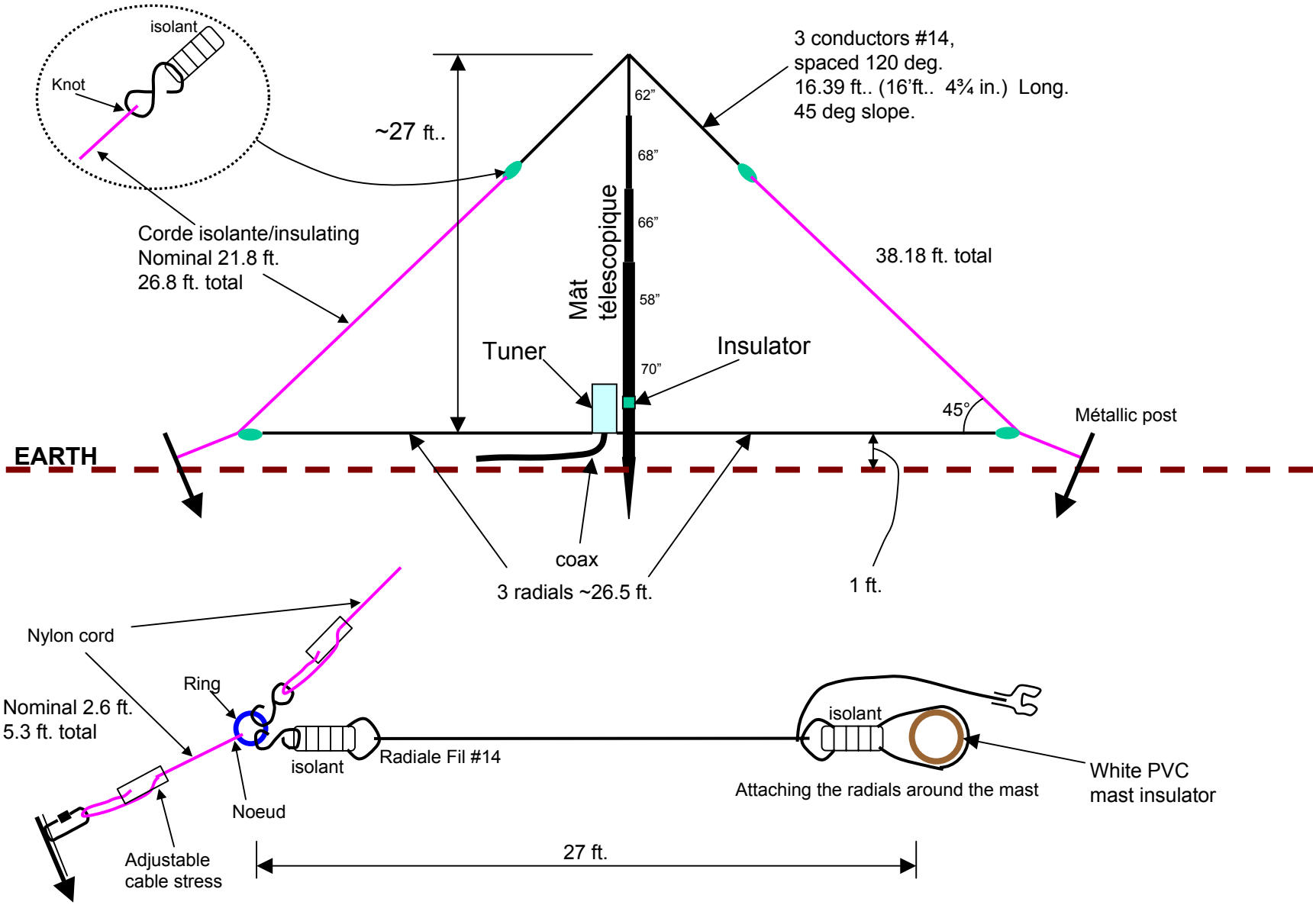
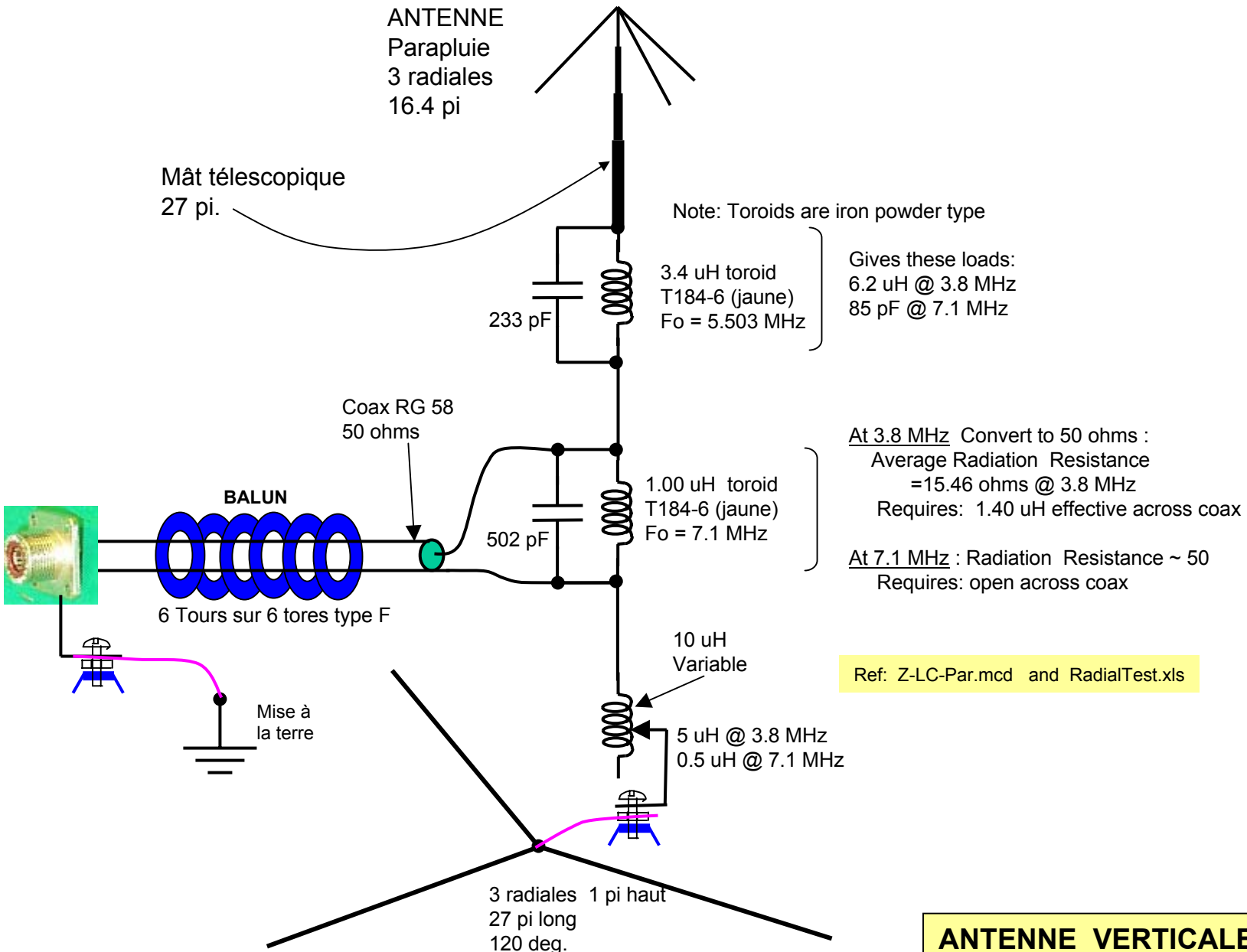
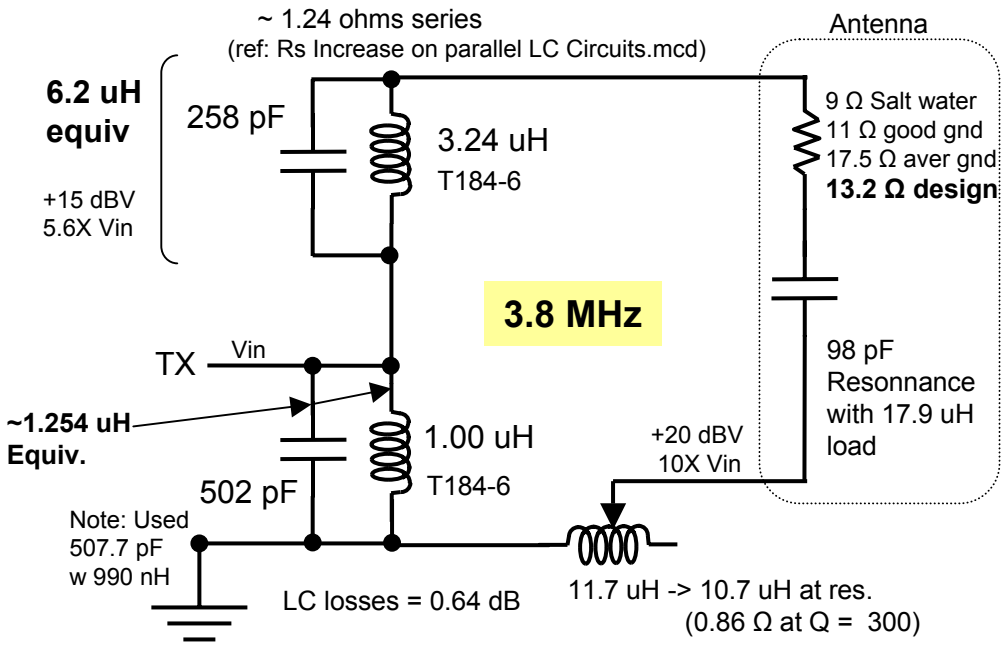
Vertical Antenna Details

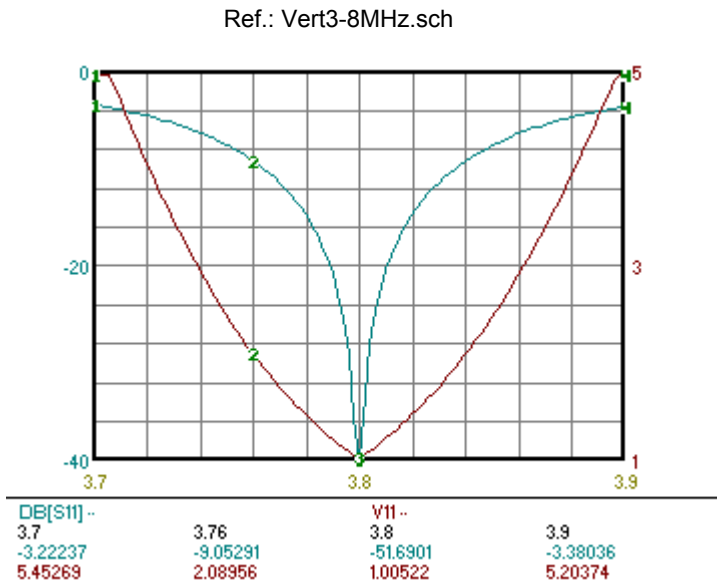
J. Audet VE2AZX
ve2azx.net

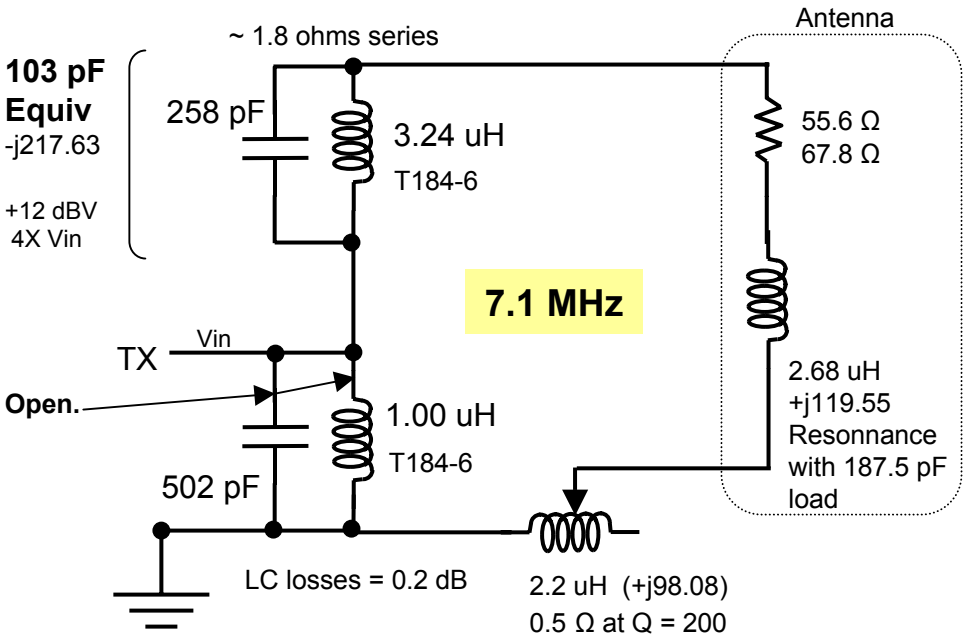
VERTICAL 3.8 & 7.1 MHz

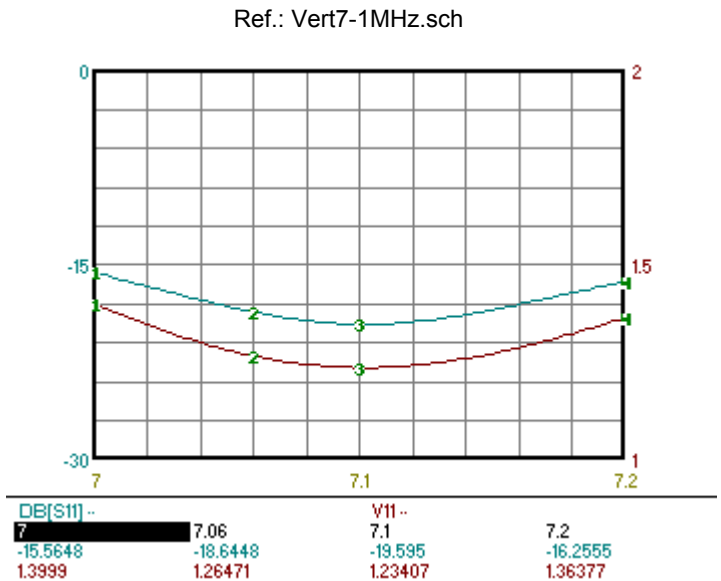


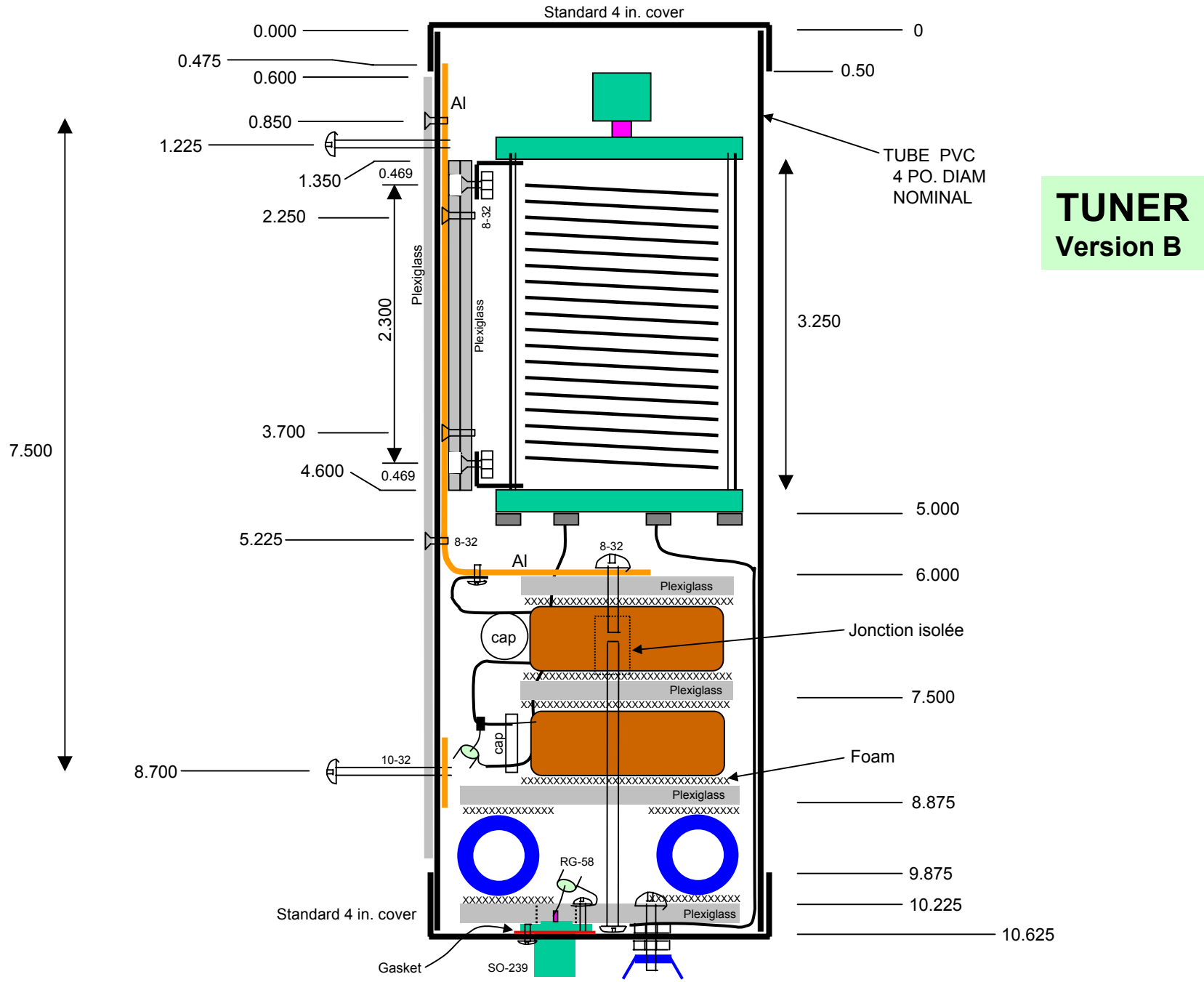

ANTENNE
Parapluie
3 radiales
16.4 pi
Mât télescopique
27 pi.
Note: Toroids are iron powder type
3.4 uH toroid
T184-6 (jaune)
Fo = 5.503 MHz
233 pF
Gives these loads:
6.2 uH @ 3.8 MHz
85 pF @ 7.1 MHz
Coax RG 58
50 ohms
BALUN
6 Tours sur 6 tores type F
1.00 uH toroid
T184-6 (jaune)
Fo = 7.1 MHz
502 pF
At 3.8 MHz Convert to 50 ohms :
Average Radiation Resistance
=15.46 ohms @ 3.8 MHz
Requires: 1.40 uH effective across coax
At 7.1 MHz : Radiation Resistance ~ 50
Requires: open across coax
10 uH
Variable
Ref: Z-LC-Par.mcd and RadialTest.xls
Mise à
la terre
5 uH @ 3.8 MHz
0.5 uH @ 7.1 MHz
3 radiales 1 pi haut
27 pi long
120 deg.
ANTENNE VERTICALE
75m –40m


~ 1.24 ohms series
(ref: Rs Increase on parallel LC Circuits.mcd)
Antenna
6.2 uH
equiv
+15 dBV
5.6X Vin
258 pF
3.24 uH
T184-6
9 Ω Salt water
11 Ω good gnd
17.5 Ω aver gnd
13.2 Ω design
3.8 MHz
98 pF
Resonnance
with 17.9 uH
load
TX
Vin
~1.254 uH
Equiv.
1.00 uH
T184-6
+20 dBV
10X Vin
502 pF
Note: Used
507.7 pF
w 990 nH
LC losses = 0.64 dB
11.7 uH -> 10.7 uH at res.
(0.86 Ω at Q = 300)


Ref.: Vert3-8MHz.sch
0
-20
-40
5
3
1
3.7
3.8
3.9
DB[S11]
V11
3.7
-3.22237
5.45269
3.76
-9.05291
2.08956
3.8
-51.6901
1.00522
3.9
-3.38036
5.20374


~ 1.8 ohms series
Antenna
103 pF
Equiv
-j217.63
+12 dBV
4X Vin
258 pF
3.24 uH
T184-6
55.6 Ω
67.8 Ω
7.1 MHz
2.68 uH
+j119.55
Resonnance
with 187.5 pF
load
TX
Vin
Open.
1.00 uH
T184-6
502 pF
LC losses = 0.2 dB
2.2 uH (+j98.08)
0.5 Ω at Q = 200

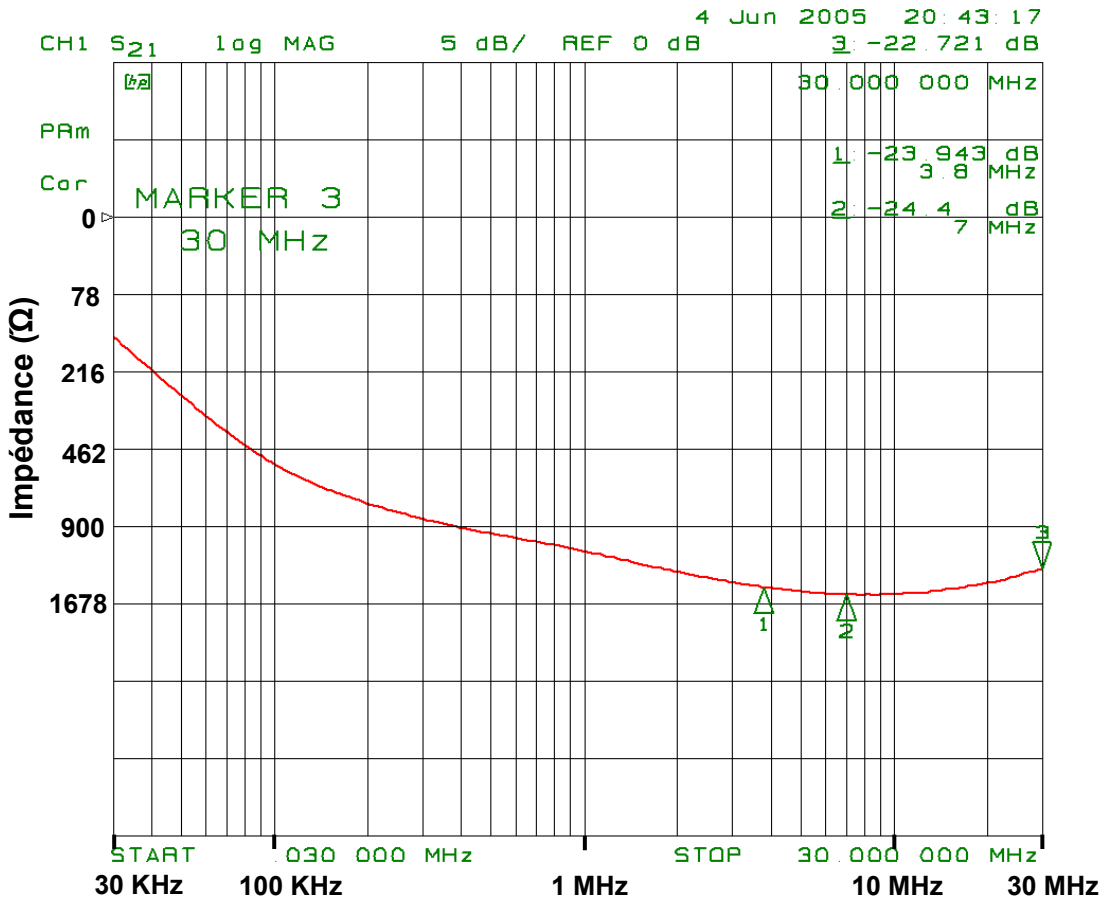

Ref.: Vert7-1MHz.sch
0
-15
-30
2
1.5
1
7
7.1
7.2
DB[S11]
V11
7
-15.5648
1.3999
7.06
-18.6448
1.26471
7.1
-19.595
1.23407
7.2
-16.2555
1.36377


Standard 4 in. cover
0.000
0.475
0.600
0.850
1.225
1.350
0.469
2.250
2.300
Plexiglass
8-32
Al
3.700
4.600
0.469
7.500
5.225
8-32
Al
8-32
Plexiglass
cap
Jonction isolée
Plexiglass
cap
10-32
8.700
Foam
Plexiglass
RG-58
Standard 4 in. cover
Plexiglass
Gasket
SO-239
0
0.50
TUBE PVC
4 PO. DIAM
NOMINAL
3.250
5.000
6.000
7.500
8.875
9.875
10.225
10.625
TUNER
Version B

MESURES D'IMPÉDANCE (mode transmission série)

6 tores type F

4 tours

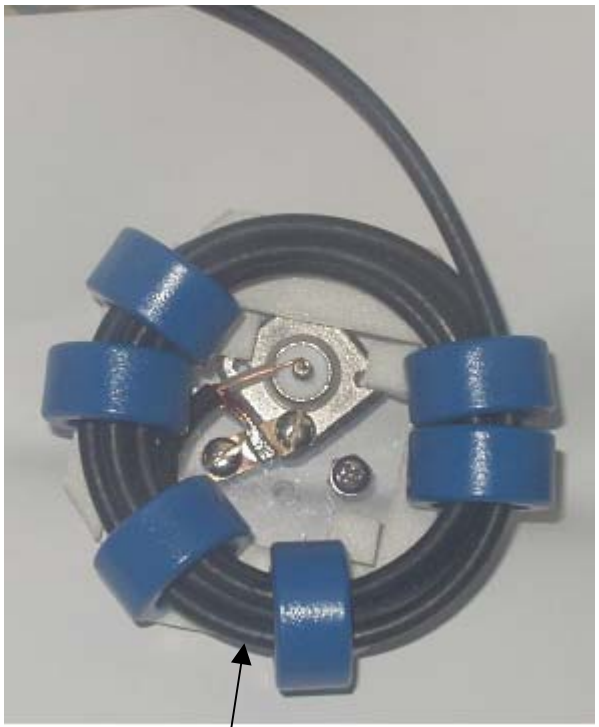


Calcul de Rx(dB):
RS=RL= 50 ohms

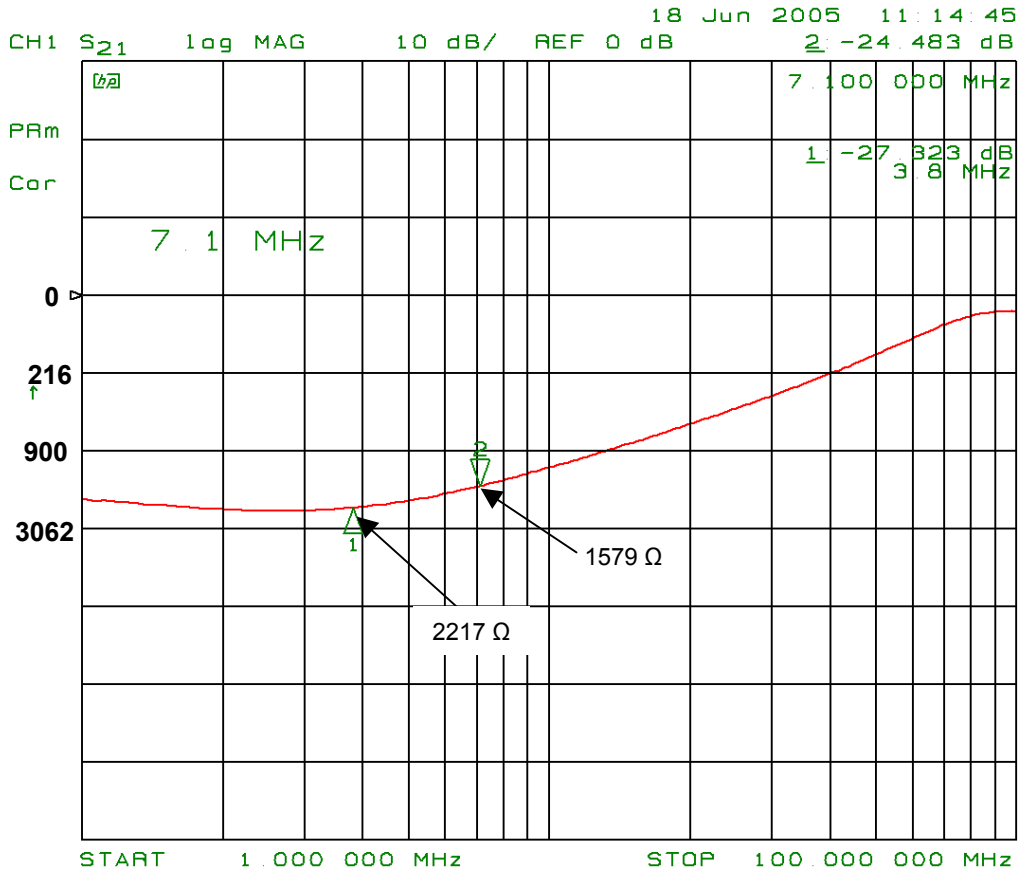
$$Rx(dB) := (RL + RS)\cdot\left[\left(10^{dB}\right)^{.05} - 1\right]$$

MESURES D'IMPÉDANCE (mode transmission série)

6 tores type F- bleu



6 tours



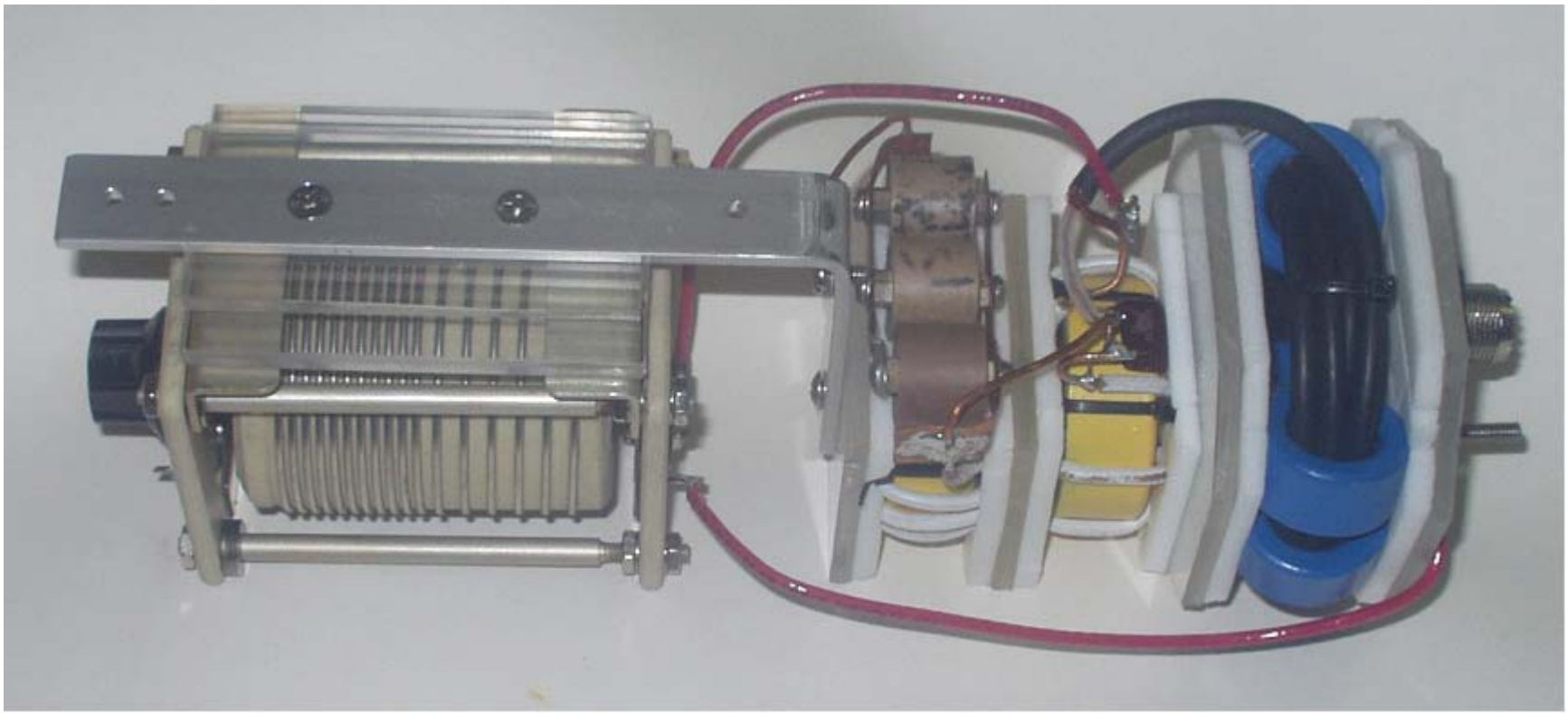
Voici la procédure d'assemblage:

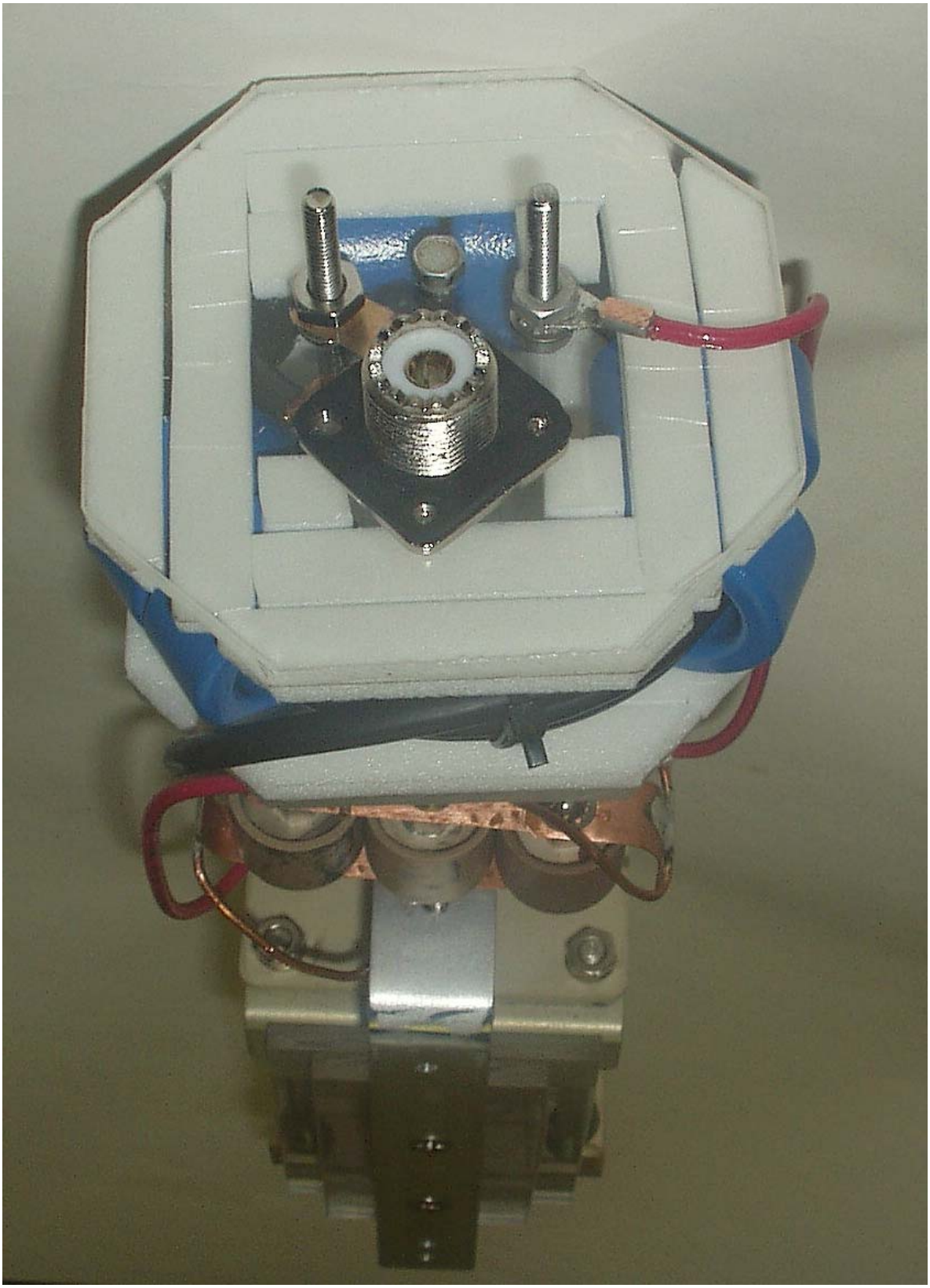
Planter le piquet métallique central.
Insérer l'isolant PVC par dessus.
Placer les 3 radiales dans la coche de l'isolant PVC et les étendre pour faire des angles de 120 degrés.
Planter les 3 piquets métalliques 3 pieds plus loin que le bout des radiales allongées.
Ouvrir l'anneau des piquets pour y placer le câble en nylon.
L'autre extrémité du câble est raccordée à l'isolant de la radiale via un anneau. Tendre les 3 radiales.
Allonger le mât télescopique à sa dimension finale.
Insérer le tuyau en Al au bas du mât télescopique.
Connecter les fils des 3 haubans avec les vis papillon, au sommet du mät.
Connecter les câbles nylon à l'autre bout de chaque hauban, en gardant un espace entre les câbles pour qu'ils ne se mêlent pas.
Placer le mât en position verticale et l'insérer dans l'isolant PVC. Une personne doit le tenir vertical.
Raccorder les câbles des 3 haubans sur les anneaux, avec les crochets, sur les câbles qui tendent les radiales.
Appliquer la tension sur chaque hauban, tout en gardant l'antenne verticale.
Attacher le tuner au tuyau via 2 vis. (Peut être préassemblé)
Connecter les 3 radiales sur la vis papillon du tuner.
Connecter le coax sur le tuner.
Vérifier le SWR et ajuster l'inductance.

Assembly procedure

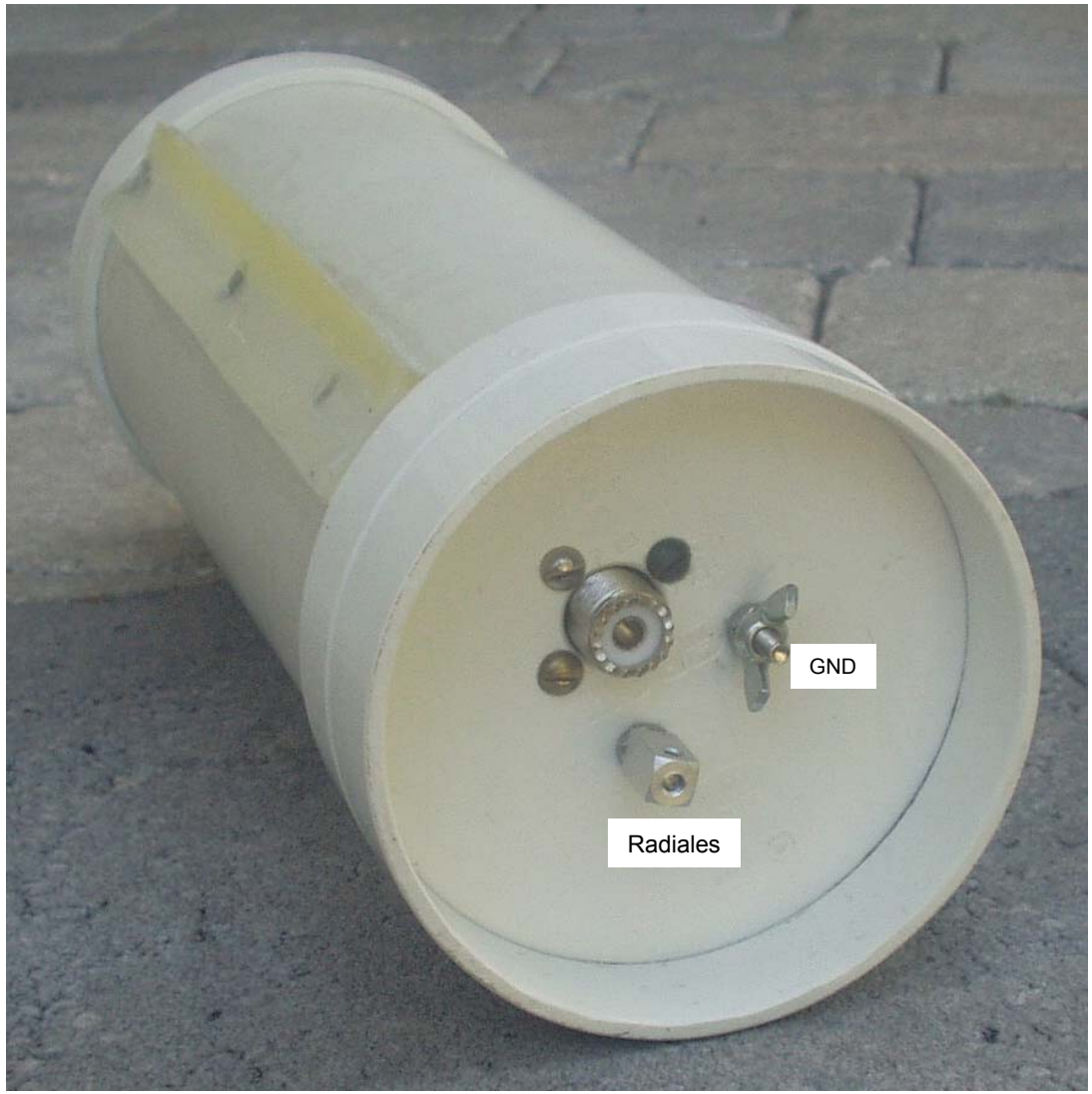
Decide where the vertical will be located and plant the first metallic post in the earth.
Insert the PVC insulator on top of the post.
Place the 3 radials starting in the slot of the PVC insulator and stretch them to make 120 degree angles.
Plant the other 3 metallic posts 3 feet farther than the end of stretched radials.
On the posts: open the links that are mounted on the posts and pass the nylon cable thru.
The other end of the cable is attached to the radial insulator via a ring. Stretch the 3 radials.
Stretch the telescopic mast to its final length.
Insert the Al pipe at the bottom of the telescopic mast.
Connect the 3 guy wires with their butterfly screws at the top end of the mast.
Attach the nylon cables at the other end of each guy, keeping the cables spaced to prevent intermixing.
One person must place the mast in its vertical position and insert it in the PVC insulator, while keeping it vertical.
Attach the nylon guy cables on the rings, with the hooks, on the cables that strech the radials.
Apply moderate tension on each guy, while keeping the antenna vertical.
Attach the tuner to the Al pipe, if not already pre-assembled.
Connect the 3 radials to the tuner butterfly screw. Connect the coax to the tuner.
Verify SWR and adjust the variable inductor.

TUNER





TUNER




320 kPa @ 8182.1 NO 3624-130 C-030527R4-P-0040 P/N 0032

In Retrospective …

The variable inductor is adjusted for minimum SWR on both bands.
However the minimum SWR on 40m was just a bit below 2.0.
That value probably depends on the type of soil. On 75m the SWR was better than 1.5.
I figure that a more conventional L-C tuner might be more appropriate, since it could give a better match.
Also I had to work hard to fit the tuner in the 4 in. PVC pipe.
Not sure I would do it again ! If you plan to use this antenna at home as a permanent installation,
it would be preferable to raise the radials at 8 or 10 ft. above ground.