



Electrónica Analógica

Profesor: Hernan Dario Cardona

Pre-Laboratorio #1

Integrantes:

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Resultados de cálculos con datos obtenidos en simulaciones

ANCHO DE BANDA

$38.701\text{MHz} - 112599\text{ Hz} = 38.5884\text{ MHz}$

GANANCIA VOLTAJE

$2.0278\text{V} / 429.933\text{mV} = 4.71654$

GANANCIA CORRIENTE

$2.0278\text{mA} / 176.67\text{ uA} = 11.47789$

VIN MAX

0.43 V

VOUT MAX

.0278 V

VOUT PROMEDIO

2.0195V

Io MAX

2.0278 mA

Io PROMEDIO

2.0195 mA

Icq

8.339mA

Pot PROMEDIO

2.039 mW

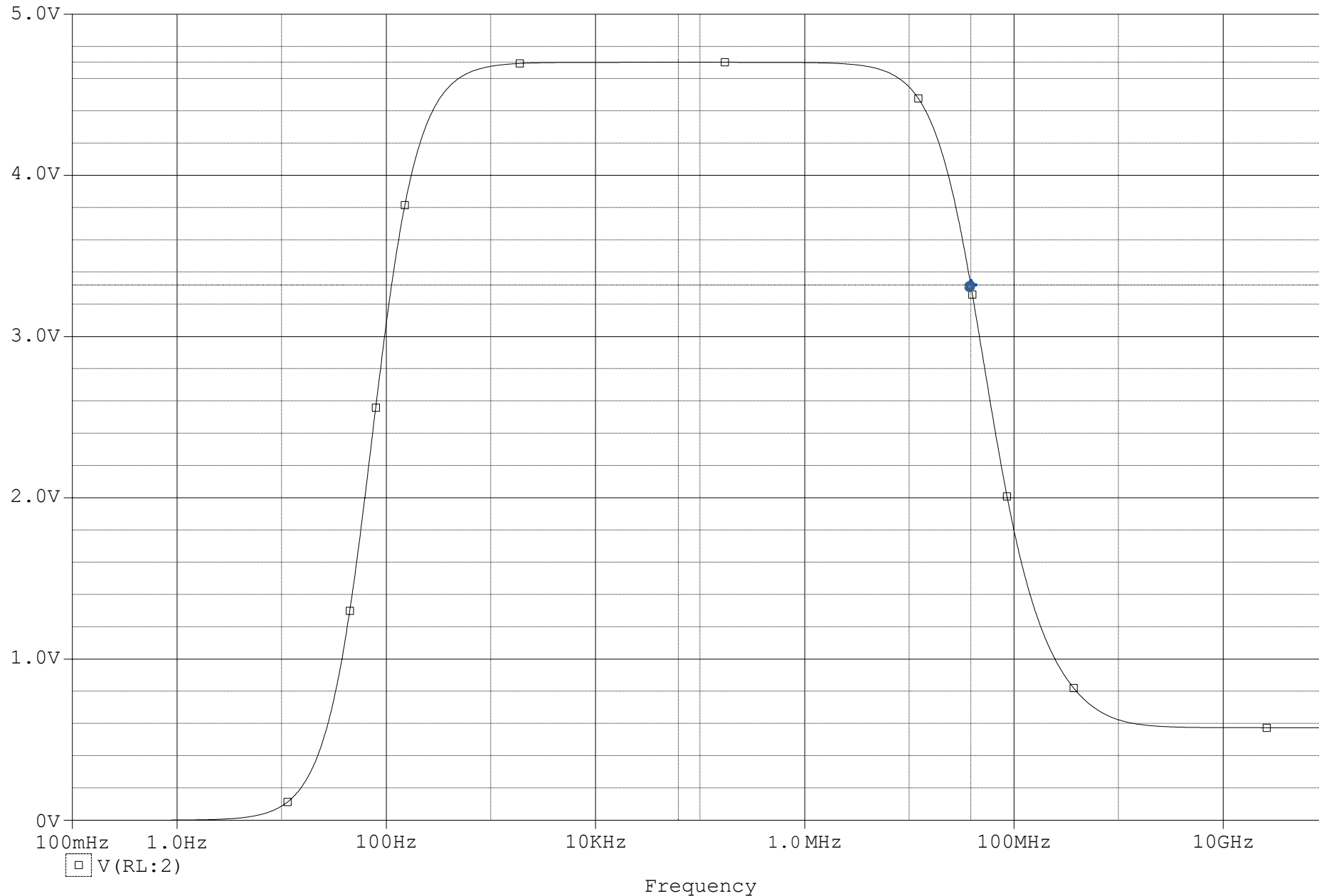
Vbb

1.541V

n%

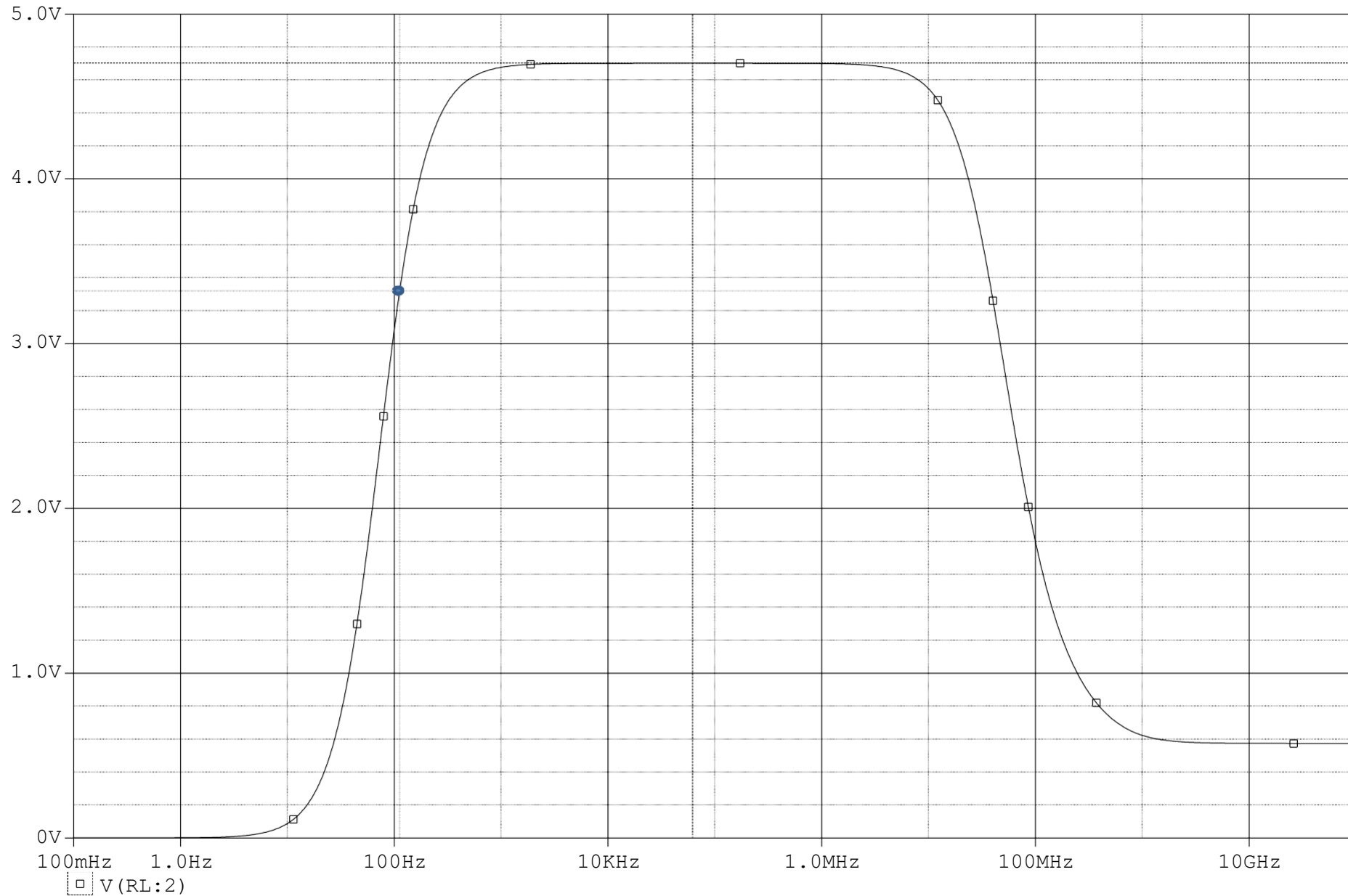
2.0545%

(A) Laboratorio-schematic1-bias (active)



A1: (38.701M, 3.3207) A2: (61.660K, 4.7015) DIFF(A): (38.639M, -1.3808)

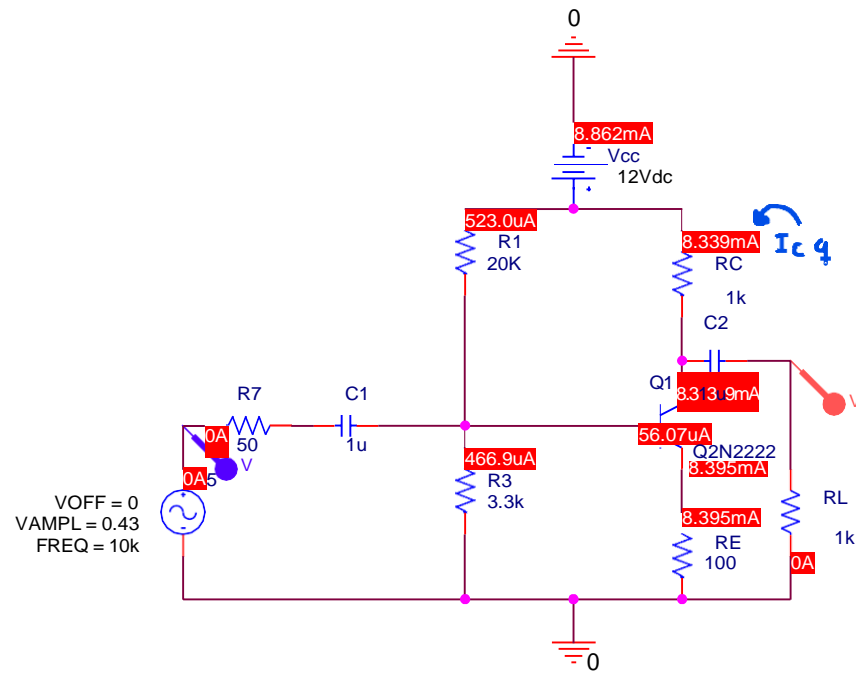
(A) Laboratorio-schematic1-bias (active)



Frequency

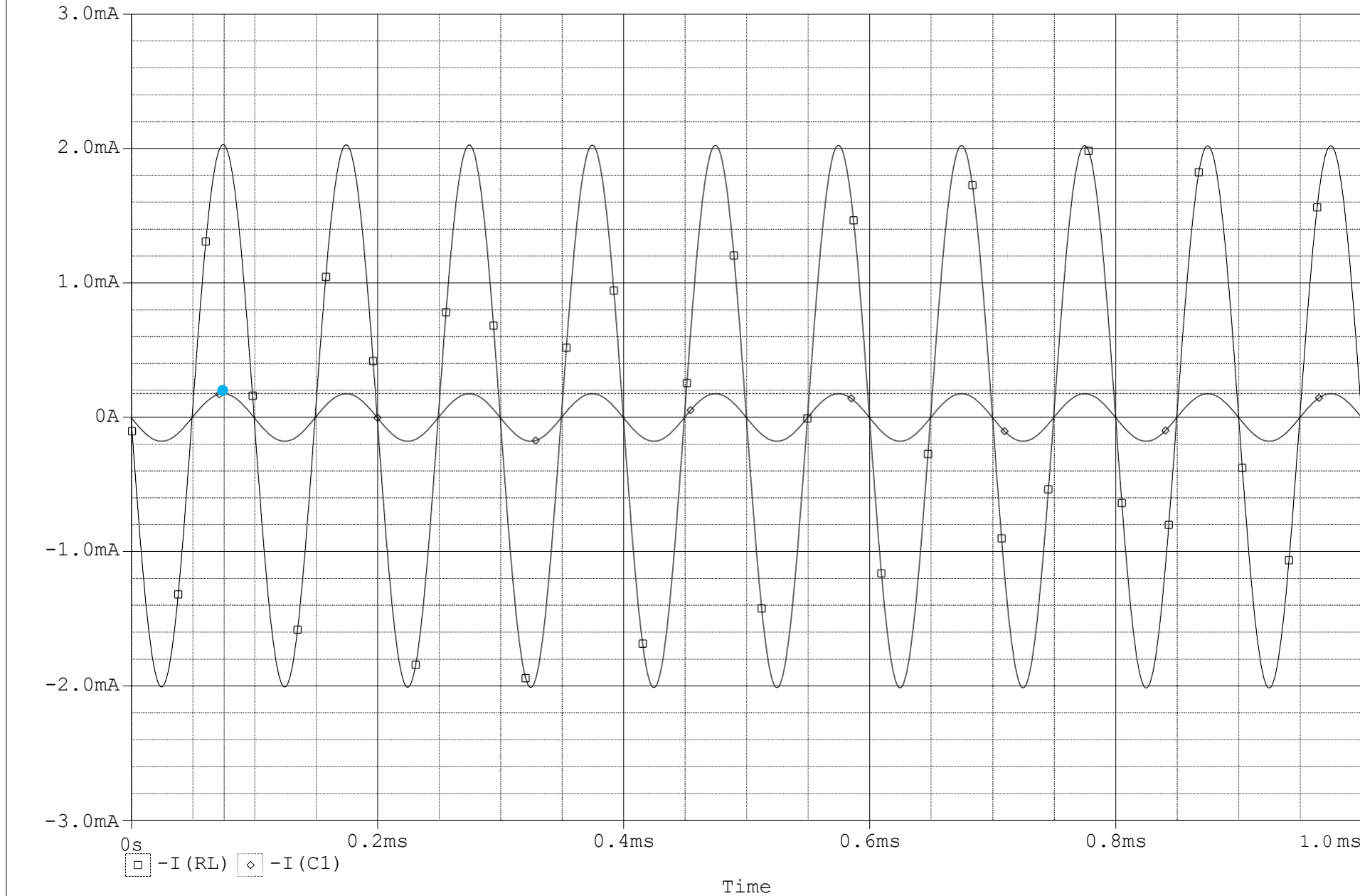
A1: (112.599, 3.3207) A2: (61.660K, 4.7015) DIFF(A): (-61.547K, -1.3808)

Valor Icq



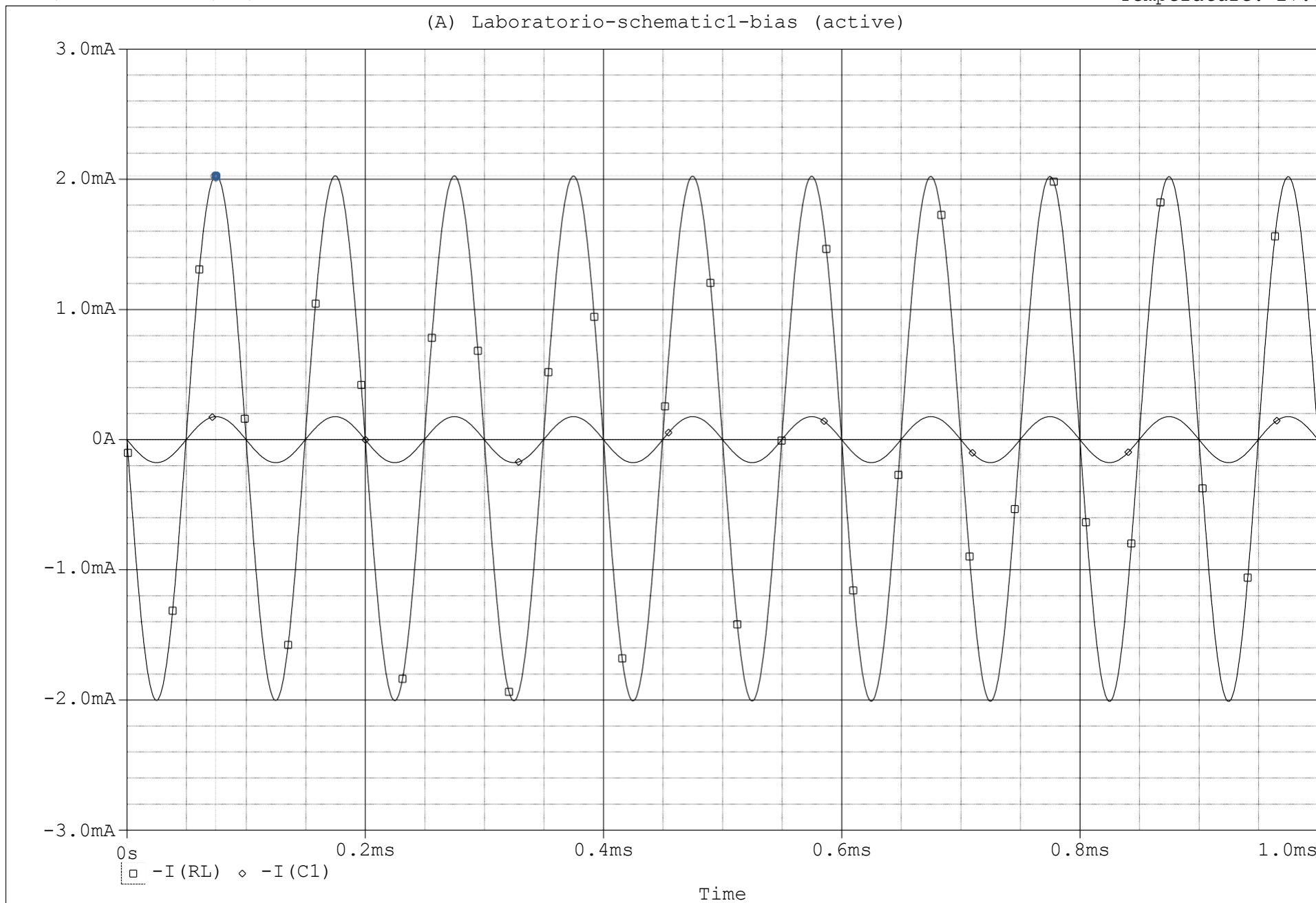
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| Size | Document Number | Rev |
| A | <Doc> | 1 |
| Date: | Thursday, April 08, 2021 | Sheet 1 of 1 |

(A) Laboratorio-schematic1-bias (active)



A1: (75.282u, 176.670u) A2: (0.000, 0.000) DIFF(A): (75.282u, 176.670u)

(A) Laboratorio-schematic1-bias (active)



A1: (74.282u, 2.0278m) A2: (0.000, 0.000) DIFF(A): (74.282u, 2.0278m)

5

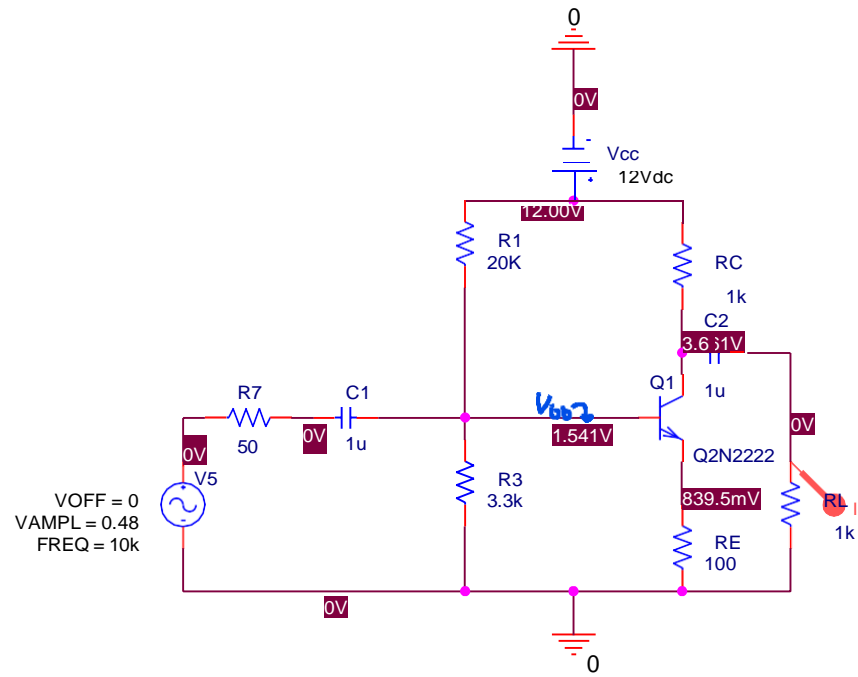
4

3

2

1

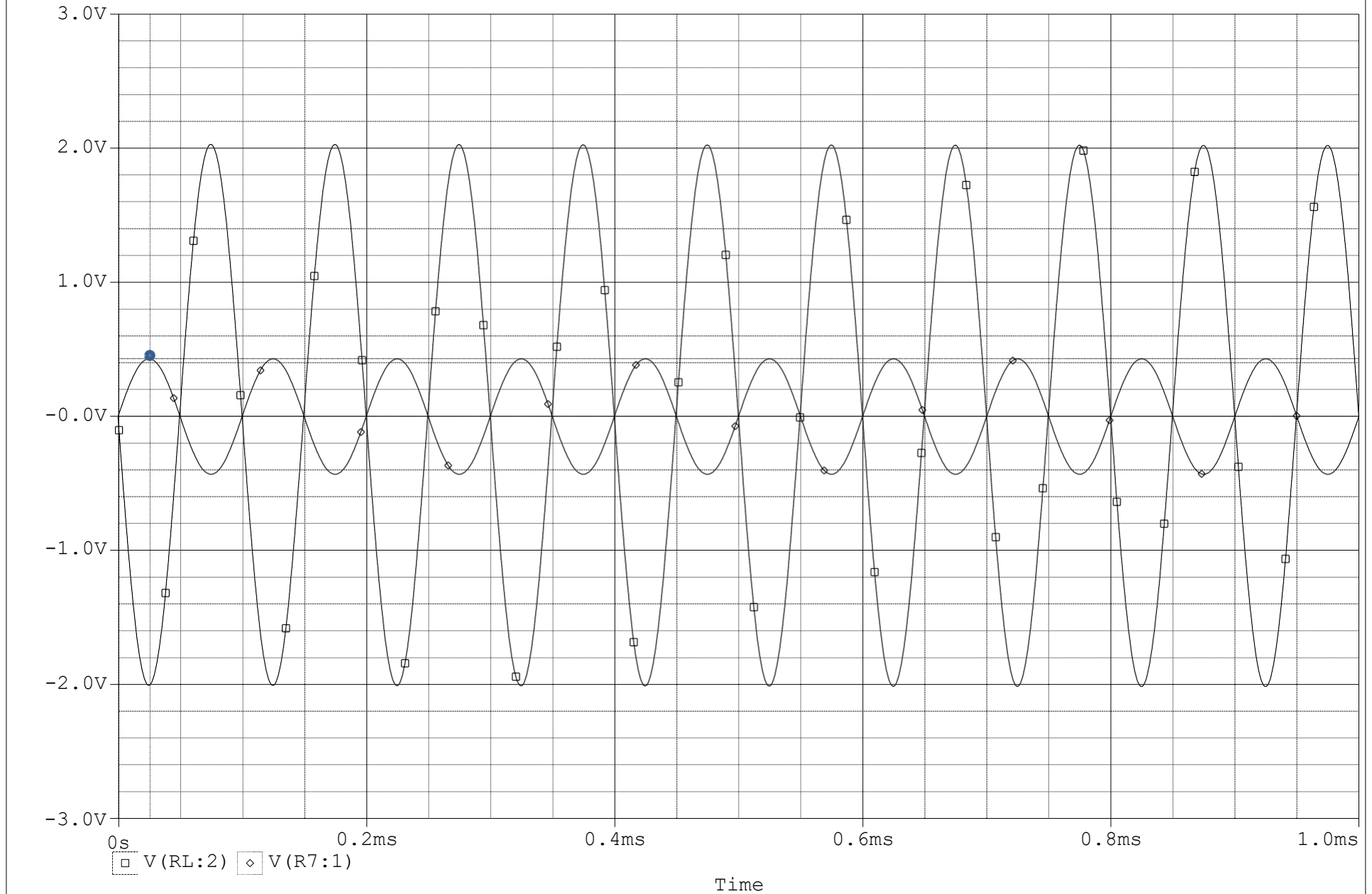
Vbb



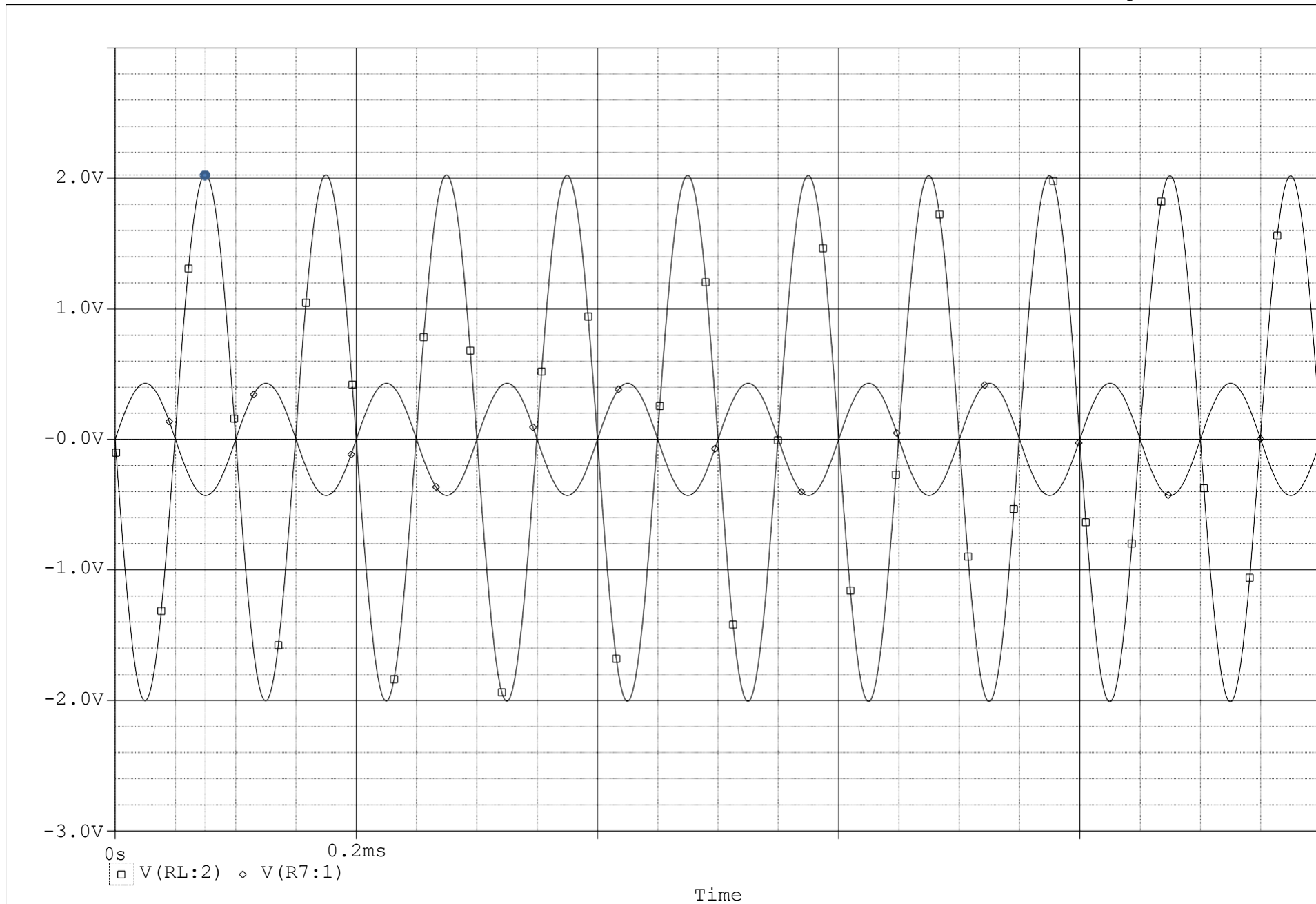
VOFF = 0
VAMPL = 0.48
FREQ = 10k

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| A | <Doc> | <RevCo> |
| Date: | Thursday, April 08, 2021 | Sheet 1 of 1 |

(A) Laboratorio-schematic1-bias (active)



A1: (25.281u, 429.933m) A2: (0.000, 0.000) DIFF(A): (25.281u, 429.933m)



A1: (74.282u, 2.0278) A2: (0.000, 0.000) DIFF(A): (74.282u, 2.0278)

** Profile: "SCHEMATIC1-Bias"

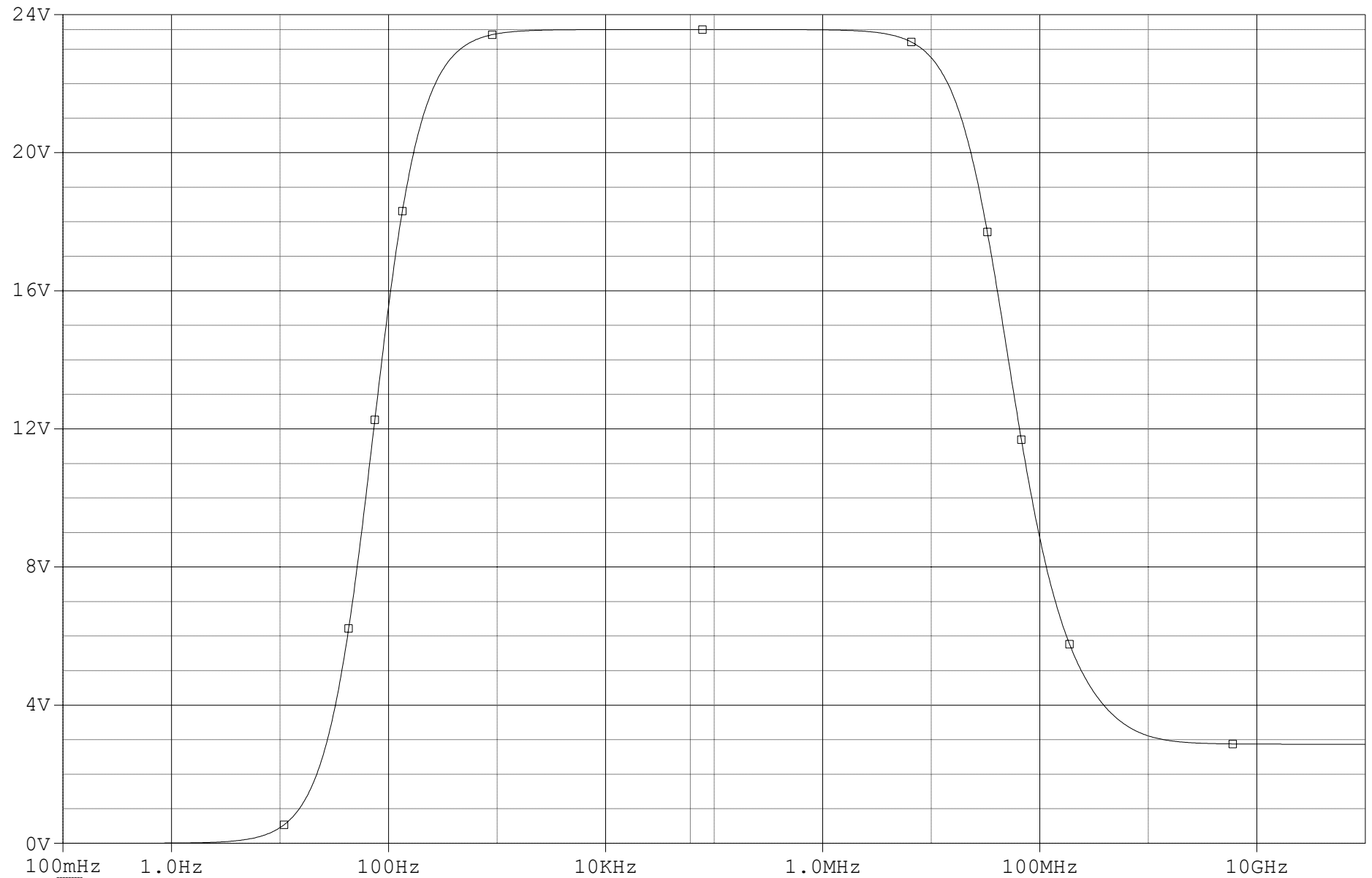
Date/Time run: 04/09/21 09:49:01

Frecuencia Max

60.256KHz

Temperature: 27.0

(A) Laboratorio-schematic1-bias (active)



□ V (RL:2)

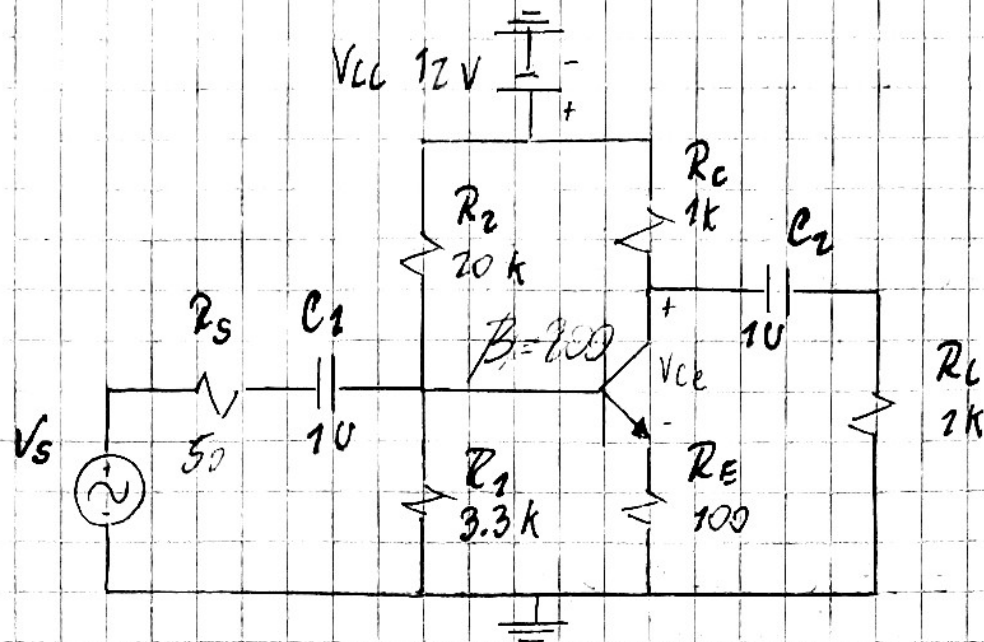
Frequency

A1: (60.256K, 23.567) A2: (100.000m, 46.086u) DIFF (A): (60.256K, 23.567)

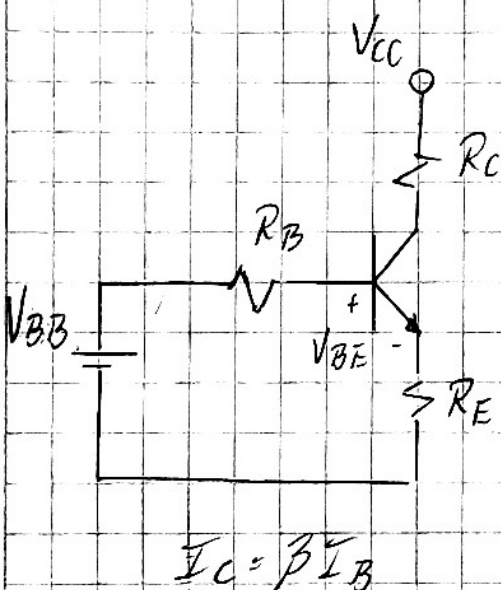
Date: April 09, 2021

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Time: 09:50:23



Analisis DC



$$R_B = R_1 \parallel R_2 = 2,8 \text{ k}\Omega$$

$$V_{BB} = V_{CC} \left(\frac{R_2}{R_2 + R_1} \right) = 7,7 \text{ V}$$

Lvk: malla interna

$$V_{BB} = \frac{I_C R_B}{\beta} + V_{BE} + I_C R_E$$

0,7 V

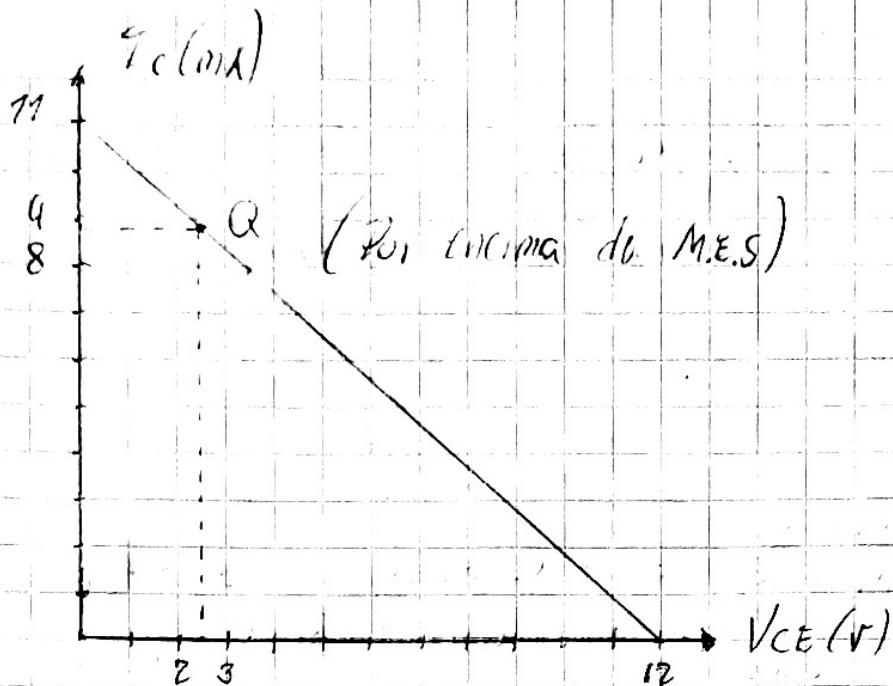
$$I_{CQ} = \frac{V_{BB} - V_{BE}}{\frac{R_B}{\beta} + R_E} = 0,7 \text{ mA}$$

Lvk: malla externa

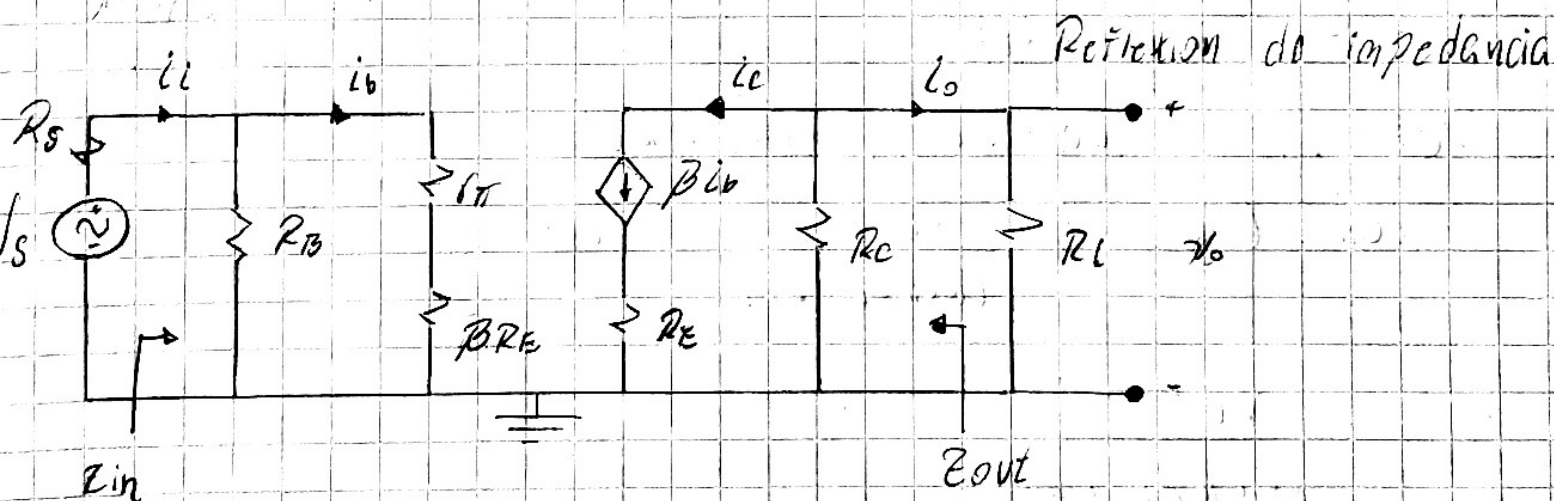
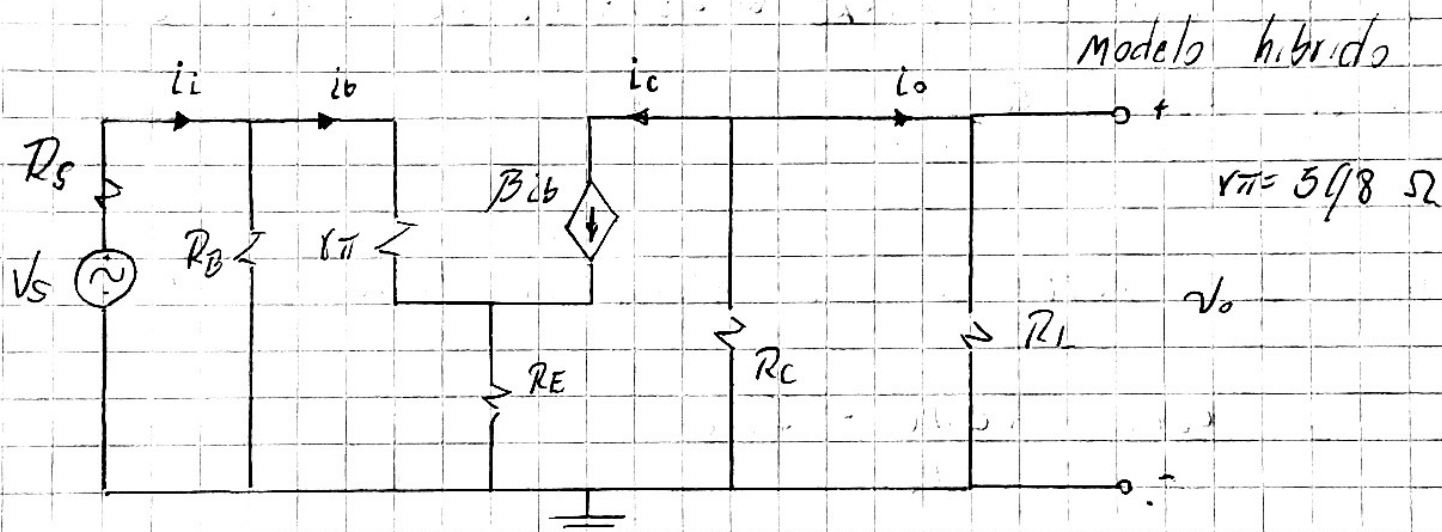
$$V_{CC} = I_C R_C + V_{CE} + I_C R_E \rightarrow V_{CEQ} = V_{CC} - I_C (R_C + R_E) = 2,43 \text{ V}$$

$$\triangleright V_{CE \max} (I_C = 0) = V_{CC} = 12 \text{ V}$$

$$\triangleright I_{C \max} (V_{CE} = 0) = \frac{V_{CC}}{R_C + R_E} = 7,7 \text{ mA}$$



Analisis Ac



$$A_i = \frac{i_o}{i_i}$$

$$\Rightarrow i_o = - \frac{\beta i_b R_C}{R_C + R_L}$$

$$\Rightarrow i_b = \frac{i_i R_B}{R_B + r_{\pi} + \beta R_E} \Rightarrow i_i = \frac{i_b (R_B + r_{\pi} + \beta R_E)}{R_B}$$

$$A_{iL} = \frac{-\beta i_b R_c}{R_c + R_L} = -\beta R_c R_b \frac{i_b (R_b + r_{\pi} + \beta R_E)}{R_b (R_c + R_L) (R_b + r_{\pi} + \beta R_E)} = -17.96$$

$$A_v = \frac{V_o}{V_s} \quad V_o = \frac{R_L \left(-\frac{\beta i_b R_c}{R_c + R_L} \right)}{i_b (r_{\pi} + \beta R_E)} = \frac{-R_L R_c \beta}{(R_c + R_L) (r_{\pi} + \beta R_E)} = -4.85$$

$$\triangleright Z_{in} = (R_b \parallel r_{\pi} + \beta R_E) \parallel R_s = 2514.92 \, \Omega = 2.52 \, k\Omega$$

$$\triangleright Z_{out} = R_L = 1 \, k\Omega$$

■ Caso III Ponto Q por encima de M.E.S

$$i_{cmax} = i_{cmáx} - I_{CQ}$$

$$\triangleright V_{ce} = -I_c (R_c \parallel R_L + R_E)$$

$$V_{CE} - V_{CEQ} = -(I_c - I_{CQ}) (R_c \parallel R_L + R_E)$$

$$i_{cmáx} (V_{CE}=0) = \frac{V_{CEQ}}{(R_c \parallel R_L + R_E)} + I_{CQ}$$

$$i_{cmax} = \frac{V_{CEQ}}{(R_c \parallel R_L + R_E)} = 4.03 \, mA$$

$$i_{omax} = \frac{i_{cmáx} R_c}{R_c + R_L} = 2.025 \, mA$$

$$V_{omax} = i_{omax} \cdot R_L = 2.025 \, V$$

$$P_L = \frac{V_{o\max}^2}{2R_L} = \frac{(2,025)^2}{2(1k\Omega)} = 2060,3 \mu W$$

$$\eta\% = \frac{P_L}{P_{DC}} = \frac{2060,3 \mu W}{V_{CC}(I_{CQ})} \cdot 100 = 1,96\%$$