"Initial RF Concepts for the Cooling Channel"

Bob Rimmer:

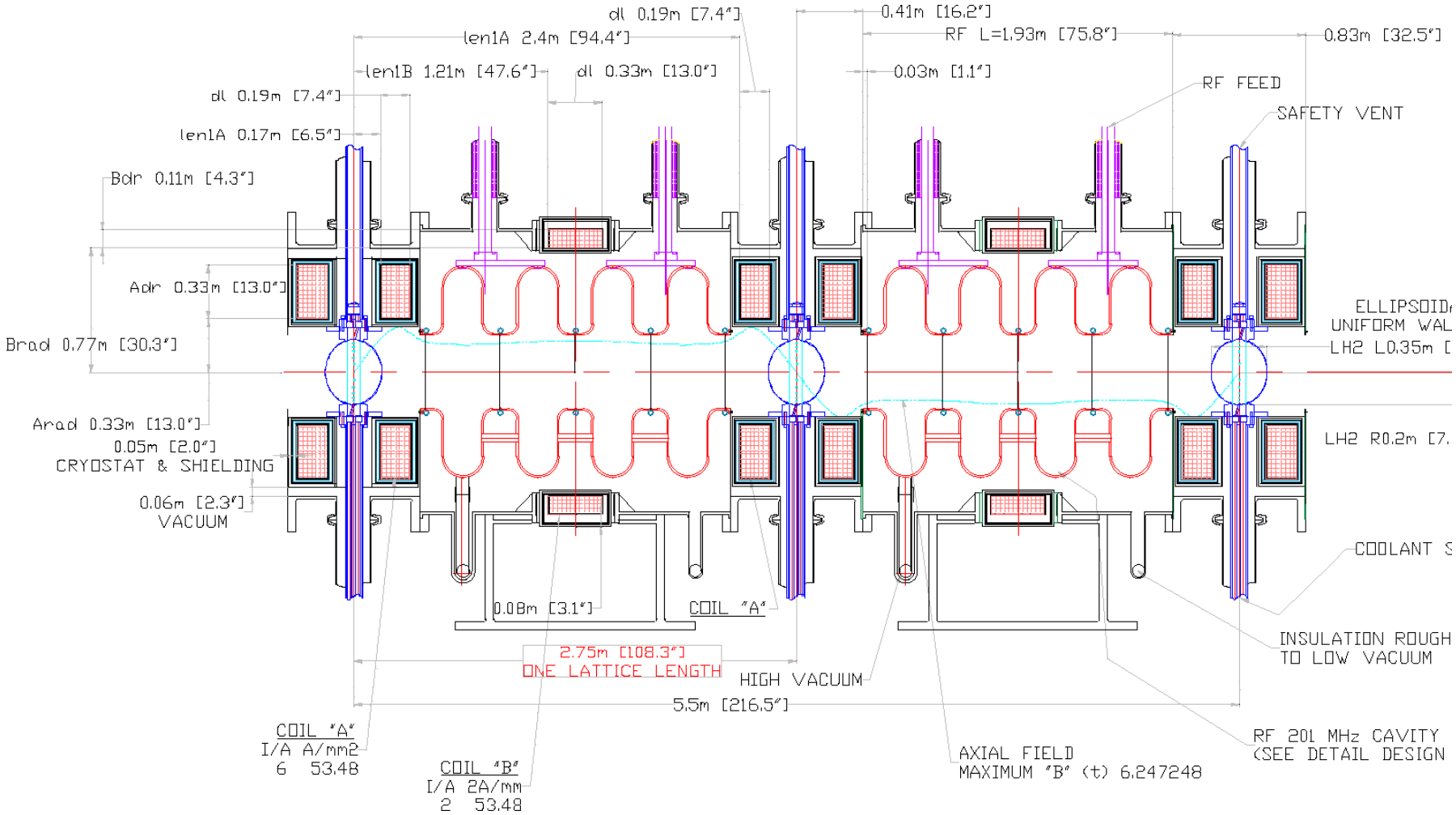
10/23/2000

1) Cavity layout:

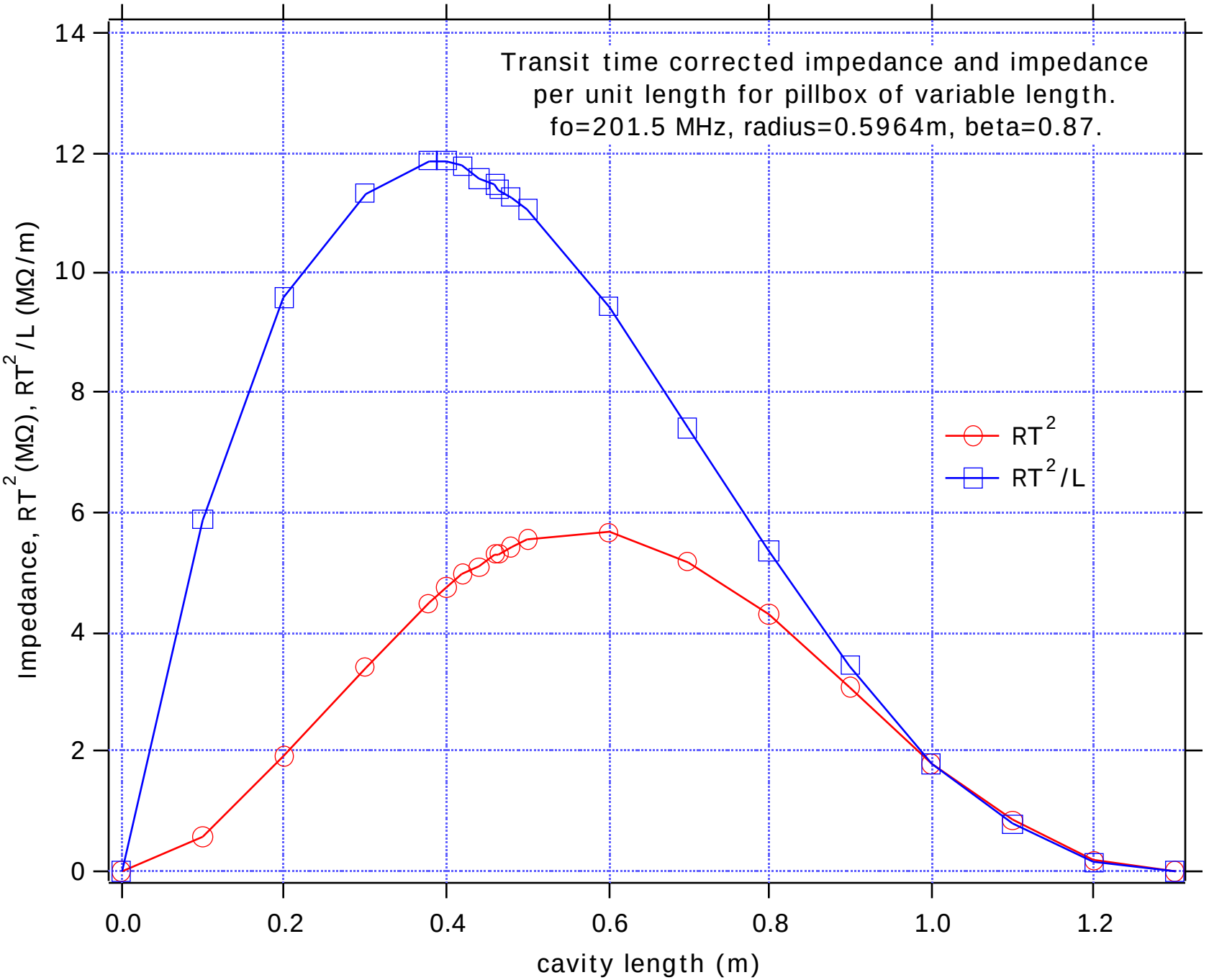
1.93m available from Ed Black's draft layout

Could be used for 4 x 48 cm long cavities with zero thickness irises (46.6cm used in Bob's table) or 5 x 38.6 cm cavities - close to optimum length for max gradient (105° phase length as pointed out by John Corlett).

In practice finite iris thickness (50mm assumed) removes this advantage, 4 and 5 cell cases are about equal in total shunt impedance, may as well stick with 4.



Ed Black's draft layout



Variation of pillbox parameters with length

2) Cavity shape:

Simple pillbox at 46.6 cm has RT^2= 5.31 MΩ ($V^2/2P$)

going to 42cm for thick irises = 4.95 MΩ, E_{pk}/E_{eff}= 1.27

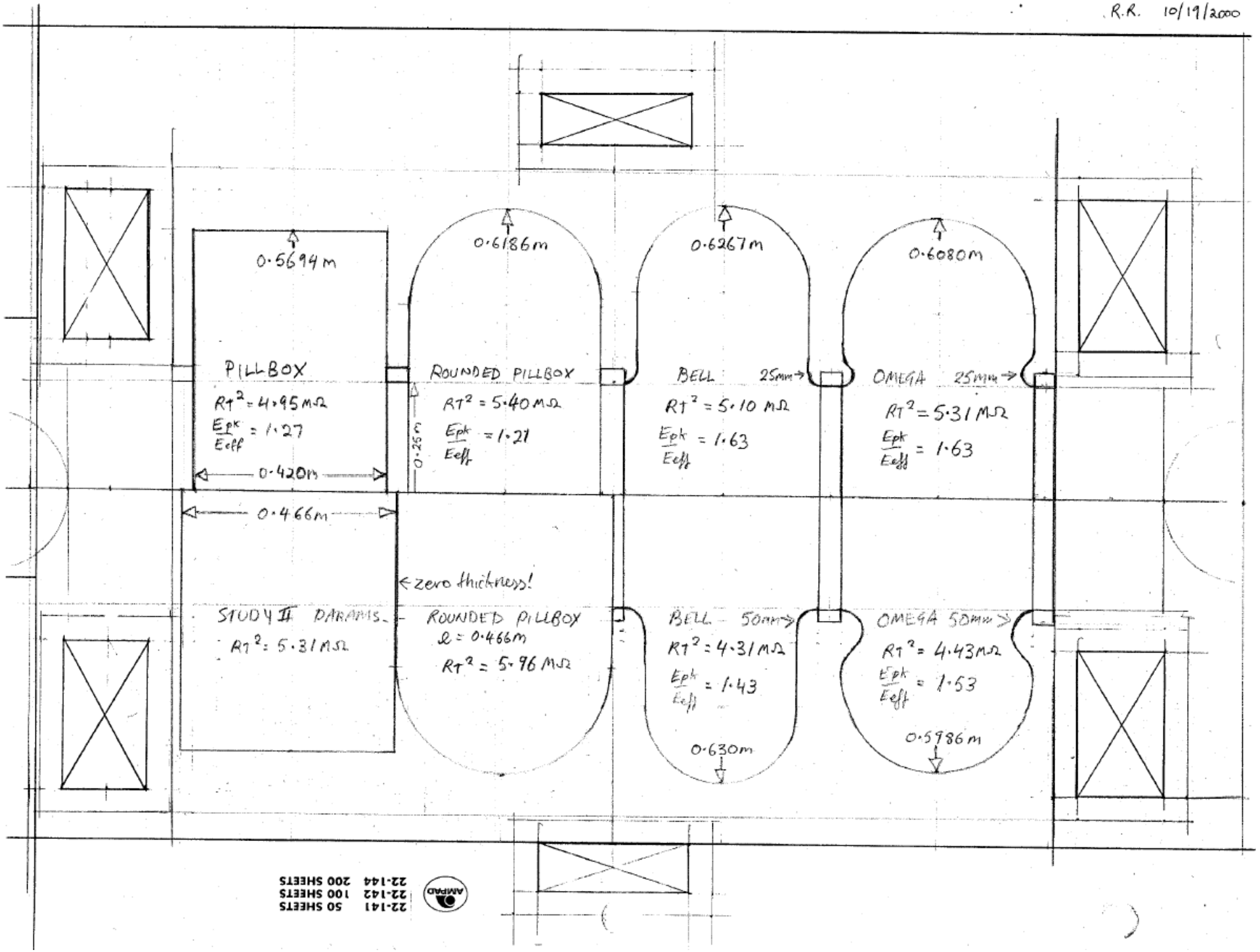
rounded pillbox gets back to 5.4 MΩ

space for assembly drops to ≤5.1 MΩ, E_{pk}/E_{eff}= 1.63

"omega" shape gets back to 5.31 MΩ,
E_{pk}/E_{eff}= 1.63 but peak field is on nose, not foil

NB: In practice Q is usually only 70-80% of calculated, so power requirements will be increased!

R.R. 10/19/2000



2) Field variation with radius:

All closed cells have very similar variation to pillbox, i.e. effective voltage off axis drops like Jo Bessel function

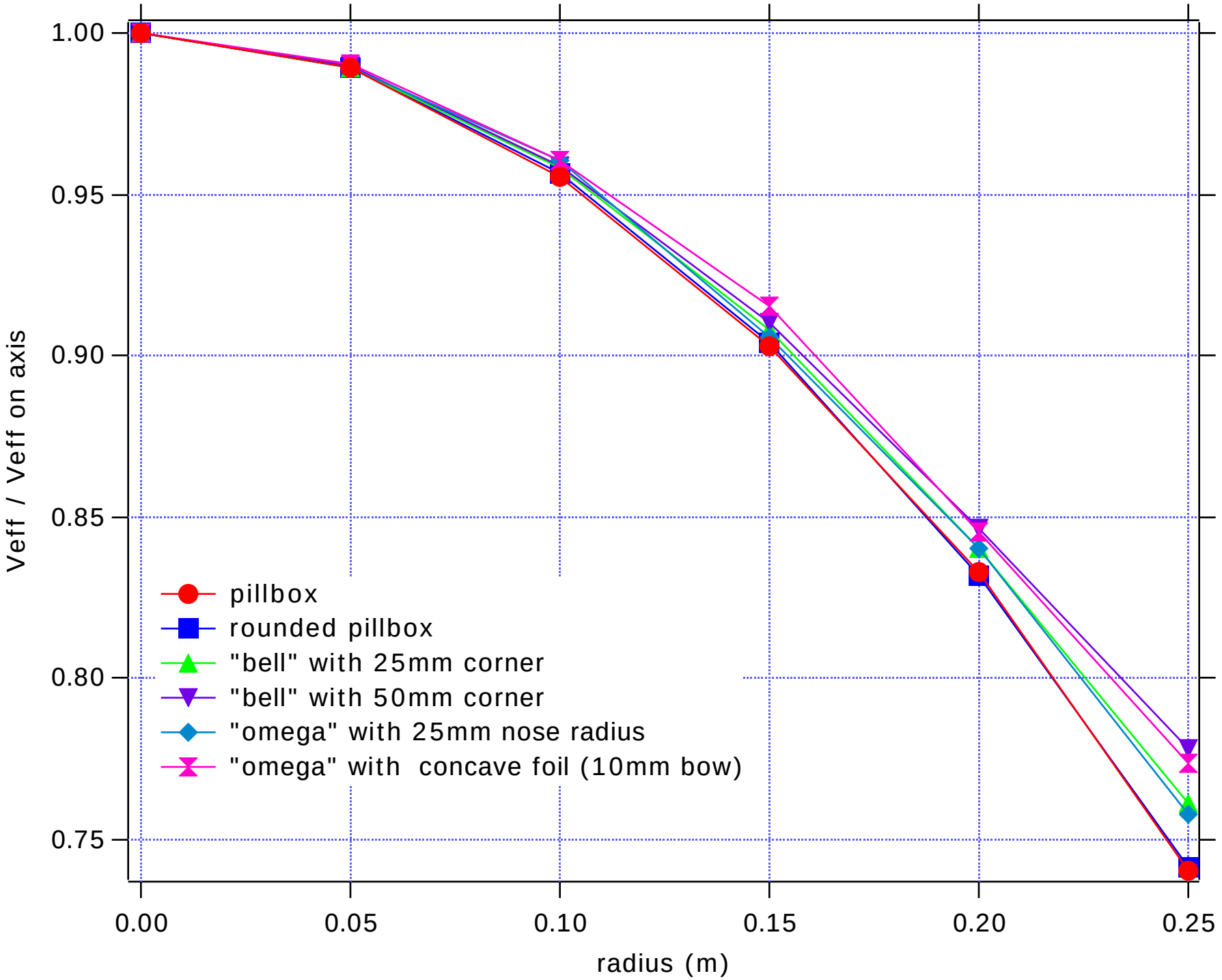
effective voltage is down to about 75% at 25cm radius, is this significant? Absorber is thinner at large radius but do we have to match this variation to minimize losses?

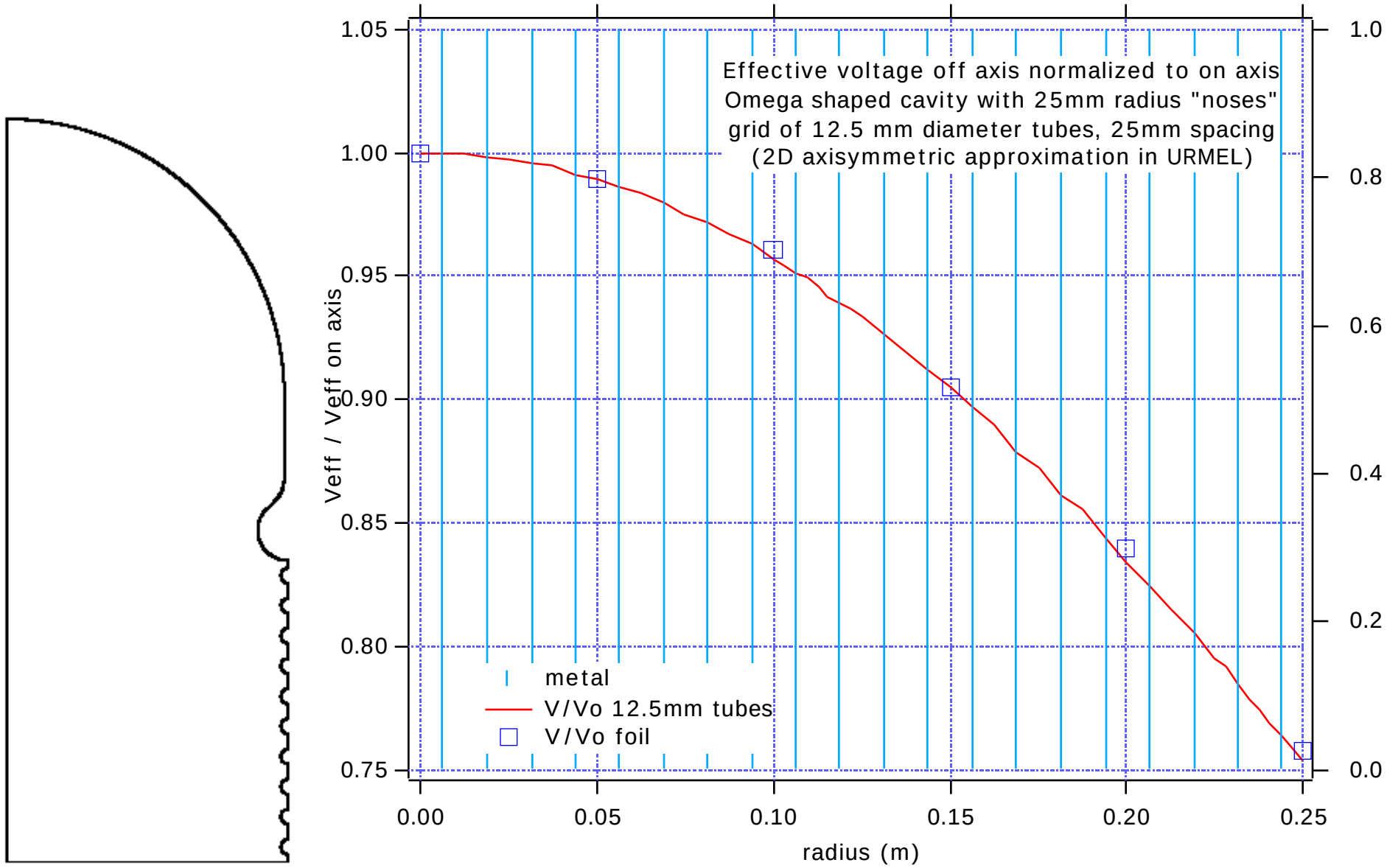
"Omega" and "bell" shapes are slightly flatter due to field concentration on noses

Concave foil with 10mm bow is very similar to others.

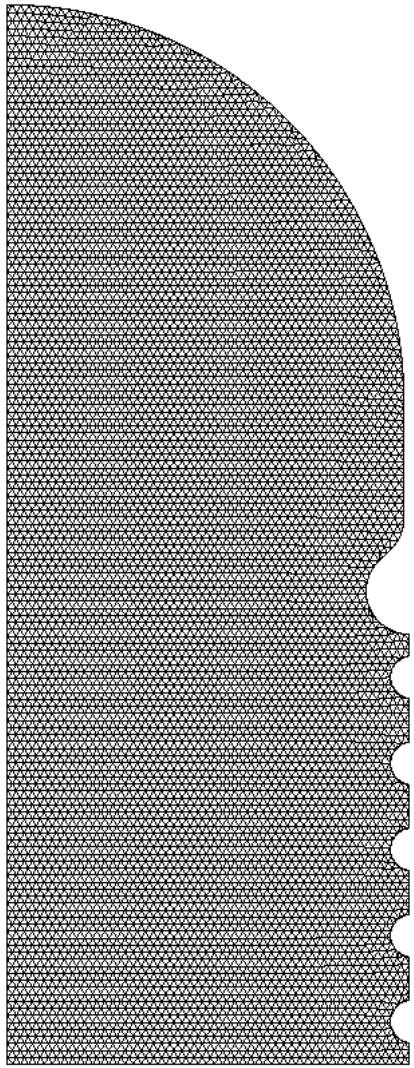
Axisymmetric approximation of tubes in URMEL shows very little disruption to fields, even with large tubes.

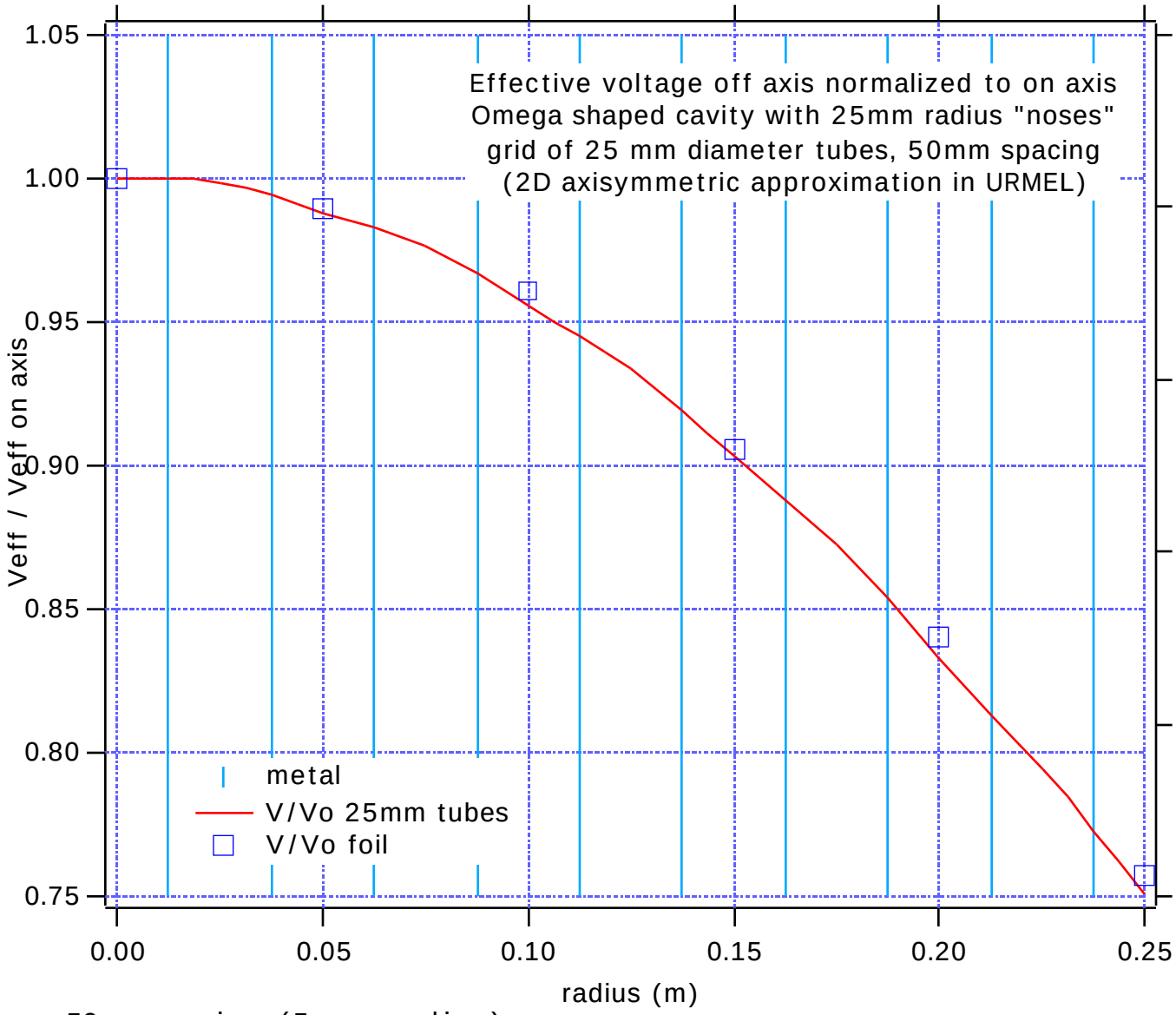
Need 3D MAFIA or ANSYS model to see true effect and to calculate transverse kicks.


1.00
0.95
0.90
0.85
0.80
0.75
Veff / Veff on axis
0.00
0.05
0.10
0.15
0.20
0.25
radius (m)
pillbox
rounded pillbox
"bell" with 25mm corner
"bell" with 50mm corner
"omega" with 25mm nose radius
"omega" with concave foil (10mm bow)

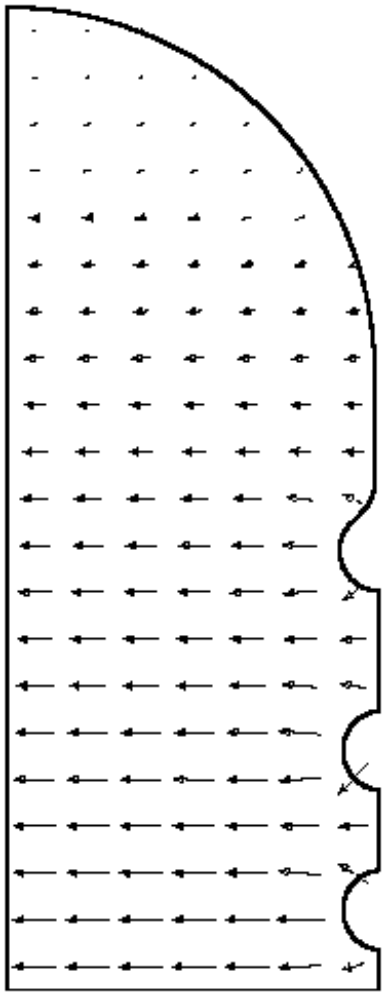


effective voltage plus outline of tube edges, 12.5mm tubes 25mm spacing





bigger tubes 25mm diameter, 50mm spacing (5 per radius)



50mm diameter tubes, 100mm spacing (4 tubes each way)