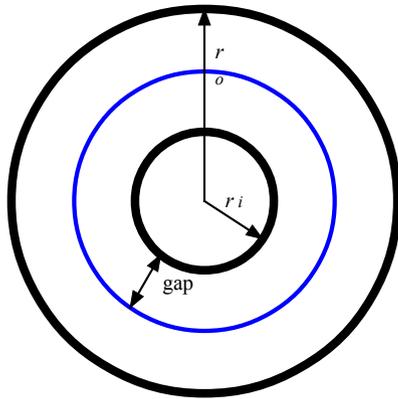


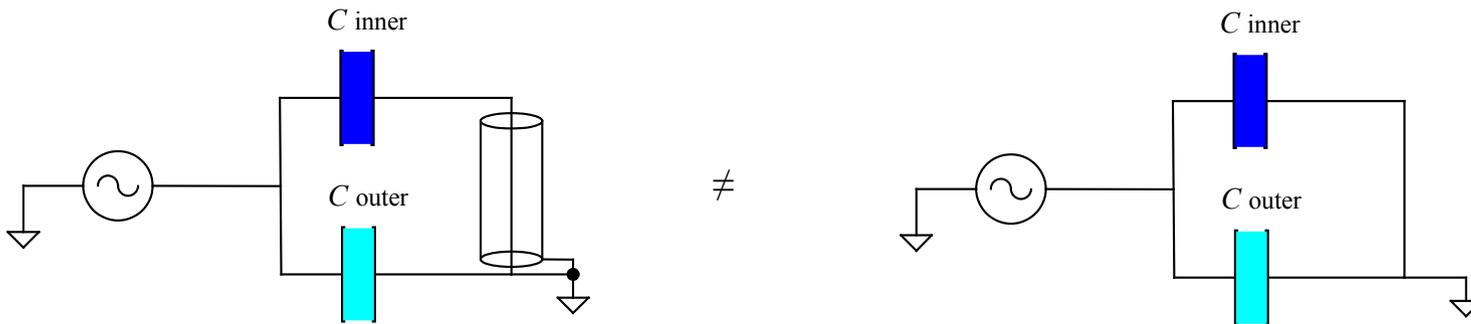
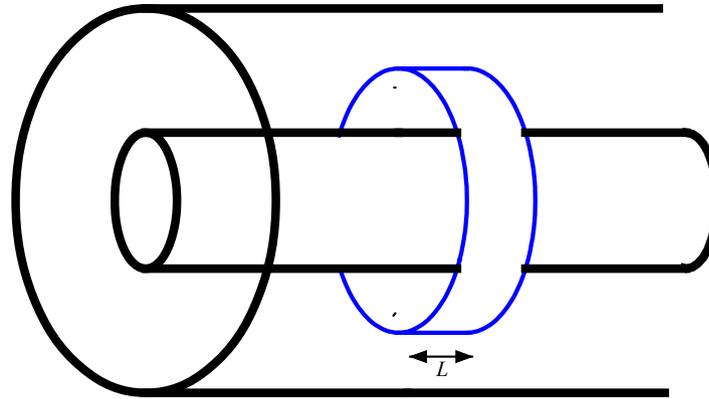
# Blocking capacitor

C.Y. Tan  
19 June 2015

# Blocking capacitor



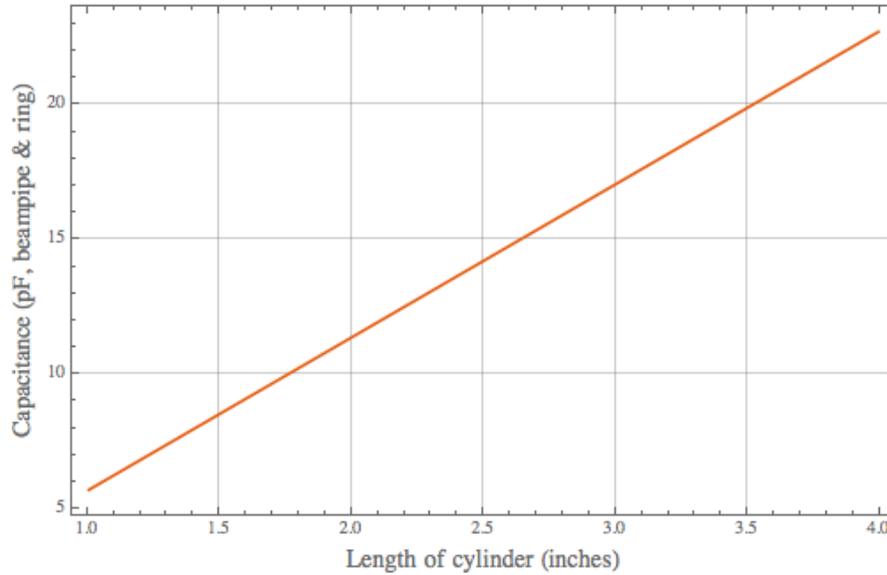
$$r_i = 45 \text{ mm}$$
$$r_o = 125 \text{ mm}$$



Assume that the beam pipe and the ring forms  $C_{\text{inner}}$  and the ring and the outer shell forms  $C_{\text{outer}}$ . The equivalent circuit on the left is NOT the same as the circuit on the right. Therefore,  $C_{\text{inner}}$  and  $C_{\text{outer}}$  must be considered separately and cannot be combined.

# Blocking capacitor ( $C_{\text{inner}}$ )

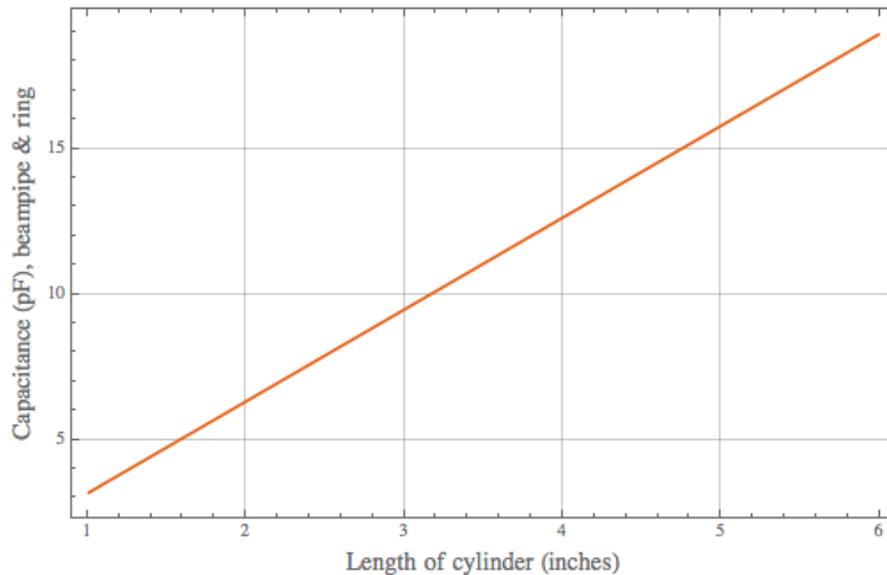
Coaxial capacitor with 0.5 inch gap between beam pipe and ring



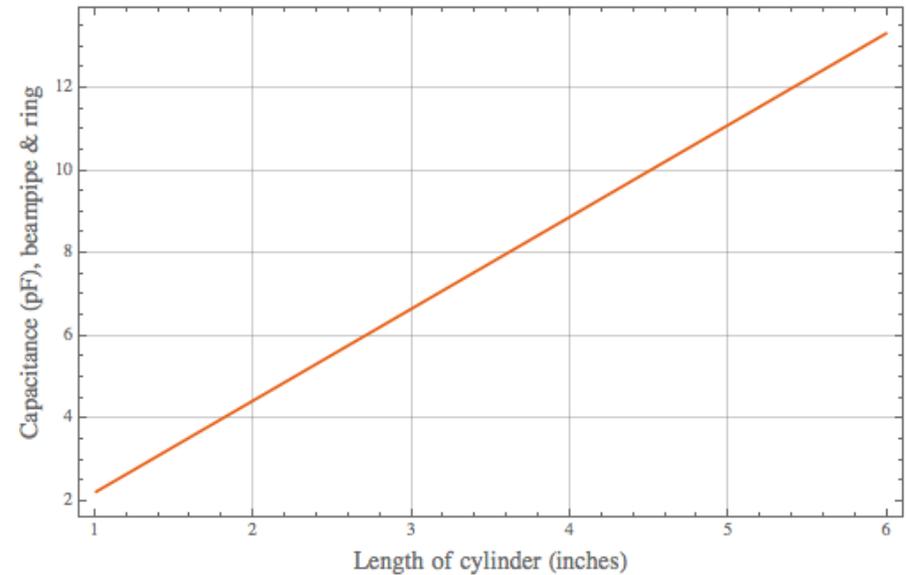
Available length < 13.5 inches  
(excludes gap)

$$C = \frac{2\epsilon_0 \pi L}{\log(r_o/r_i)}$$

Coaxial capacitor with 1 inch gap between beam pipe and ring

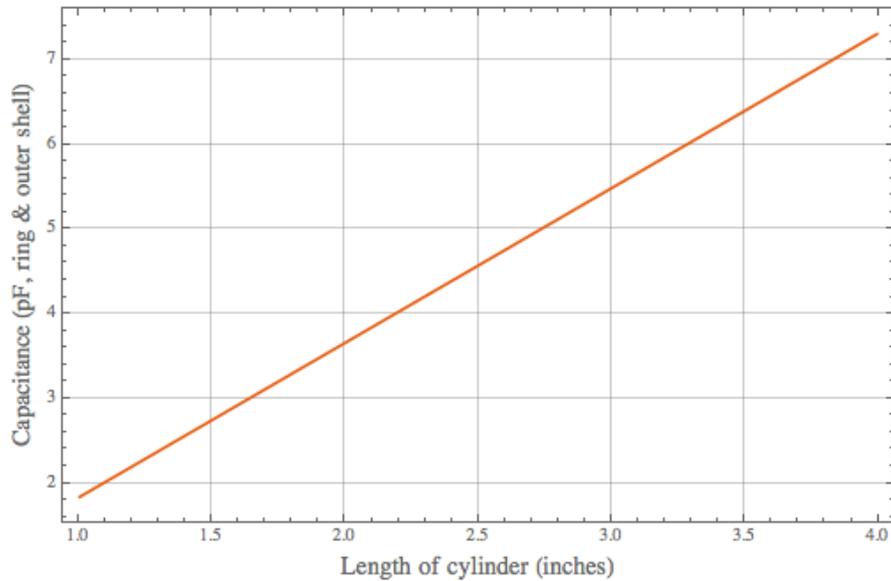


Coaxial capacitor with 4 cm gap between beampipe and ring



# $C_{\text{outer}}$

Coaxial capacitor with 0.5 inch gap between beam pipe and ring

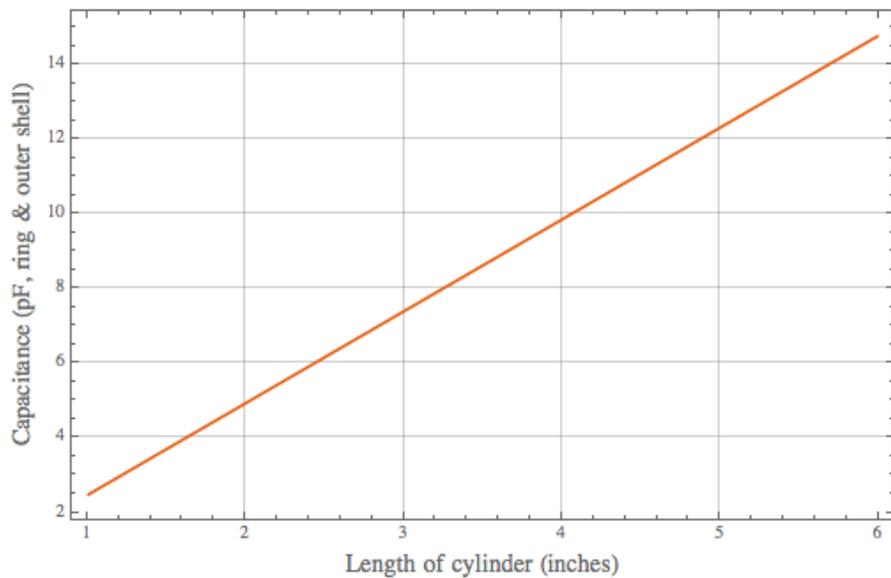


$C_{\text{outer}}$  is not small compared to  $C_{\text{inner}}$ .

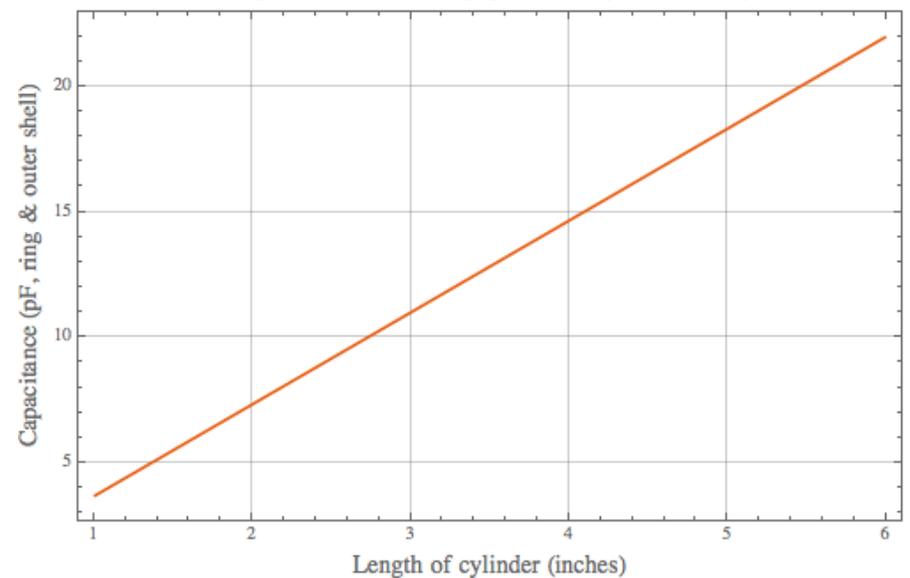
For 1 inch gap between beam pipe and “ring”, I have length = 3 inches (8 cm).

1 inch gap => ring radius = 7 cm

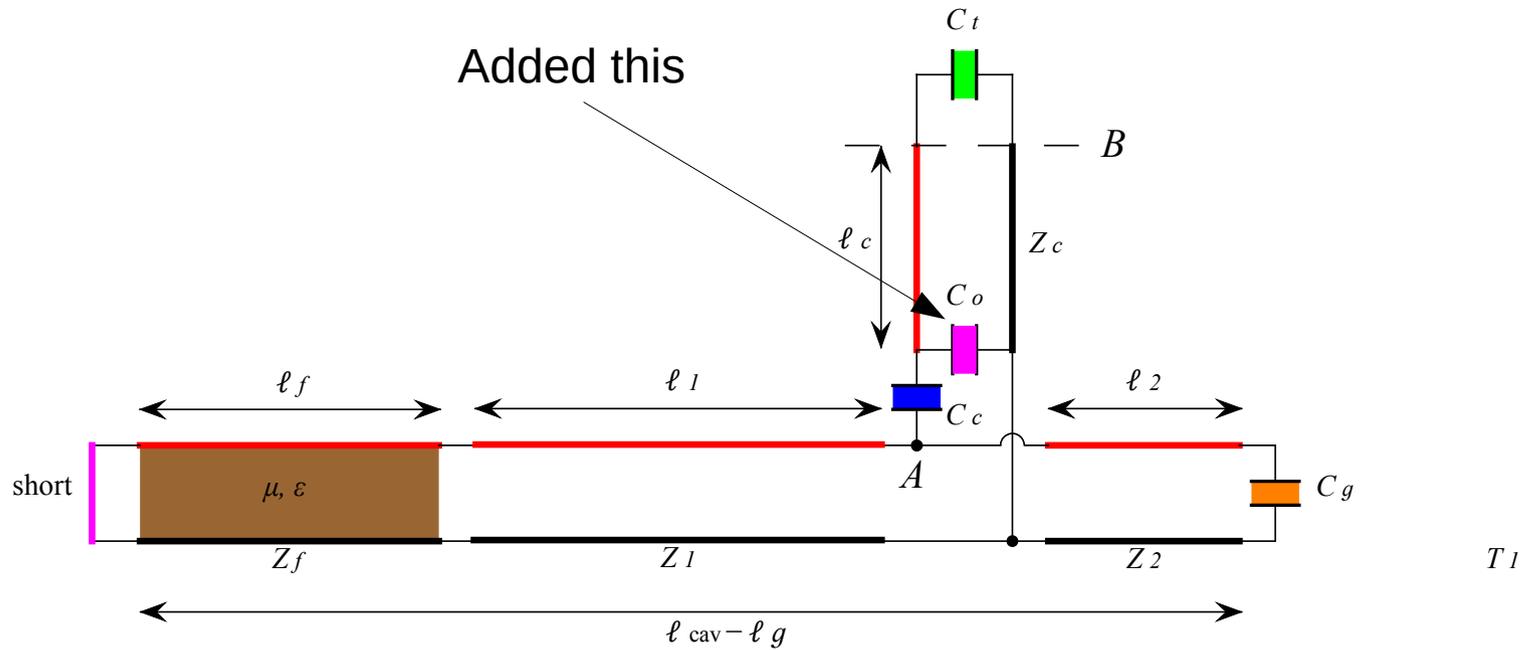
Coaxial capacitor with 1 inch gap between beam pipe and ring



Coaxial capacitor with 4 cm gap (half way between cylinders)



# Transmission line model is modified

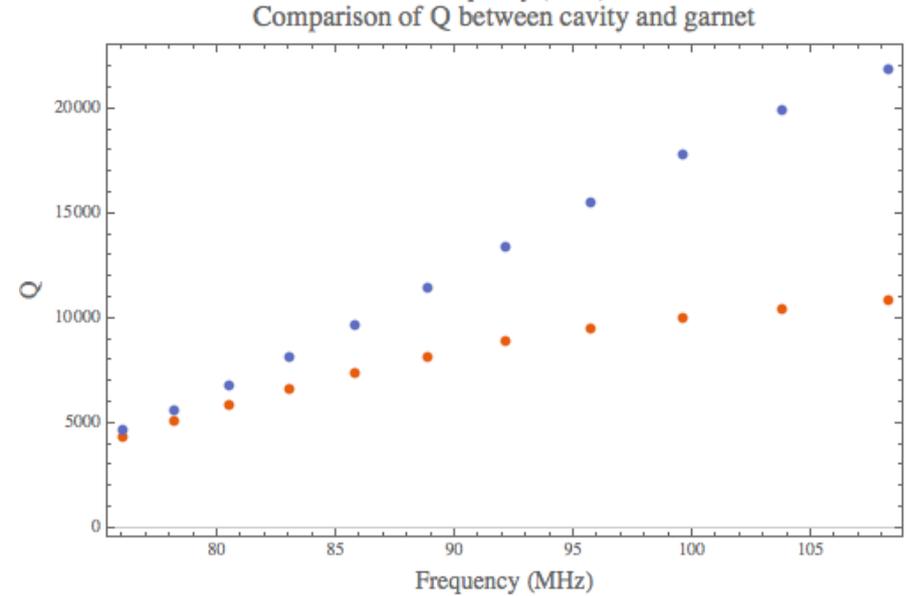
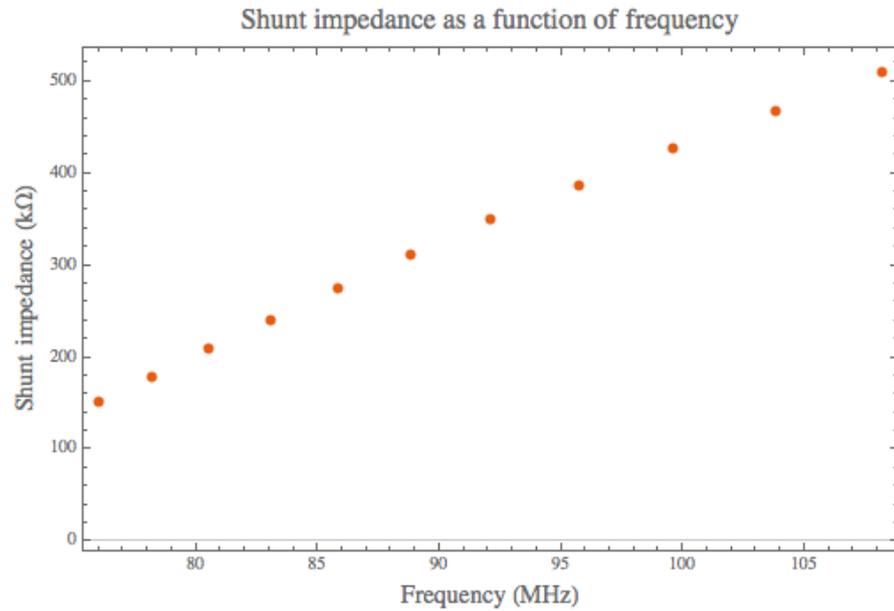
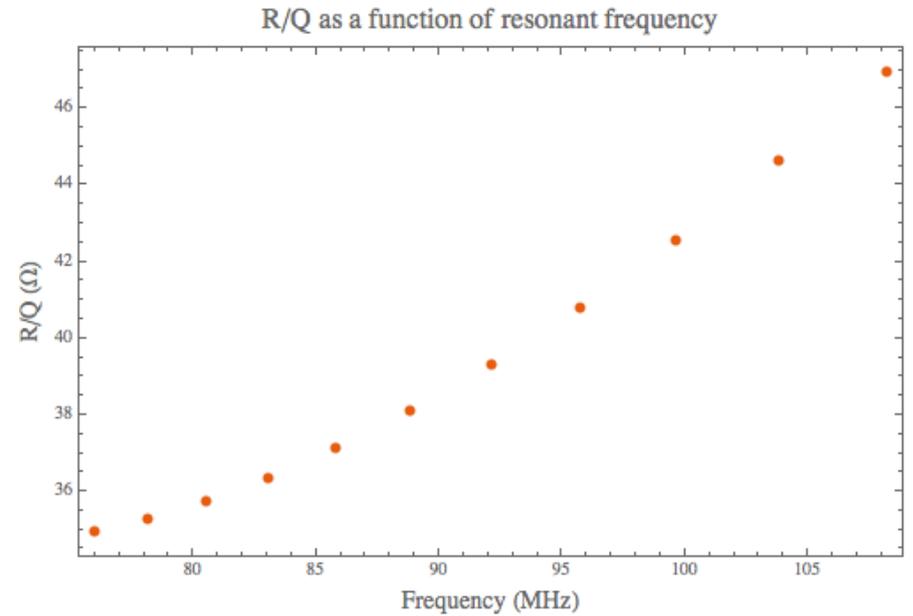
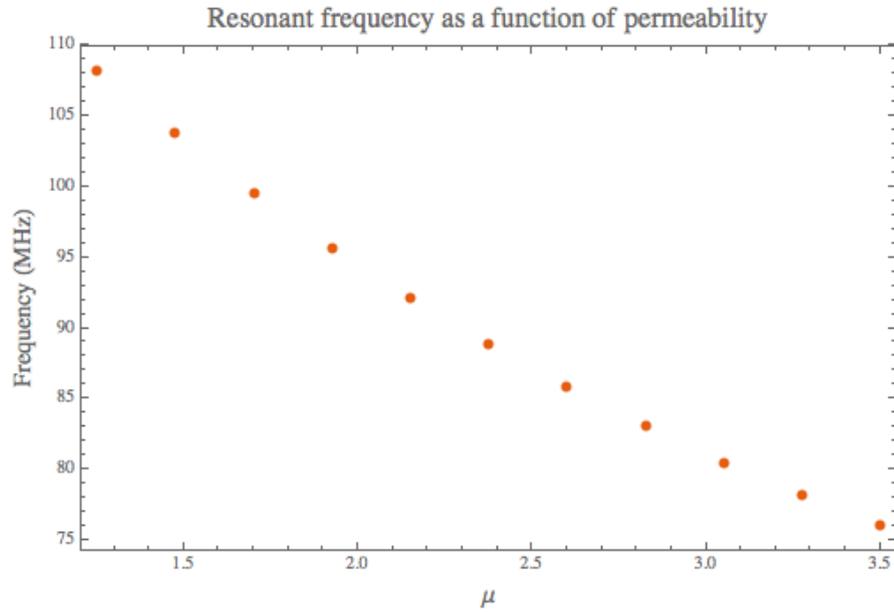


I have to add in the extra capacitor  $C_o$  which is  $C_{\text{outer}}$  to the transmission line model to see how this extra capacitor affects the step up ratio, impedance at the tap point etc.

It is clear that  $C_o$  increases the tube capacitance because it is in parallel with  $C_t$ .

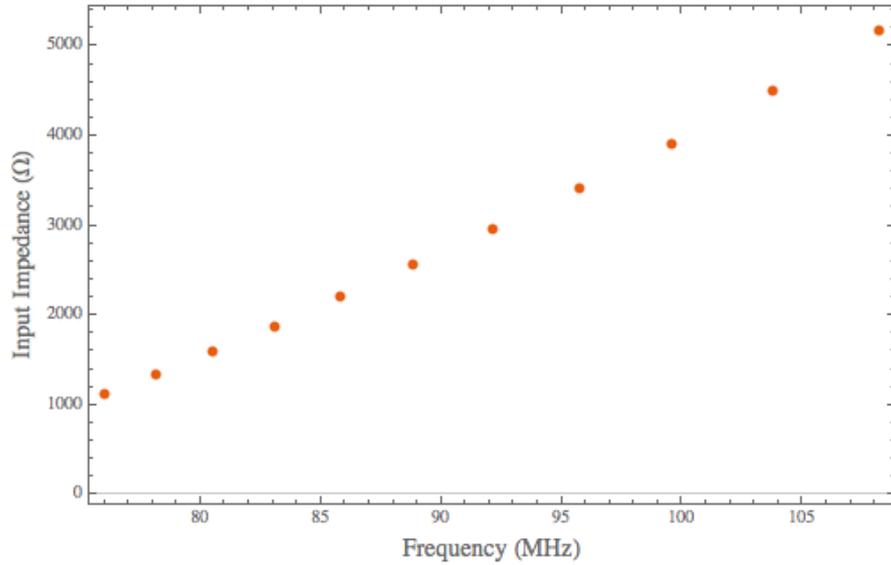
Results are a little different compared to results without  $C_o$ . (Also checked with ADS by Robyn)

# Results

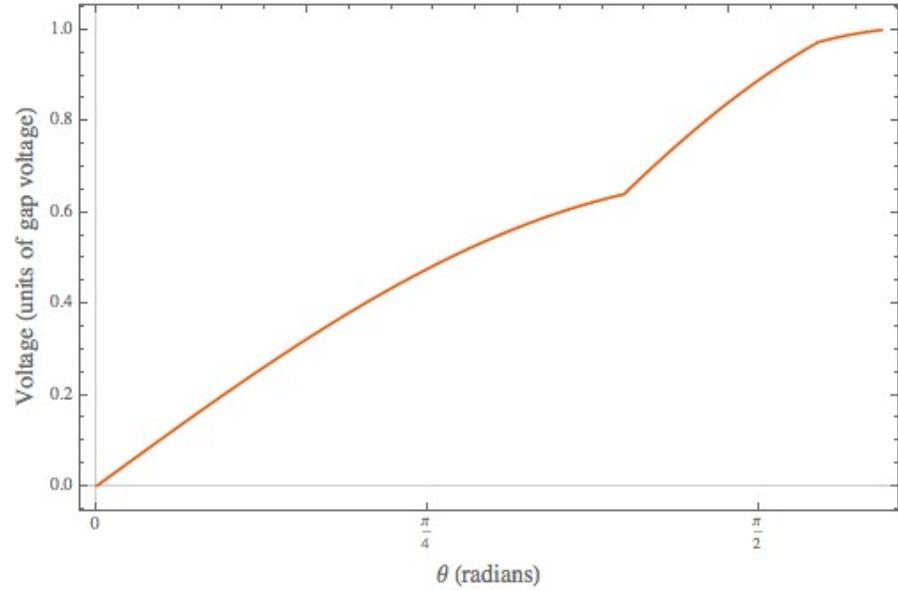


# Results (cont'd)

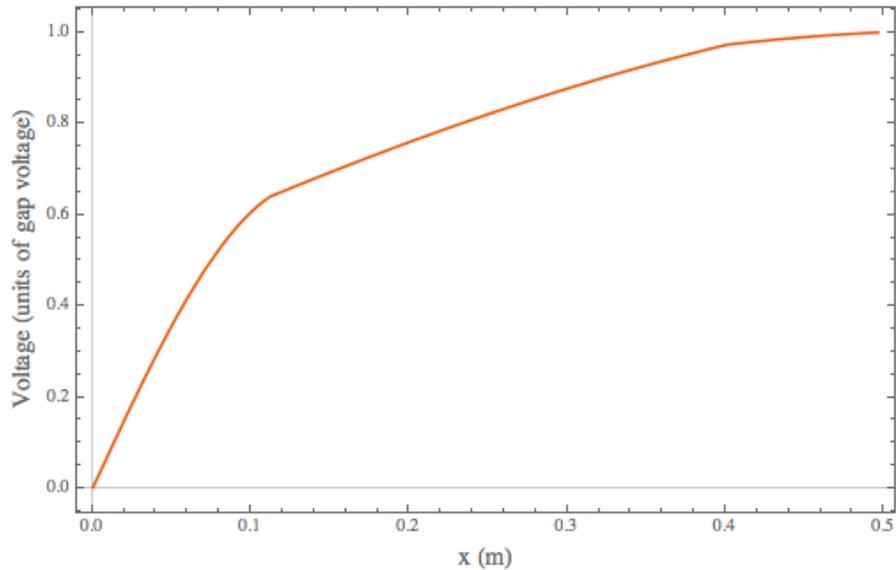
Real part of anode impedance



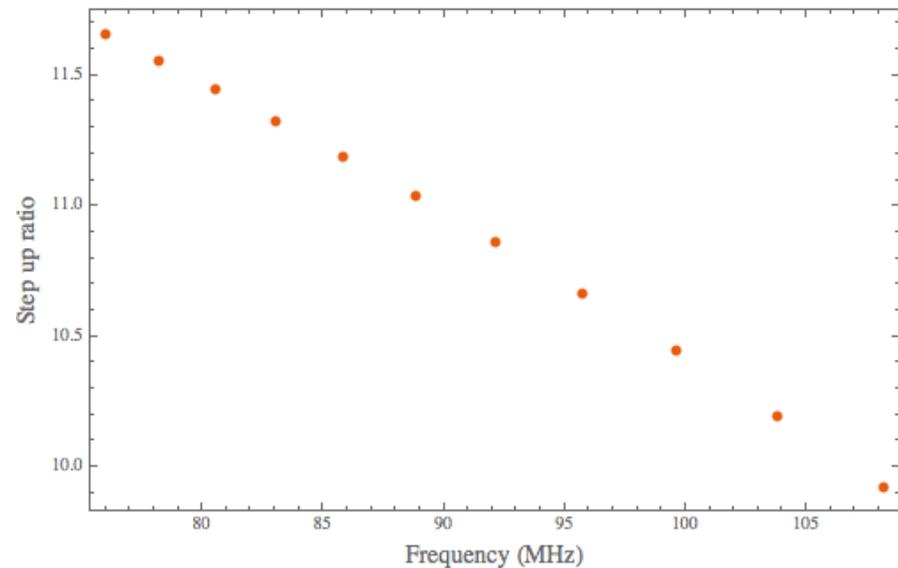
Behaviour of voltage along cavity



Behaviour of voltage along cavity

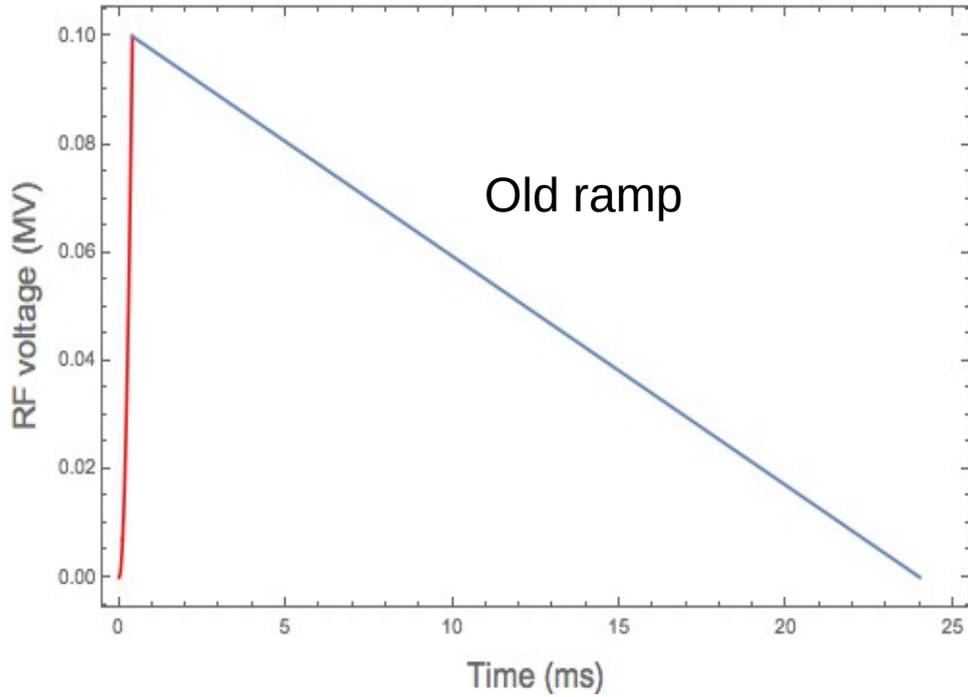


Step up ratio from tube to gap



# Old vs new Ramp

Entire RF Ramp



2nd harmonic ramp and frequency

