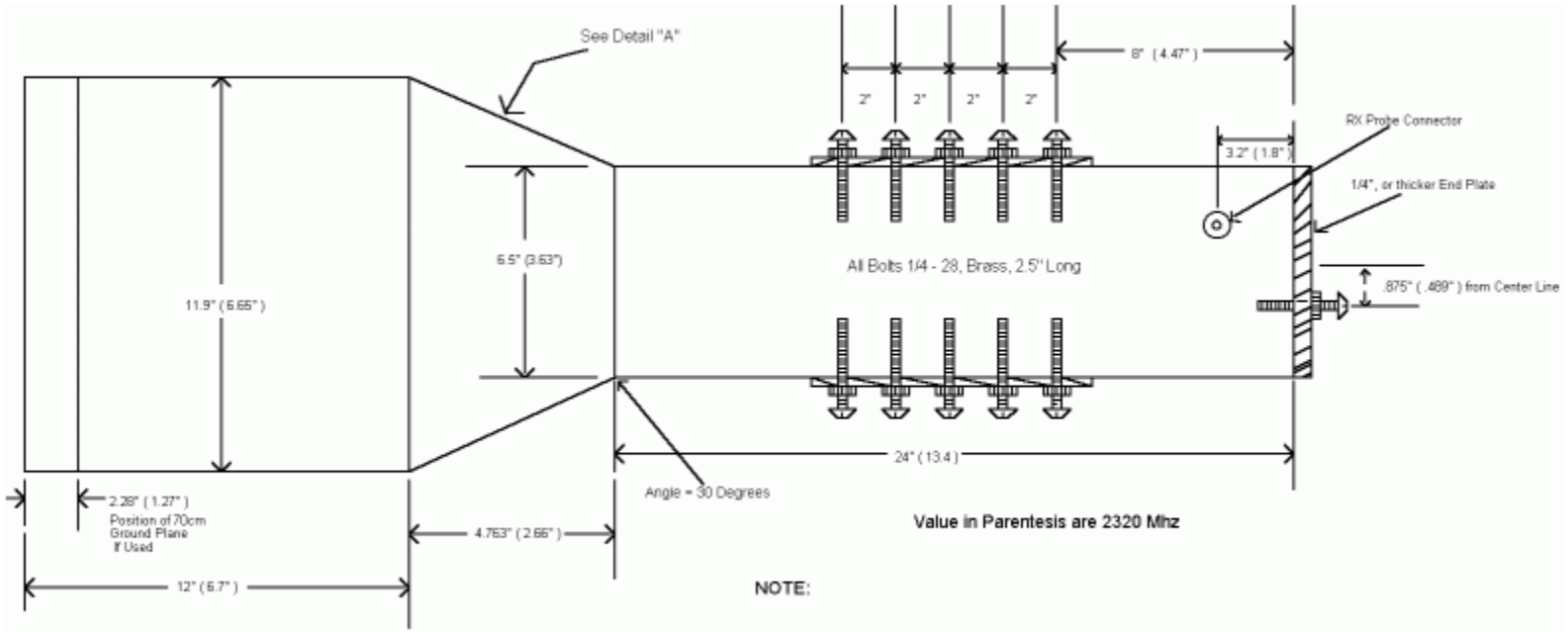
Please Note that These Scalar Ring Dimensions are **ONLY** for a 6.5 in Dia. (W2IMU) Main Feed

VE4MA 1296 feed with flush choke ring, by NEC2

Figure 6.3-8



Dish diameter = 18.4 λ Feed diameter = 1.84 λ

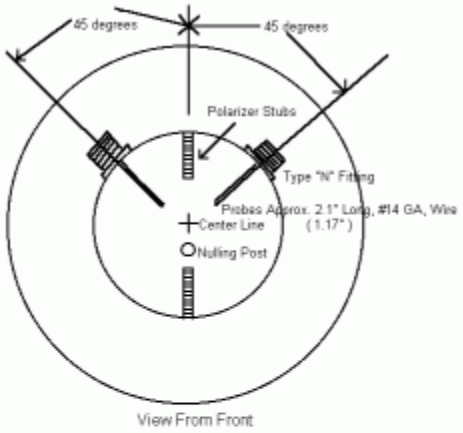


Value in Parentesis are 2320 Mhz

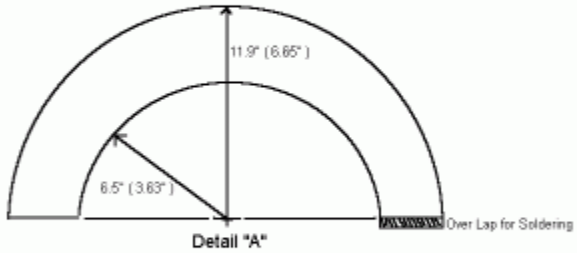
NOTE:

1296 Mhz / 2320 Mhz Dual Mode

W2IMU Wave Guide



View From Front



Detail "A"

Supplied By WB5LUA

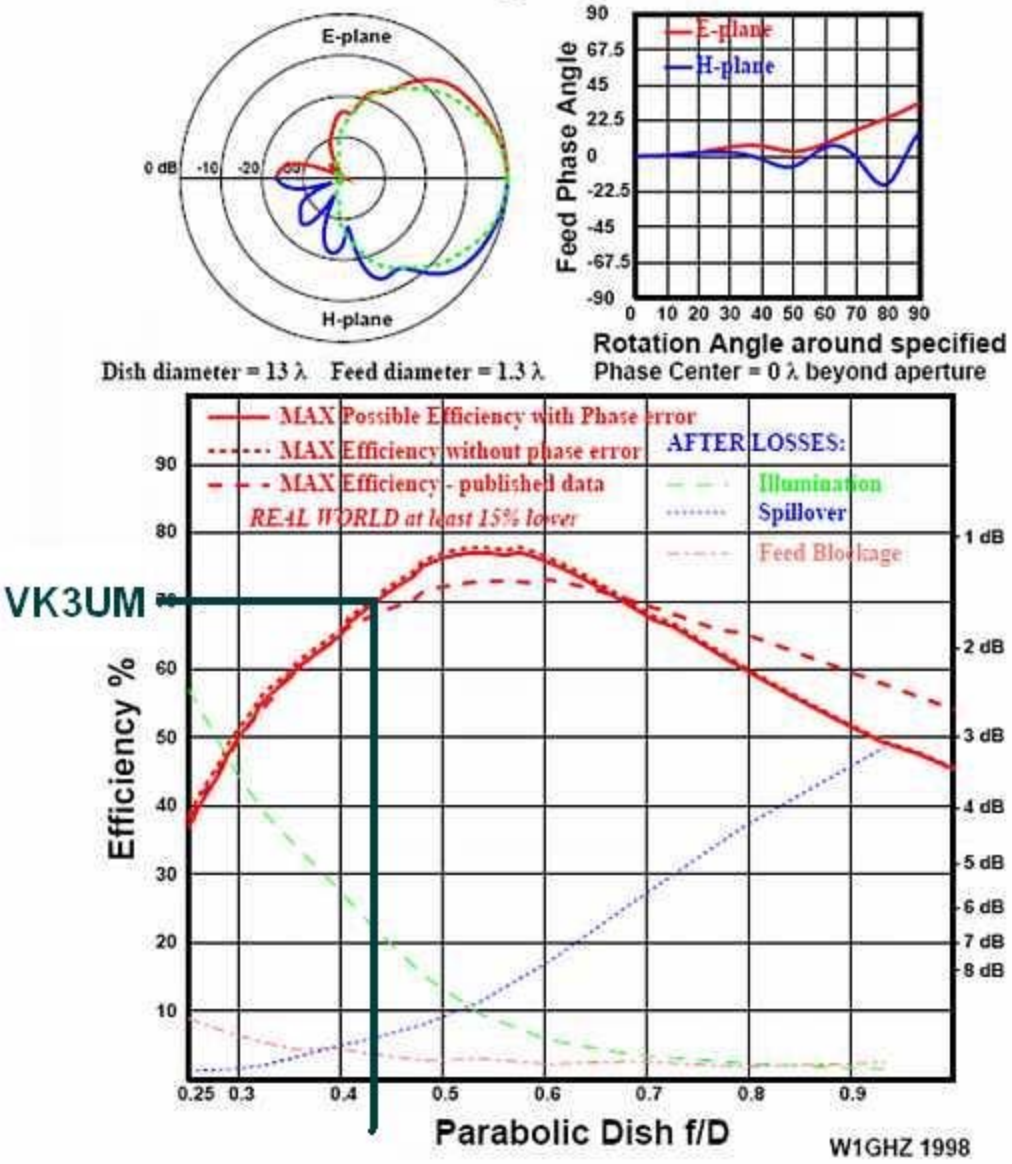
4 - 23 - 85

Re-drawn By VE1ALQ

Sept 1997

W2IMU dual-mode feedhorn, 1.31λ diameter, by NEC2

Figure 6.5-1



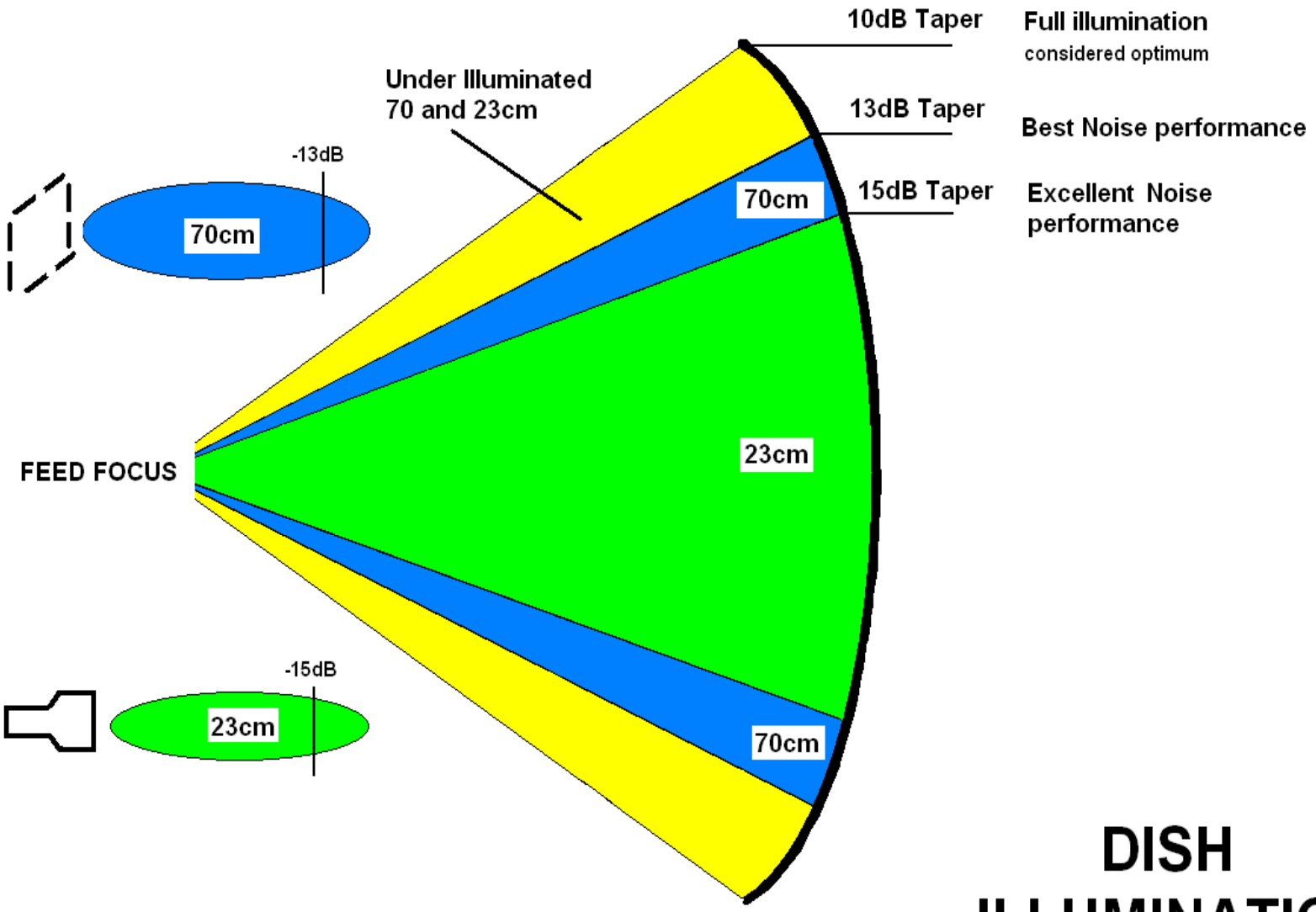
COMPARISON F/D of 0.43

W2IMU		VE4MA	
• **Efficiency**			
68%		75% …	Higher … +0.42dB
• **Illumination**			
75%		90% …	Greater … +0.79dB
• **Spill Over**			
6%		15% …	Worse … -3.97dB

THE W2IMU WILL HAVE A LOWER GAIN THAN THE VE4MA

BUT A SIGNIFICANT IMPROVEMENT IN NOISE TEMPERATURE

Equivalent to a ~30°K improvement in System performance!



DISH ILLUMINATION

CHOICE OF 70cm FEED

- **Switch-able Dual Polarity.**

  (fully variable polarity not possible as 23cm feed is in the centre)

- **Commensurate with 23cm feed (got to fit !)**

  (can't impinge on 23cm feed opening .. inter-reaction minimal)

- **Constant impedance matching (50Ω).**

  (no matching or transition sections .. length independent)

- **Lowest feasible transmission loss.**

  (minimal use of connectors .. dipole to pre-amp shortest possible)

- **Best fit illumination taper.**

  (Not a choice with dual dipoles .. just have to get them as close as possible!)

DIMENTIONS FORCE CHOICE

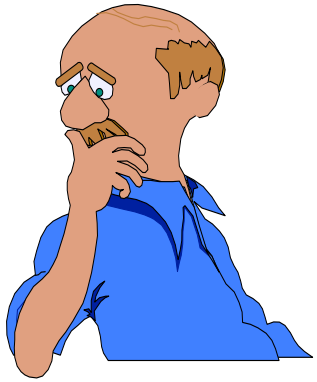
- VE4MA 390mm (15.375”) diameter.
- W2IMU 302mm (11.9”) diameter

To get the 70cm dipoles as close as possible to enable the maximum achievable illumination,

the VE4MA is too wide and they would fall inside the launching ring !

W2IMU is the only way to go!

The Die is cast !



If I want both bands then ..

- **70cm will be under illuminated.**

  So what! It always was that way .. but there is a clear need to reduce previous losses.

- **23cm there will be a reduction of gain** but a significant improvement in antennae noise temperature. May need more Tx goo but ears will be exceptional! (anti alligator system)

The 70cm feed Z myth

- **'Always' assumed as 75 Ω at dipole.**

  Transformed to 50Ω by ¼ matching sections or use of 75 Ω cable.

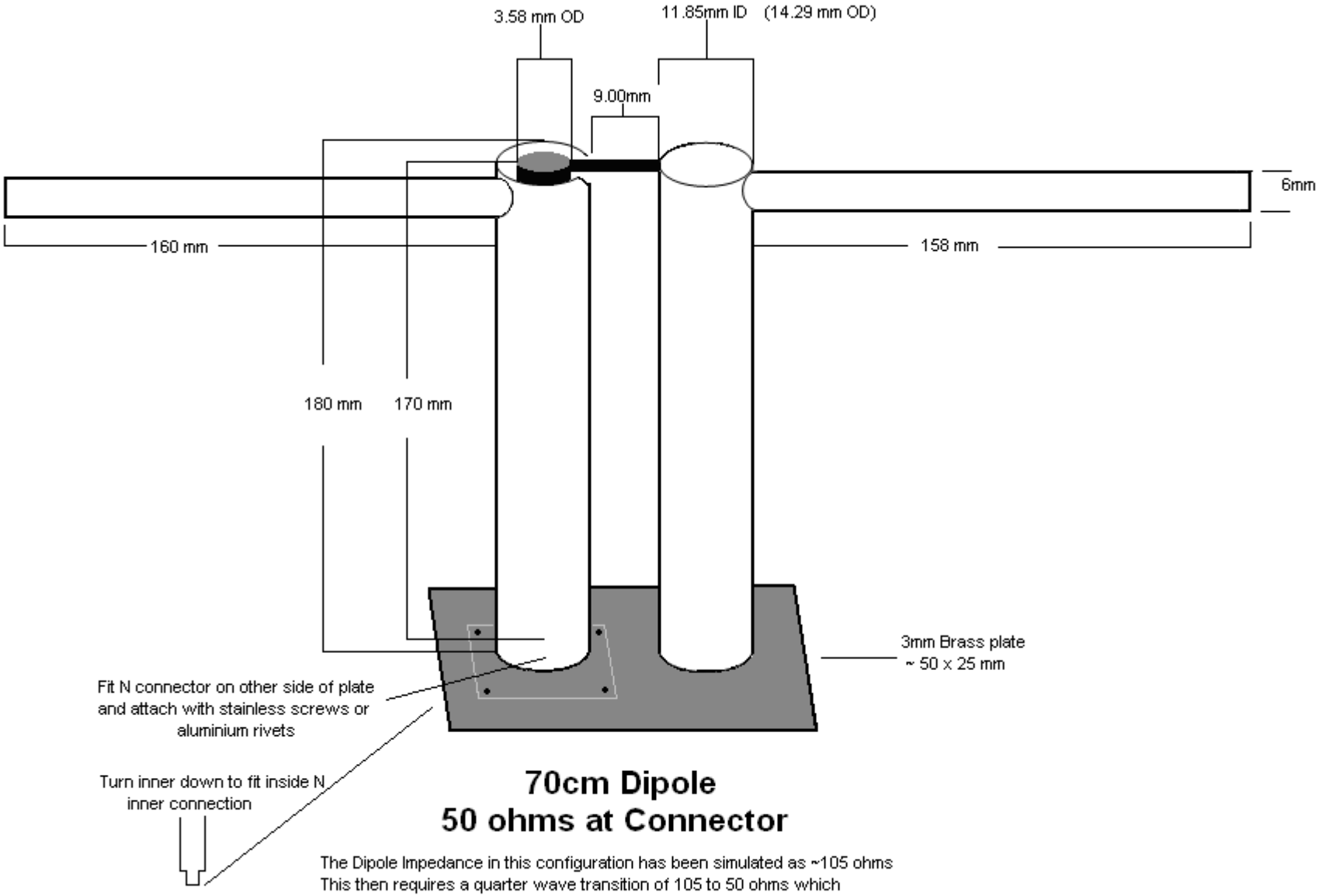
- **Simulation said it was more like 105 Ω.**

  Given that, it requires a 105 – 50 Ω matching section (72.5 Ω).

TEST EQUIPMENT

- RF Bridge (built for the purpose)
- 6dB through line attenuator
  (pad down the IC910H at 1 watt reduced setting for RF Bridge)
- IC910H (RF source for Bridge and return loss with Bird 43)
- MFJ-269 (return loss)
- BIRD 43 (100 and 5 watt 400-100MHz slugs)
- HP 141T (23cm port isolation checks)

- Digital Calipers with Imperial and Metric.
- ZCalculator software written for the purpose!

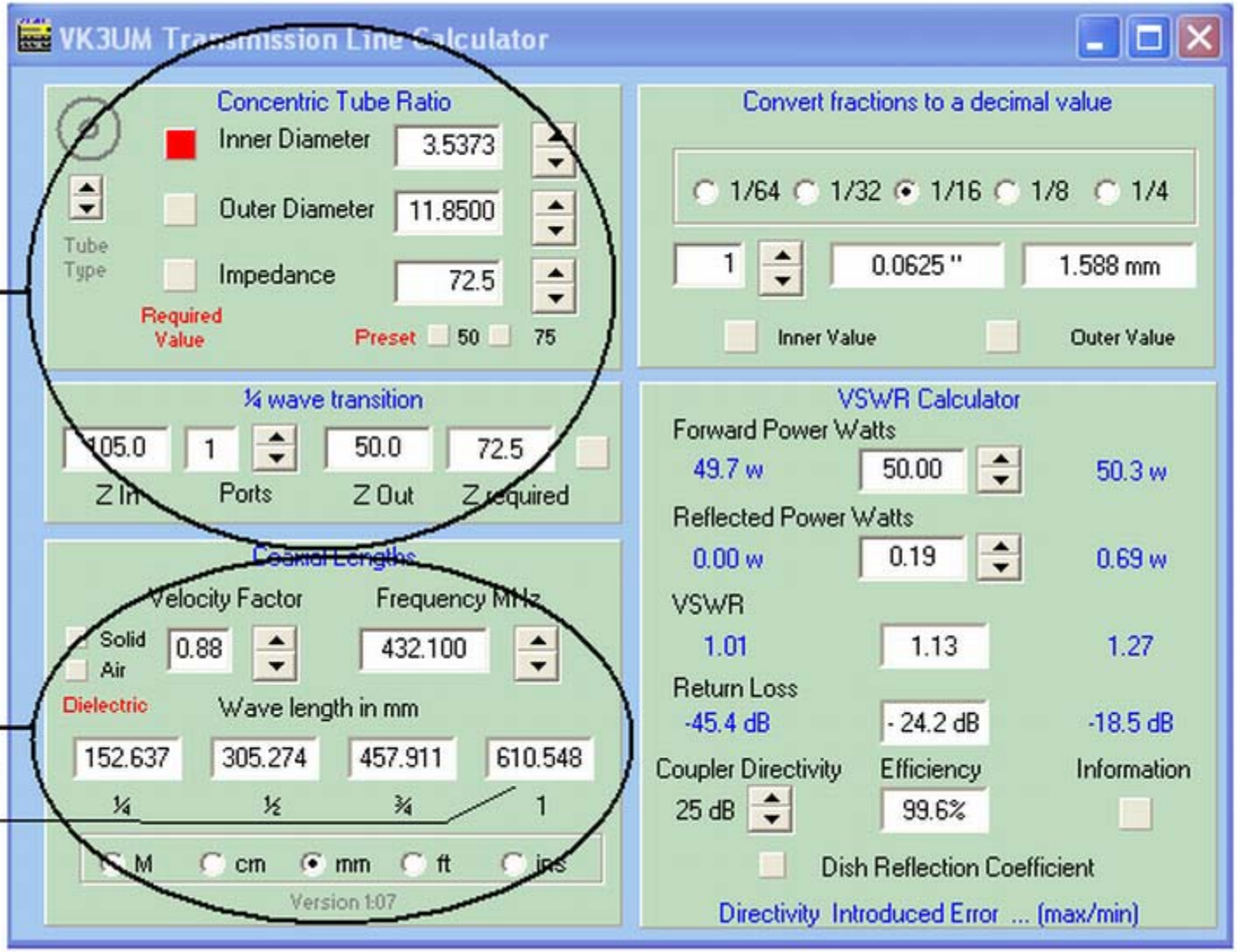


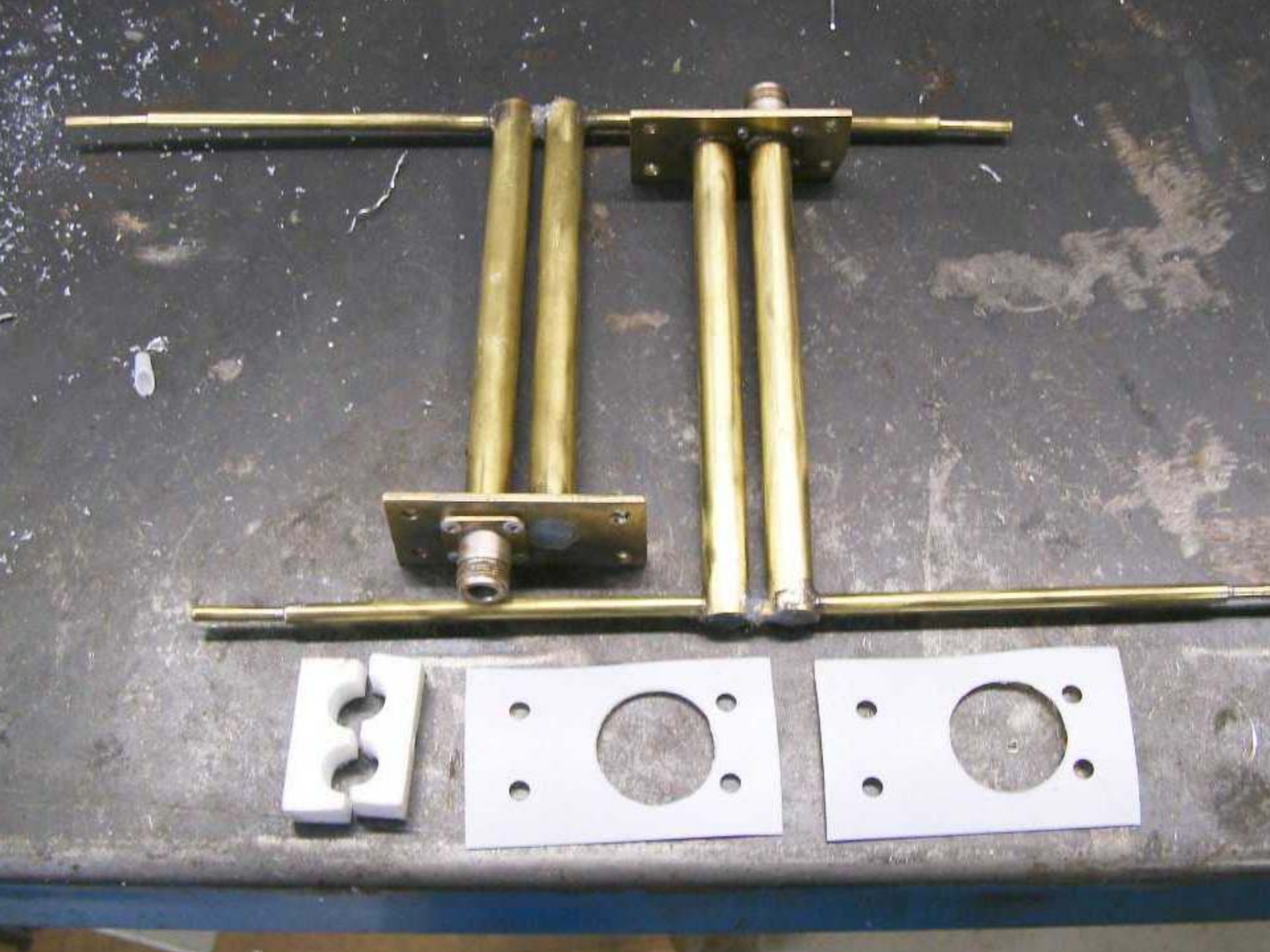
70cm Dipole
50 ohms at Connector

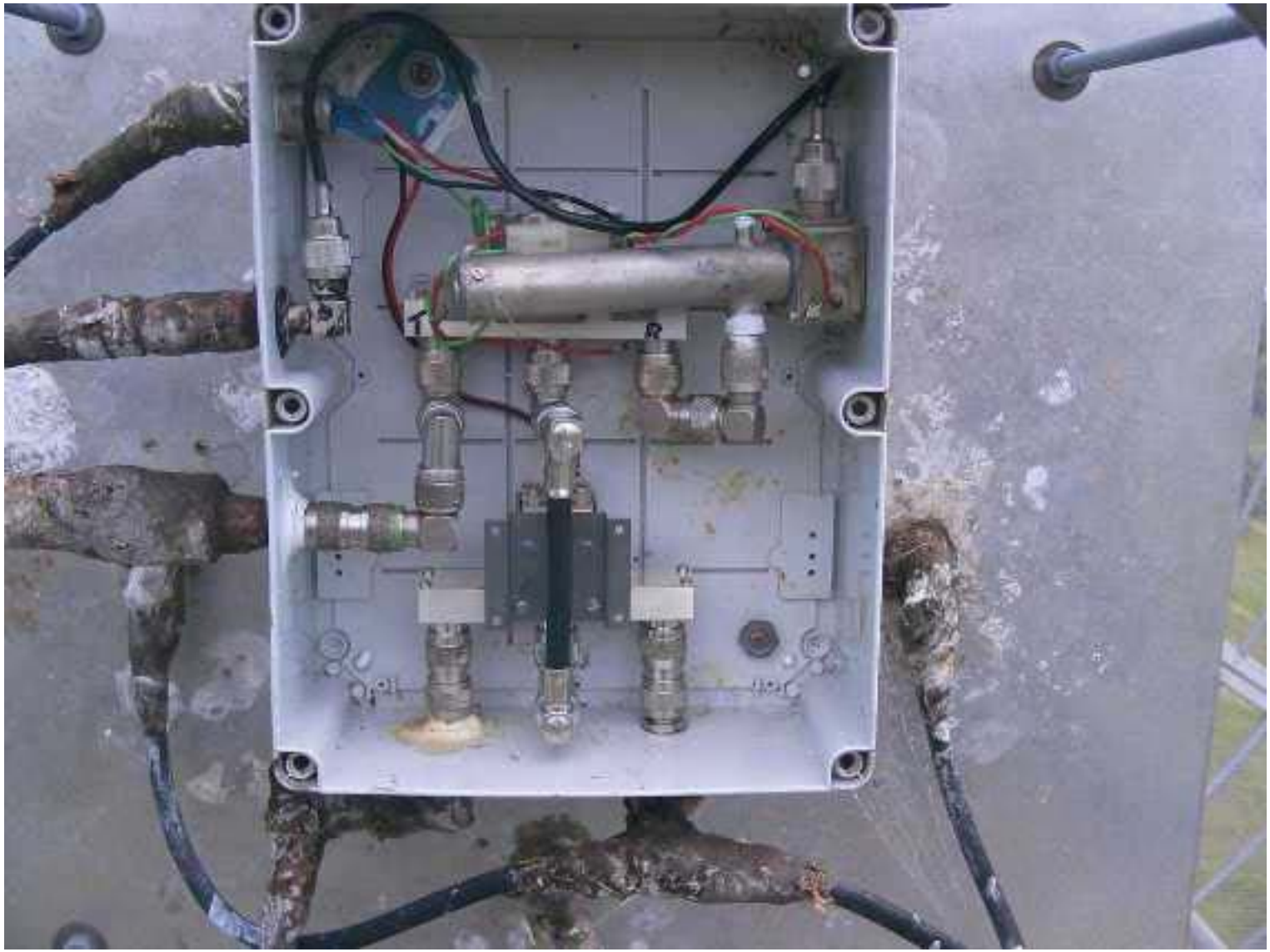
The Dipole Impedance in this configuration has been simulated as ~105 ohms
This then requires a quarter wave transition of 105 to 50 ohms which equates to a tube ratio to provide 72 ohms.

70cm
DIPOLE

LDF4-50
Dipole - combiner





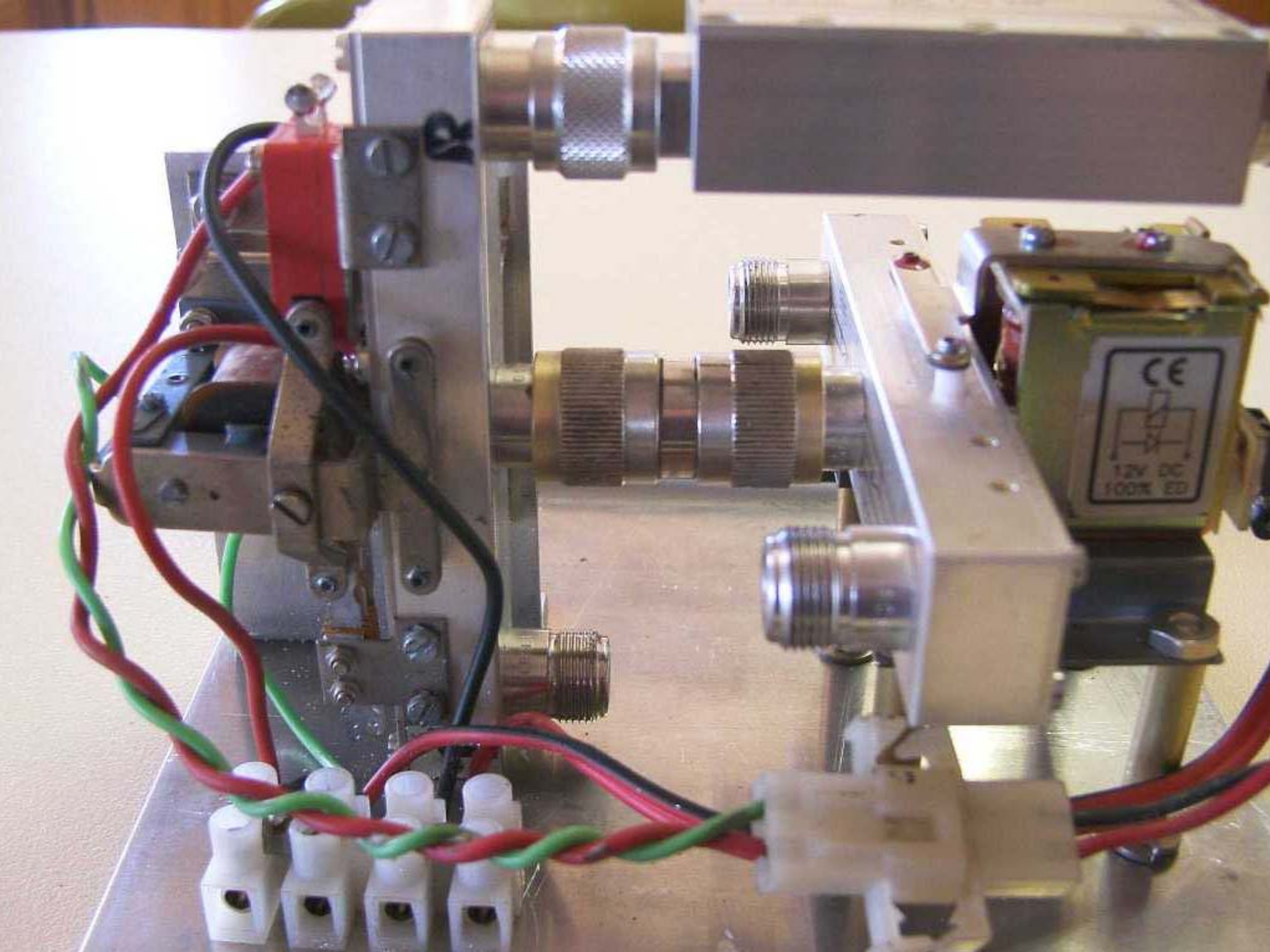


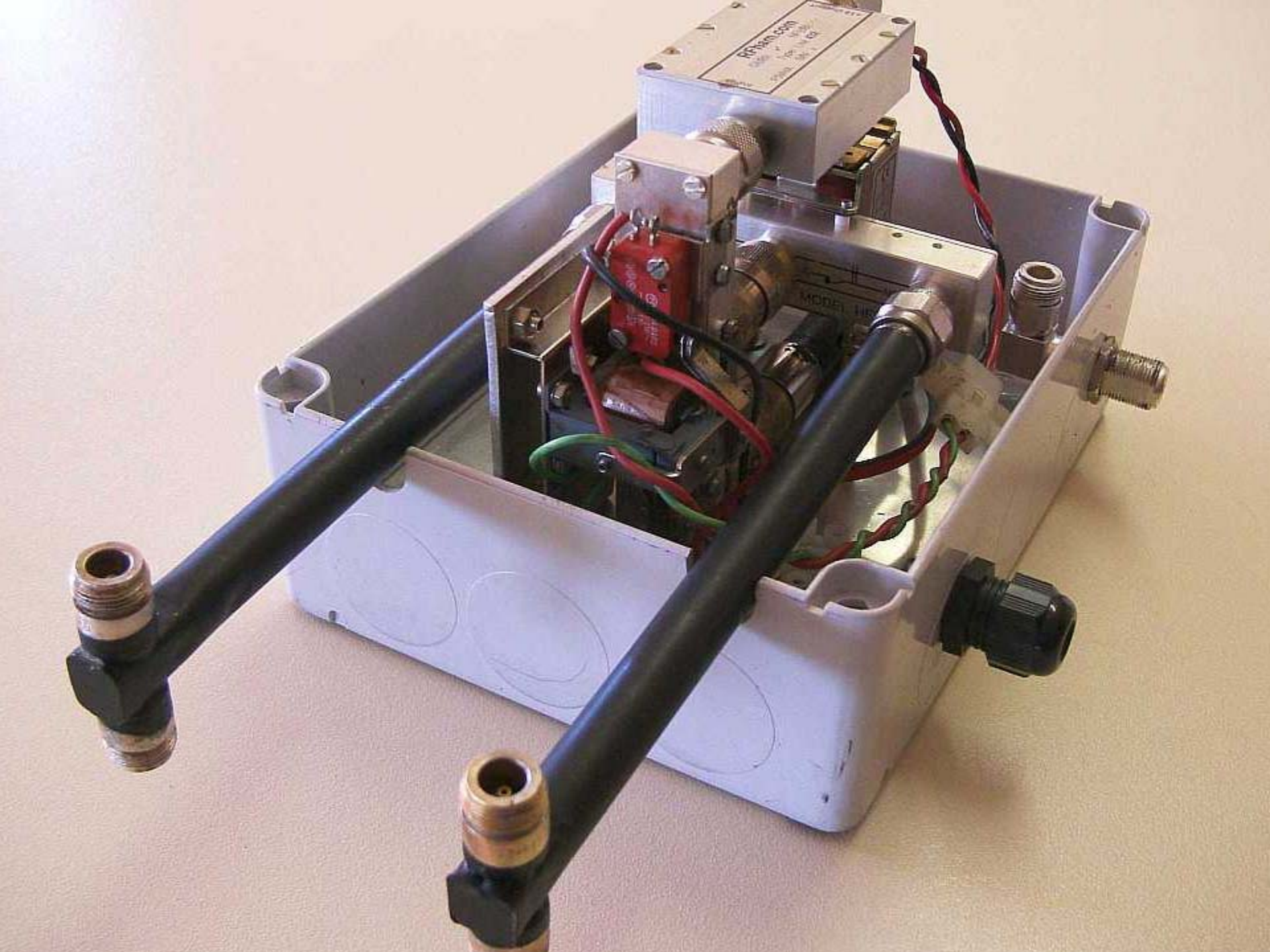
70cm RE-DESIGN INCORPORATES

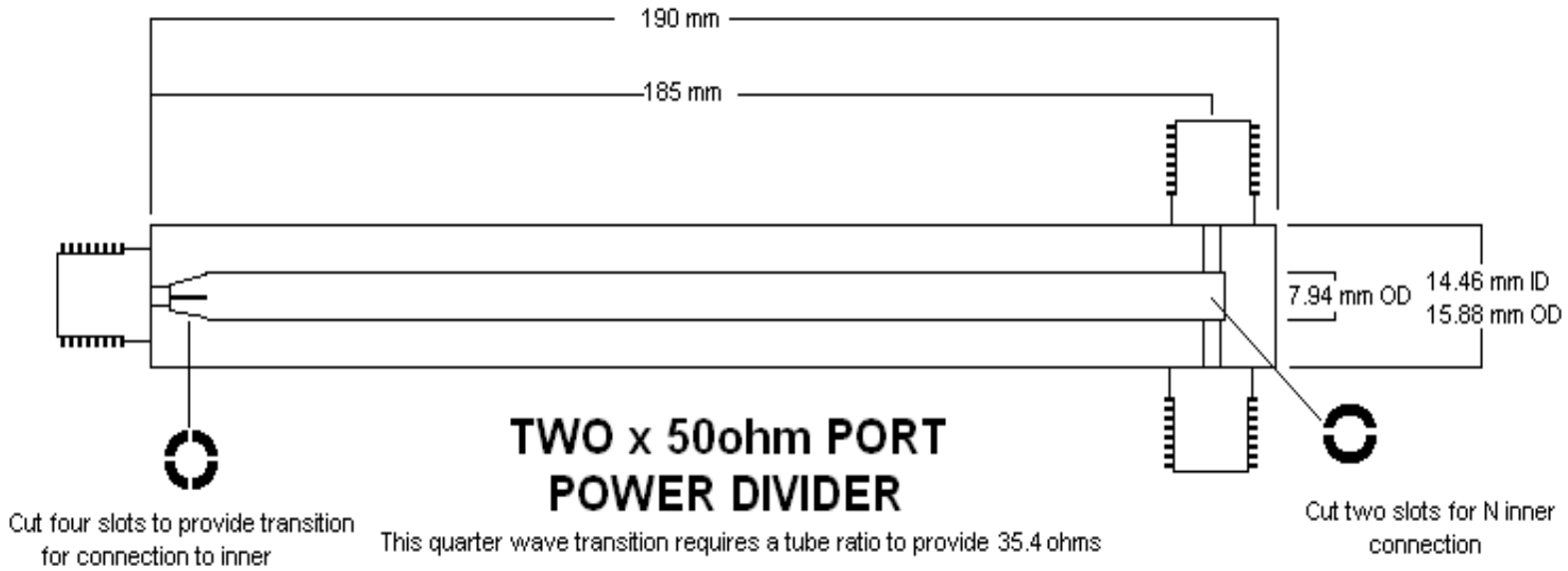
- Use of 2 way power dividers.
- Shortest route from Dipole to pre-amp.
- Minimum number of connectors and adaptors.

  Only one ‘ M-M barrel ‘ was used.

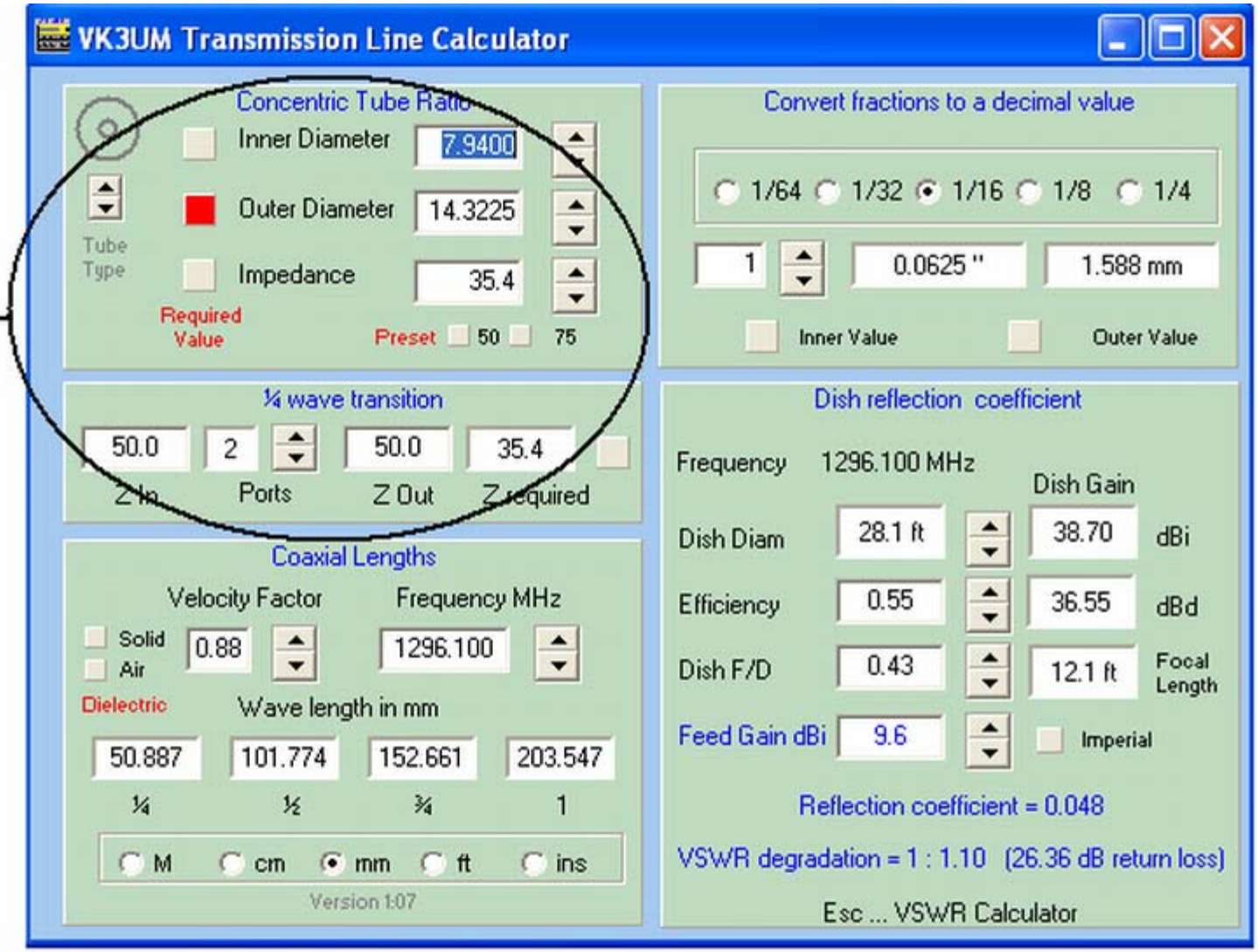
  (interconnect between polarity switching relays)


CE
12V DC
100% ED

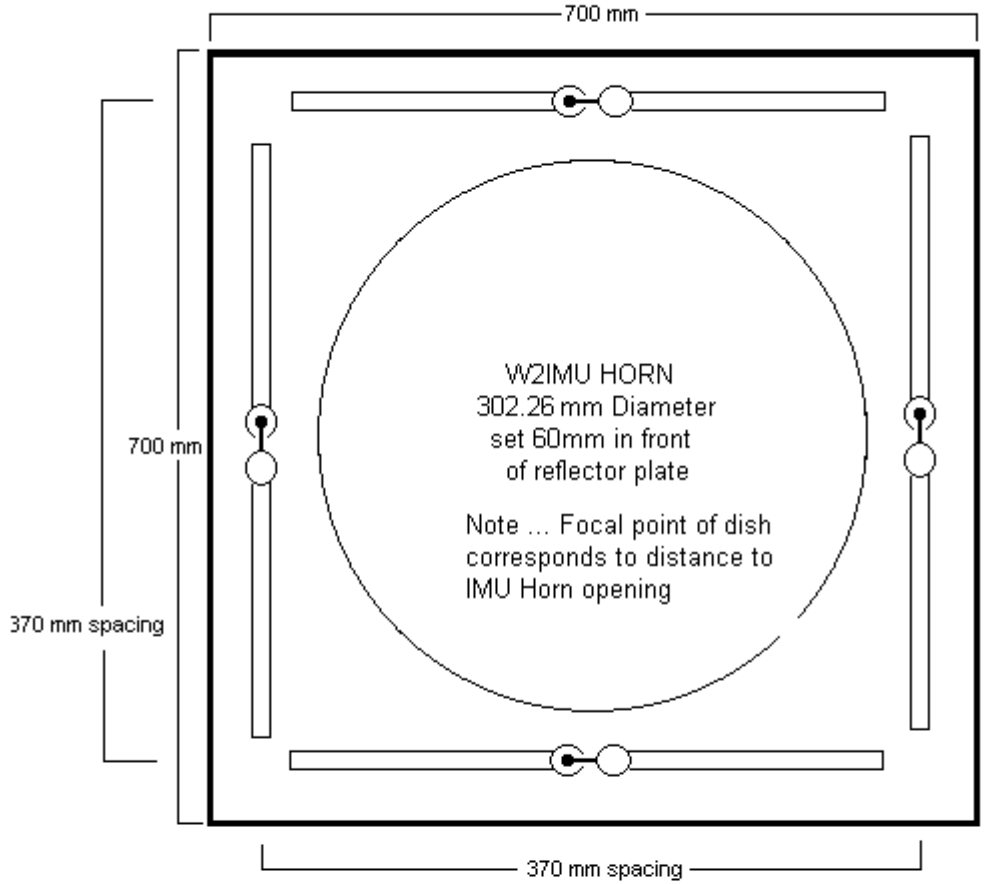


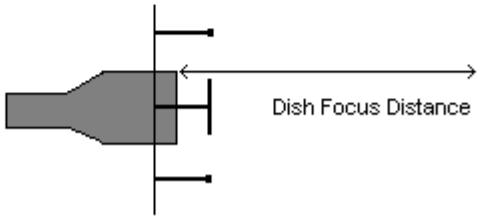

190 mm
185 mm
7.94 mm OD
14.46 mm ID
15.88 mm OD
TWO x 50ohm PORT
POWER DIVIDER
Cut four slots to provide transition for connection to inner
This quarter wave transition requires a tube ratio to provide 35.4 ohms
Cut two slots for N inner connection

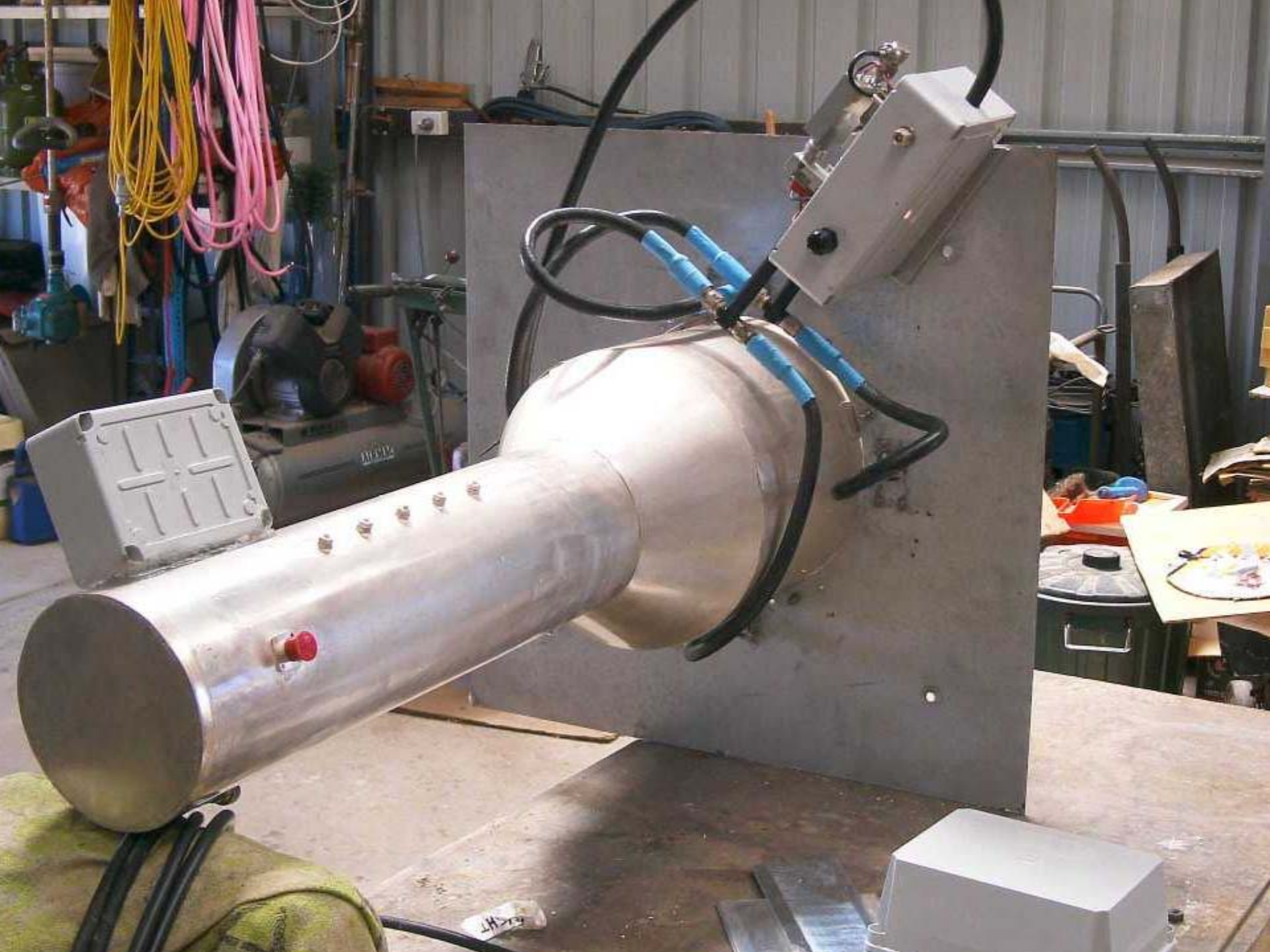
2 PORT COMBINER

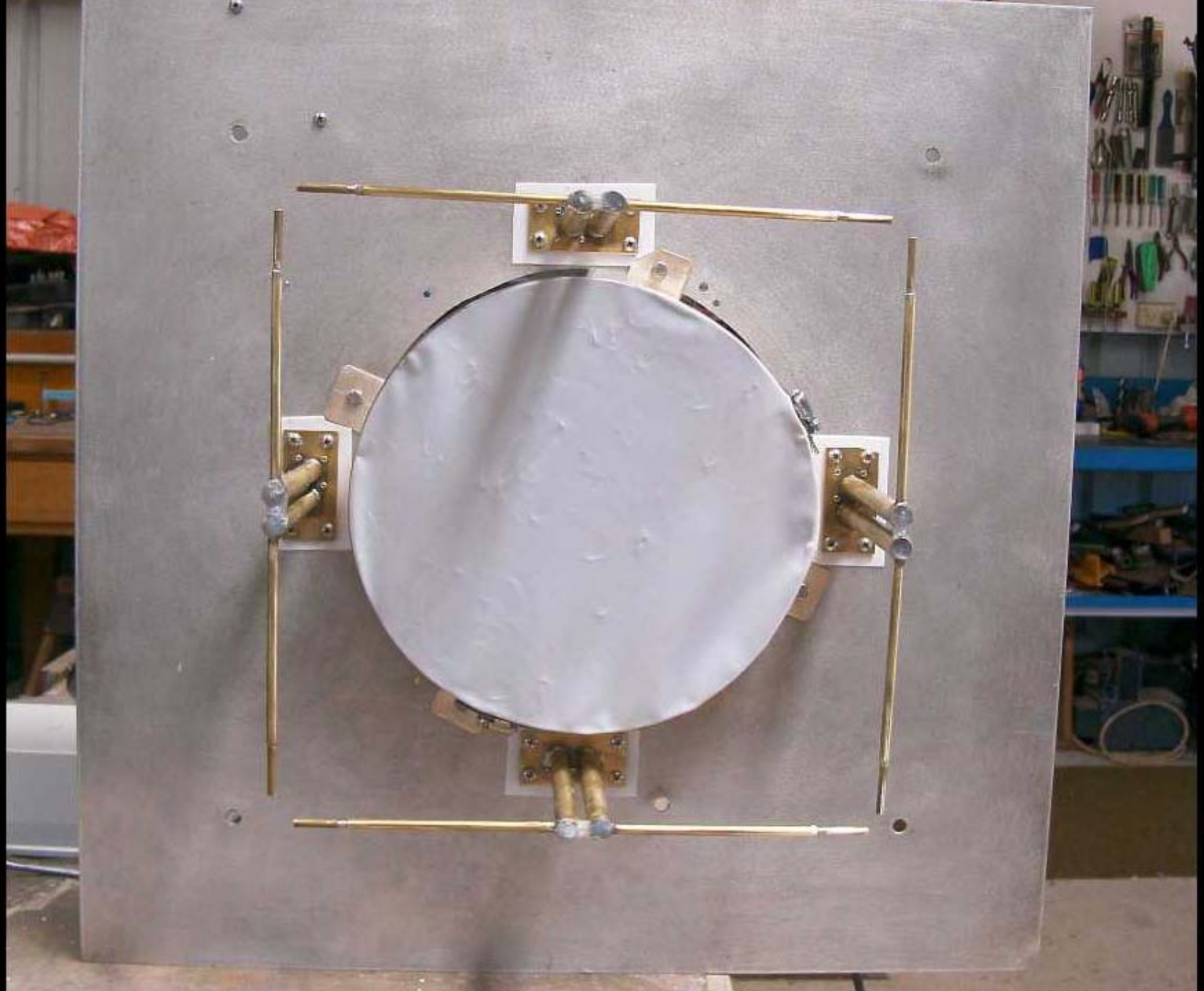


REFLECTOR PLATE AND DIPOLE LAYOUT










LOT NO. TJ-330066

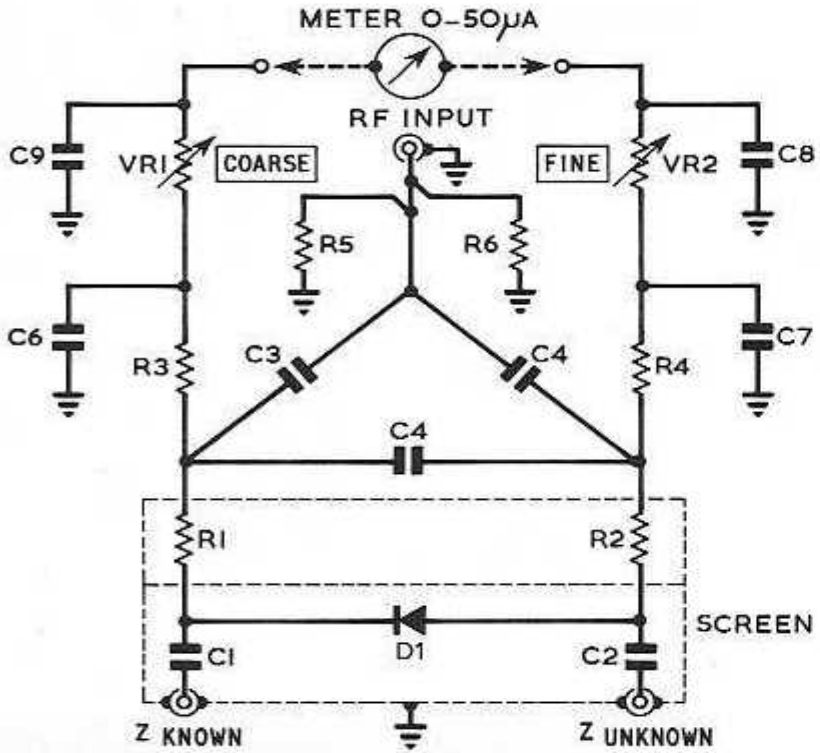


Fig 10.39. Circuit of an rf bridge. R1 and R2 are 100Ω ±1% metal oxide type; R2 and R3 are 4·7kΩ ±1% metal oxide type; R5 and R6 are terminating resistor consisting of two 150Ω in parallel for 75Ω; C1, C2 are 0·001μF ceramic disc; C3, C4, C6, C7, C8, C9 are 0·01μF ceramic disc; D1 is GEX66 or CV2290; VR1 is 50kΩ miniature variable resistor; VR2 is 2·5kΩ miniature variable resistor; Z known is 75Ω resistor fitted into a coaxial plug; * If 50Ω is required then R5-R6 will be 2 × 100Ω − Z known = 50Ω

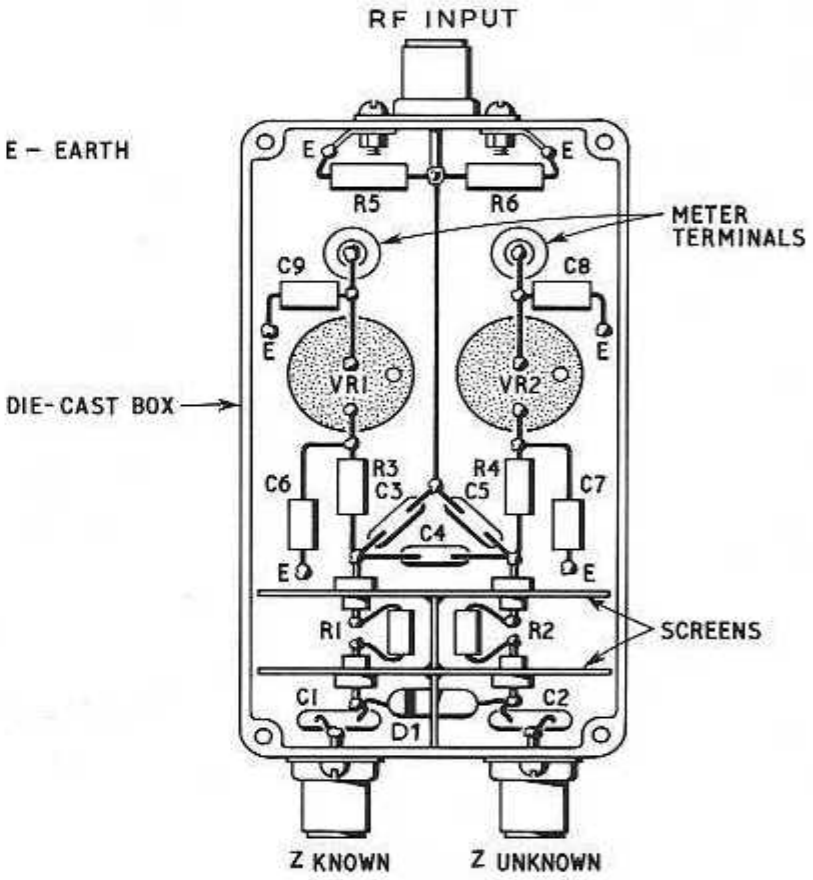


Fig 10.40. Component layout of the rf bridge

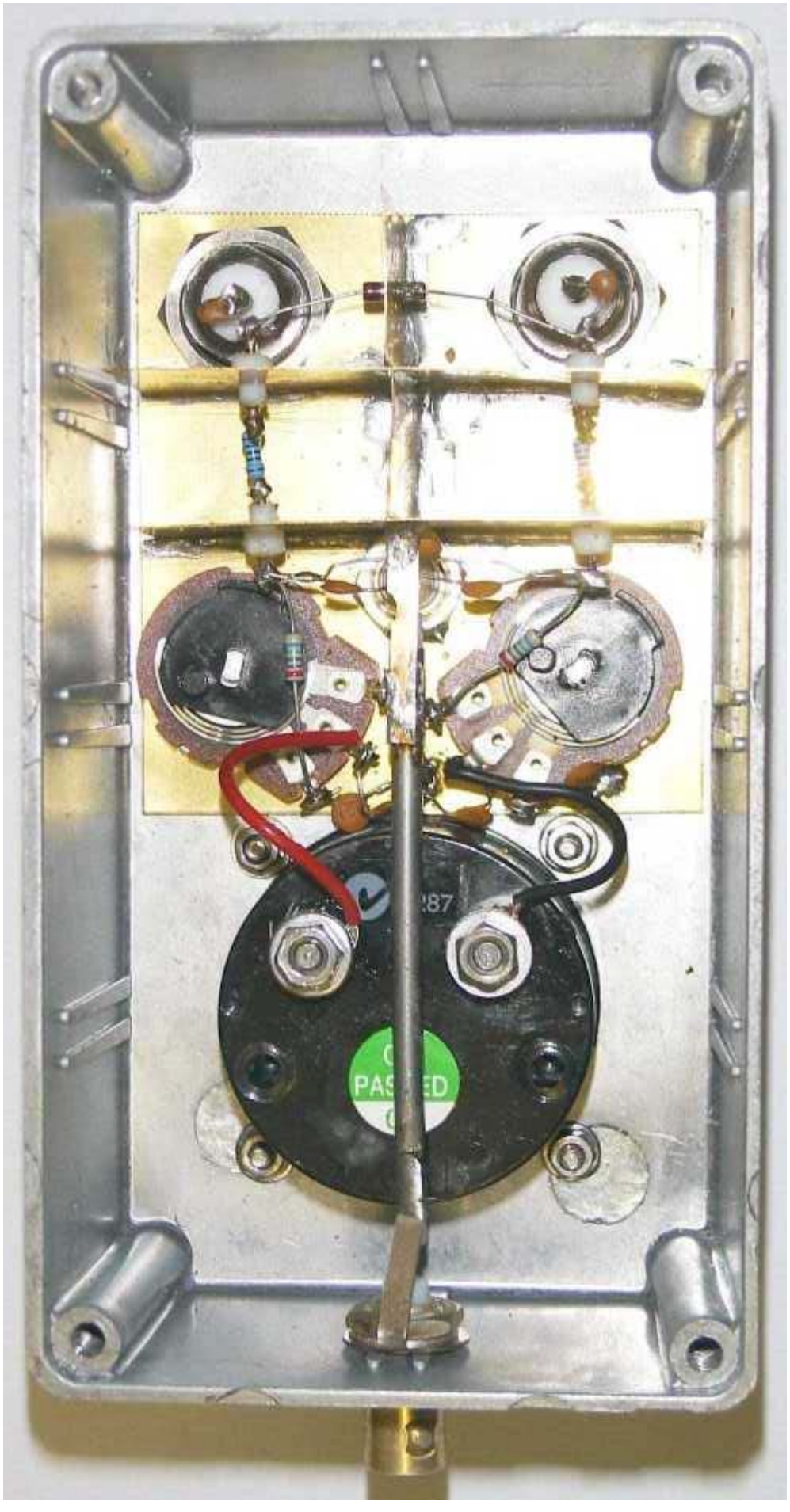
RF noise bridge

The rf noise bridge is basically a simple rf version of the Wheatstone, which with reasonable care in construction will give reliable performance to over 200MHz and may still be useful up to 432MHz.

The basis of the unit is a noise source consisting of a

The toroidal transformer consists of a ferrite ring of material suitable for the maximum frequency needed with a core of approximately 15 to 20mm od, 7 or 7·5mm id and 4 or 5mm thick. The transformer consists of two windings twisted together and wound on one half of the core. The third winding has the same number of turns and is wound in the


VK3UM RF BRIDGE
Z Known
Z Unknown
Coarse
Term
Fine
0
10
20
30
40
50
D.C.
MICROAMPERES
CLASS-2.5
QP5012
CE
RF In


PASSED

Observations

- **23cm**
- **phase focus point is quite critical.**

70cm

- **focus point is ~ half way between dipole element and back plane.**
- **Interaction from test bed to dish was barely detectable.**
- **Although ground noise increases with shack proximity, return loss now remains the same.**
- **Previous phase errors were mistaken for Faraday offset.**

- **It is believed that the phase error interaction with the 70cm dipoles may have caused an elliptical polarisation effect.**

- **This interaction was previously believed to have been caused primary by Faraday offset but observations now indicate a more consistent polarisation offset with less Faraday.**

- **Faraday now can be identified more clearly.**
  (H-H .. V-H .. V..V or V-H .. Favoring one polarity over the other)

SUMMARY

23cm

Return loss -22dB.

(not brilliant but just could not seem to improve on recommended probe dimensions.)

TSys < 50°k.

Echo's …+1dB 120Hz BW = ~2.5 watts.

70cm

Return loss on both V & H polarizations > -24dB.

TSys < 60°k.

Echo's … +1dB 120Hz BW = ~25 watts.

TOTALLY AS PREDICTED .. ALL FIGURES MATCH VERY CLOSELY.

THEORY and PRACTICE DOES WORK !!

NOW LISTEN TO THESE ECHOS