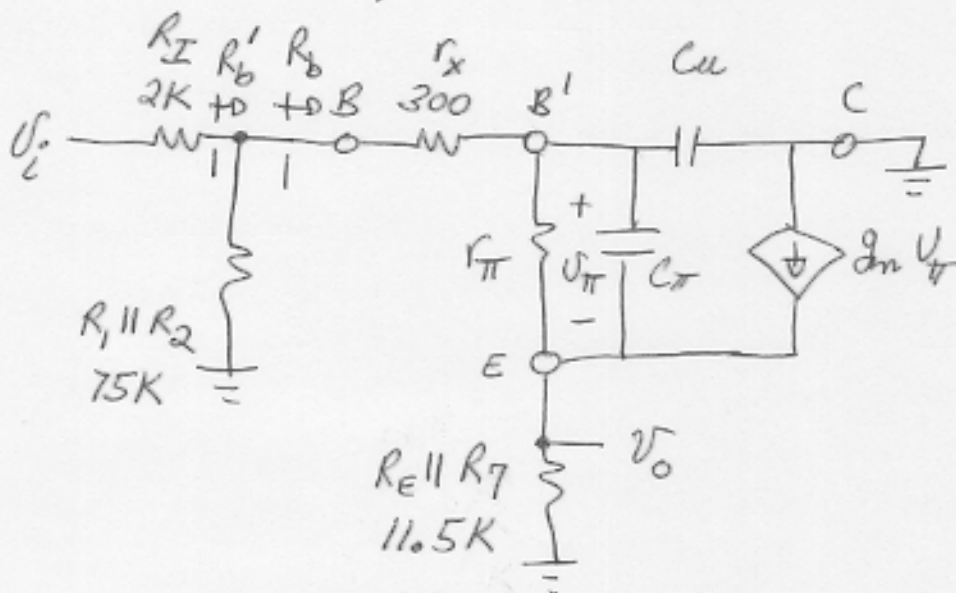


Jaeger 3rd edition

16.70 (see prob 16.22)

HF eq. ckt.



at Q pt

$$g_m = 10 \text{ mS}$$

$$\beta_0 = 100$$

$$I_C = 0.25 \text{ mA}$$

$$V_{CC} = 15 \text{ V}$$

$$f_T = 500 \text{ MHz}$$

$$r_x = 300$$

$$C_{\mu} = 0.60 \text{ pF}$$

$$r_{\pi} = 10 \text{ K}$$

$$C_{\pi} = 2.6 \text{ pF}$$

$$R_1 \parallel R_2 = 75 \text{ K}$$

$$R_E \parallel R_7 = 11.5 \text{ K}$$

(midband resistances)

$$R_b = r_x + r_{\pi} + (1 + \beta_0)(R_E \parallel R_7) = 1.17 \text{ M}\Omega$$

$$R_b' = R_1 \parallel R_2 \parallel R_b = 70.49 \text{ K}$$

midband gain

$$A_m = \frac{U_o}{U_i} = \frac{R_b'}{R_I + R_b'} \frac{(R_E \parallel R_7)}{(R_E \parallel R_7) + \frac{r_x + r_{\pi}}{1 + \beta_0}} = (0.972)(0.991) = 0.96$$

(a) estimate  $f_H$  by method of O.C. time constants

$$f_H \approx \frac{1}{2\pi} \frac{1}{\tau_{C_{\pi}} + \tau_{C_{\mu}}} = 96.4 \text{ MHz}$$

$$R_{C_{\pi}} = 117 \Omega \quad C_{\pi} = 2.6 \text{ pF} \quad \tau_{C_{\pi}} = 304 \text{ ps}$$

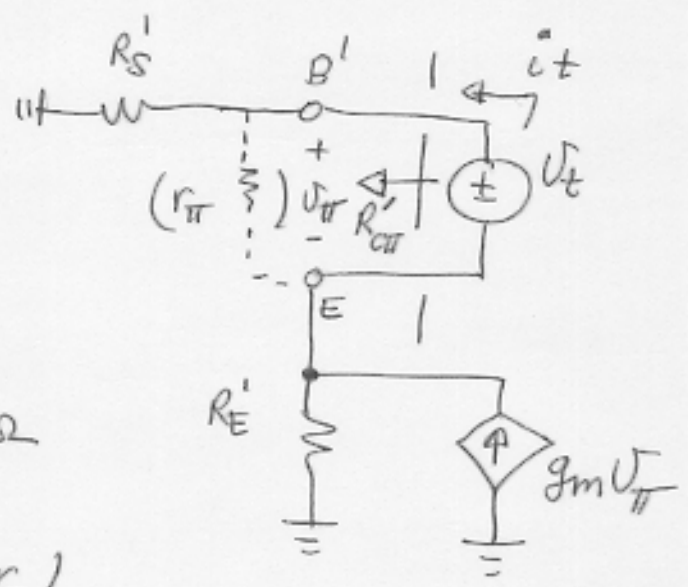
$$R_{C_{\mu}} = 2244 \Omega \quad C_{\mu} = 0.6 \text{ pF} \quad \tau_{C_{\mu}} = 1.35 \text{ ns}$$

(details next page)

16.70 cont

O.C. time constants  
find equivalent resistances

for  $R_{C\pi}$



$$R_S' \equiv r_x + (R_I \parallel R_1 \parallel R_2) = 2248 \Omega$$

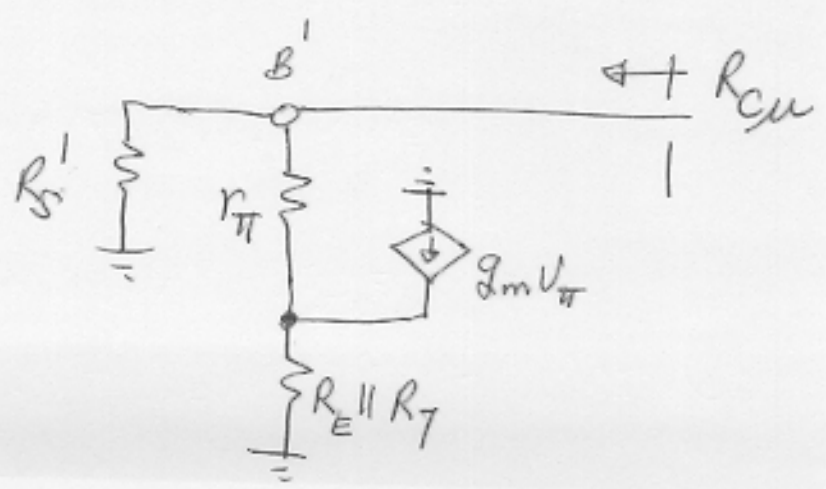
$$R_E' \equiv R_E \parallel R_7 = 11.5 K\Omega$$

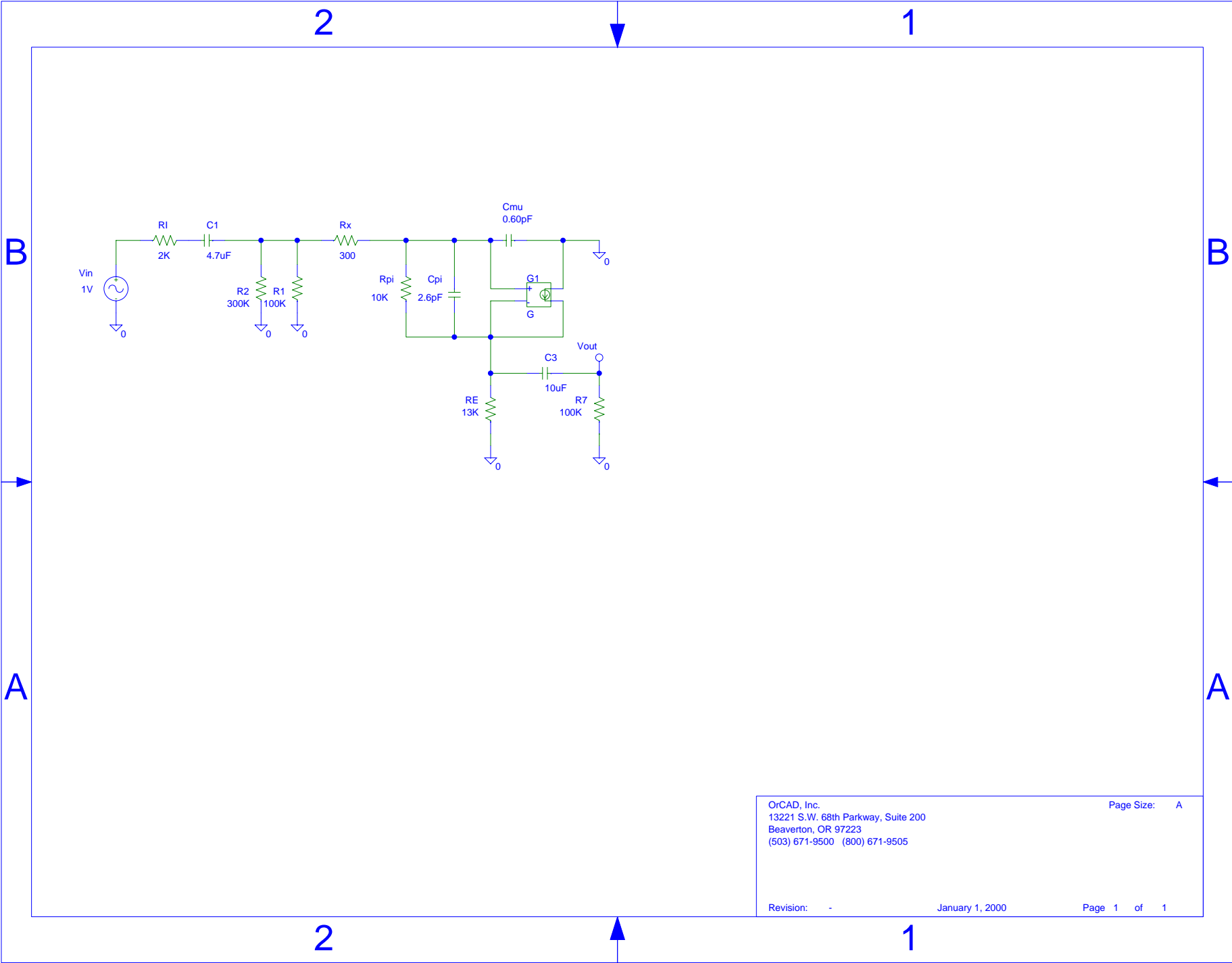
find  $R_{C\pi}'$  (without  $r_{\pi}$ )

$$R_{C\pi}' = \frac{R_S' + R_E'}{1 + g_m R_E'} = 119 \Omega \quad \text{then} \quad R_{C\pi} = R_{C\pi}' \parallel r_{\pi} = 117 \Omega$$

for  $C_{\mu} - R_{C\mu}$

$$R_{C\mu} = \left[ \overbrace{(R_I \parallel R_1 \parallel R_2) + r_x}^{R_S'} \right] \parallel \left[ r_{\pi} + (1 + \beta_0)(R_E \parallel R_7) \right] = 2244 \Omega$$





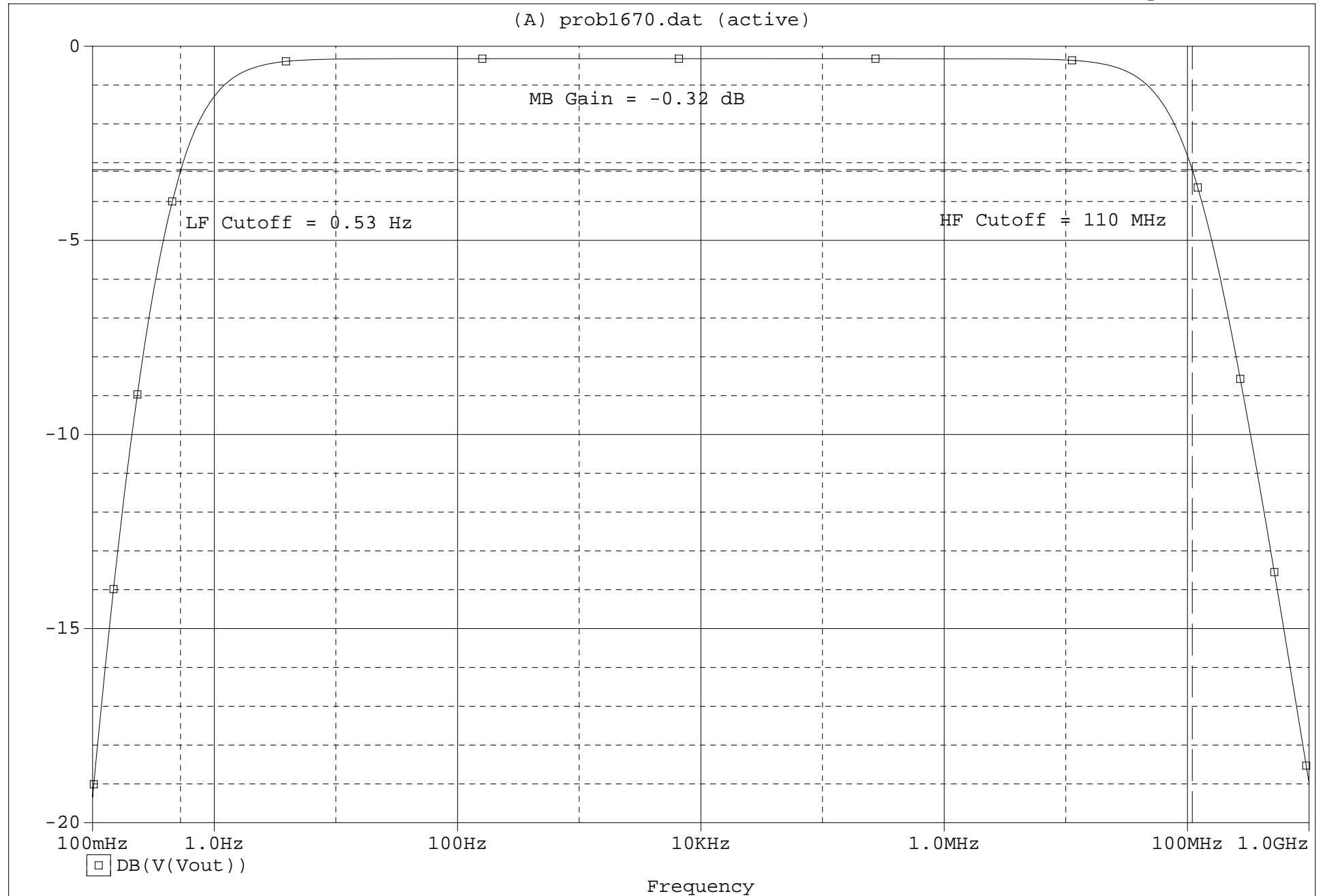
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January 1, 2000

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A1: (527.500m, -3.2176) A2: (109.548M, -3.1782) DIFF(A): (-109.548M, -39.364m)