A high-frequency Colpitts oscillator is to be designed as shown below.

The frequency of oscillation should be 1 GHz set by the shorted transmission line plus capacitors. Use $C_1 = 2pF$.

Design this circuit to deliver 3mW of power to $R_L = 300\Omega$.

Calculate $HD_2$ and $HD_3$ in the output voltage. Verify your design using SPICE.

**Transistor Data:**

As on P.S. 1, but use 2X device size and in addition assume $r_k$ is further reduced in layout by a factor of 2.

**Transmission line impedance**

$$ Z = jZ_0 \tan \frac{2\pi f l}{V} $$

for a shorted line where

- $Z_0 =$ characteristic impedance = $50\Omega$
- $f =$ frequency
- $l =$ length
- $V =$ wave velocity = $10^8 m/sec$

and the tan argument is in radians