ANEXO

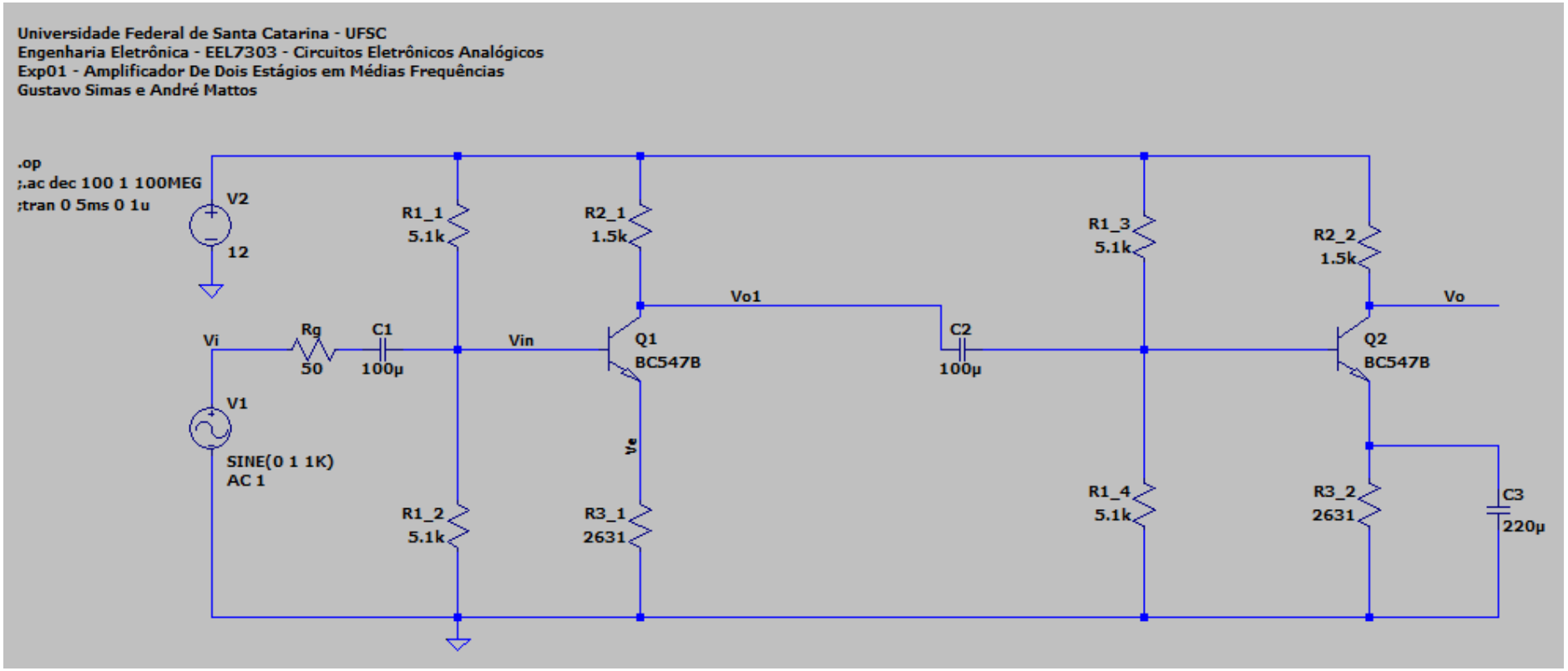

Figura 1 - Amplificador Dois Estágios Simulado no LTSpice

```
        --- Operating Point ---

V(vi):          0               voltage
V(n002):        2.99126e-014    voltage
V(vin):         5.98252         voltage
V(n001):        12              voltage
V(vo1):         8.97392         voltage
V(ve):          5.32578         voltage
V(n003):        5.98252         voltage
V(vo):          8.97392         voltage
V(n004):        5.32578         voltage
Ic(Q2):         0.00201739      device_current
Ib(Q2):         6.85416e-006    device_current
Ie(Q2):         -0.00202424     device_current
Ic(Q1):         0.00201739      device_current
Ib(Q1):         6.85416e-006    device_current
Ie(Q1):         -0.00202424     device_current
I(C3):          1.17167e-015    device_current
I(C2):          -2.9914e-016    device_current
I(C1):          5.98252e-016    device_current
I(R3_2):        -0.00202424     device_current
I(R1_4):        -0.00117304     device_current
I(R2_2):        -0.00201739     device_current
I(R1_3):        -0.0011799      device_current
I(R3_1):        -0.00202424     device_current
I(R2_1):        -0.00201739     device_current
I(R1_2):        -0.00117304     device_current
I(R1_1):        -0.0011799      device_current
I(Rg):          5.98252e-016    device_current
I(V2):          -0.00639457     device_current
I(V1):          5.98252e-016    device_current
```

Figura 2 - Ponto Quiescente obtido no simulador

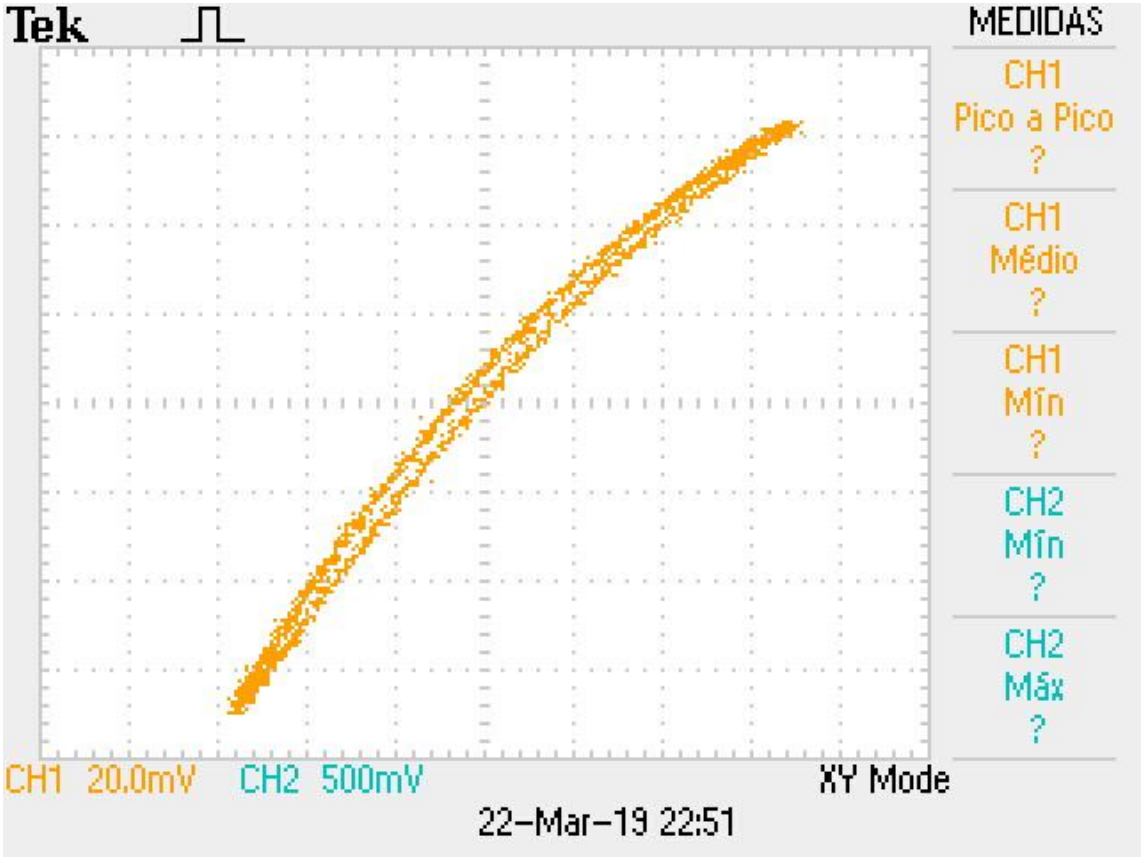

Figura 3 - Intervalo Linear de Operação no Modo X-Y

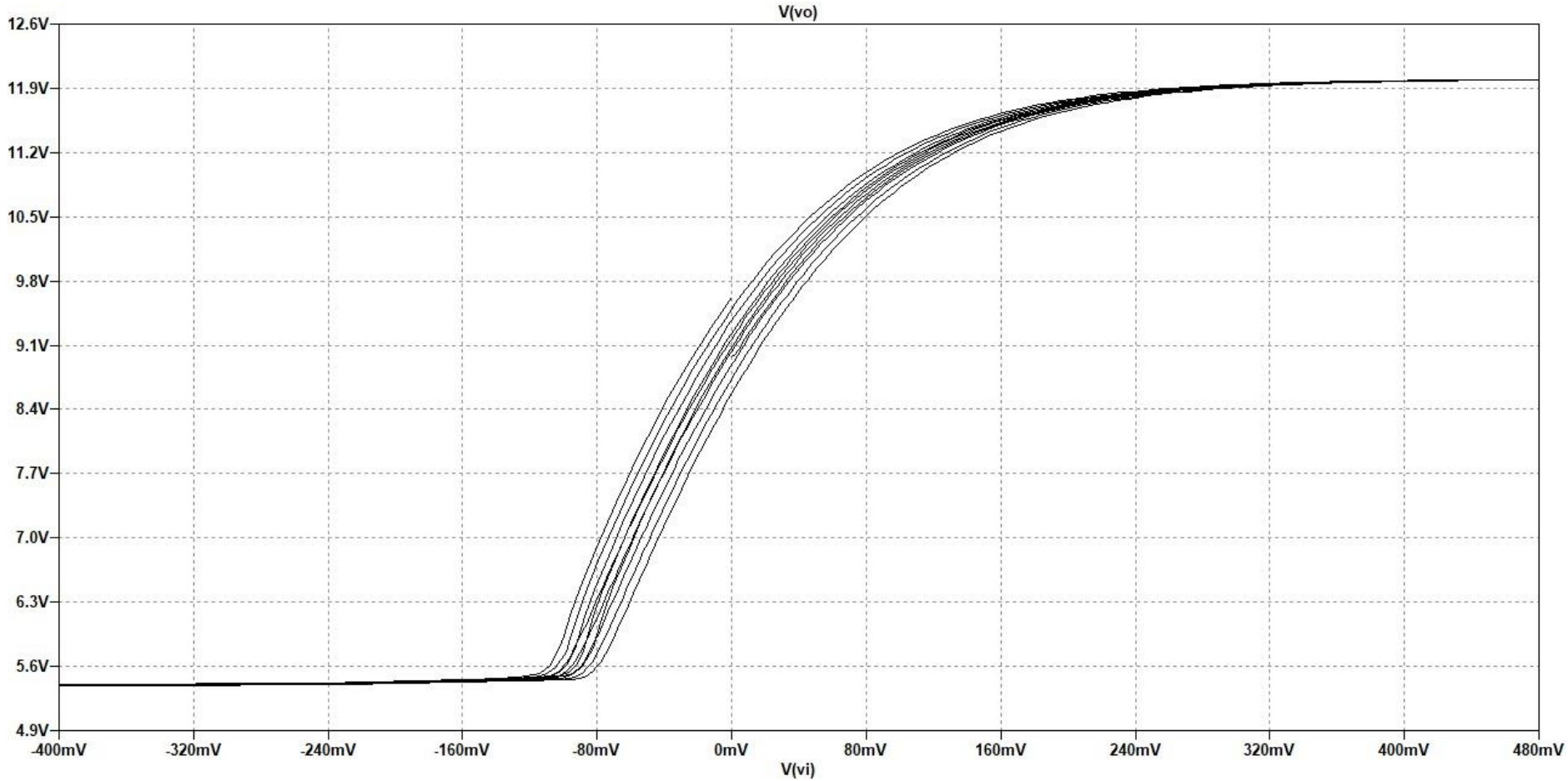

Figura 4 - Intervalo Linear de Operação no Modo X-Y Simulado

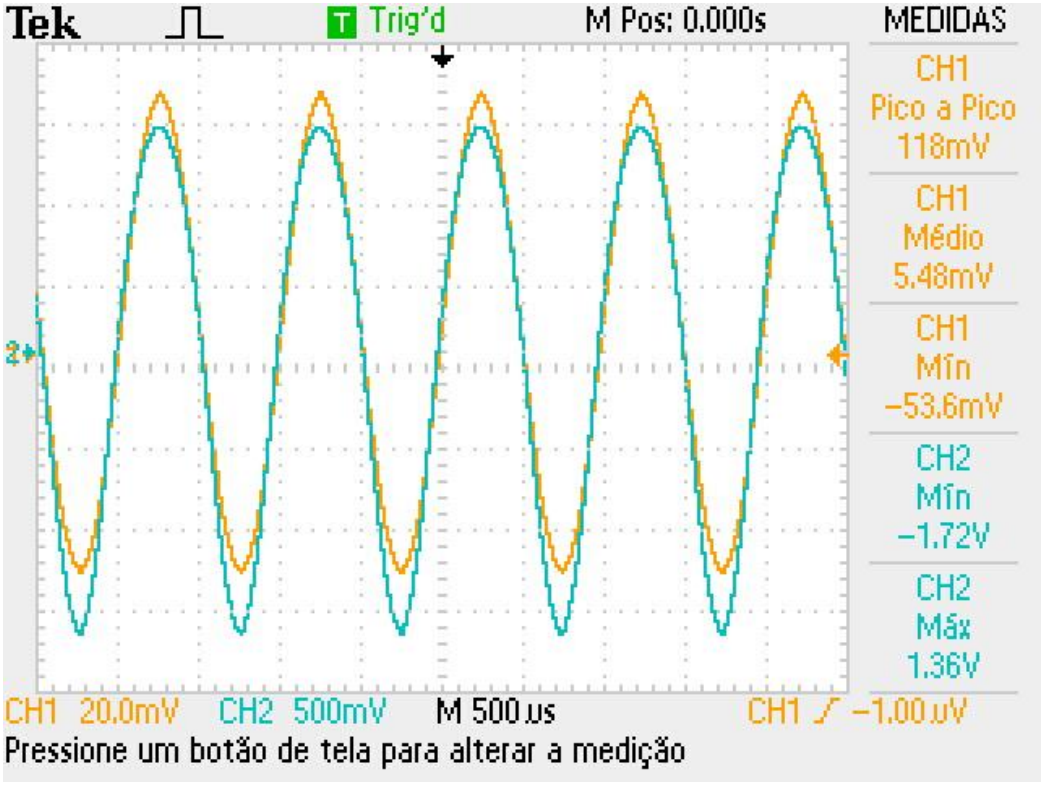

Figura 5 - Intervalo Linear de Operação no Modo Y-T

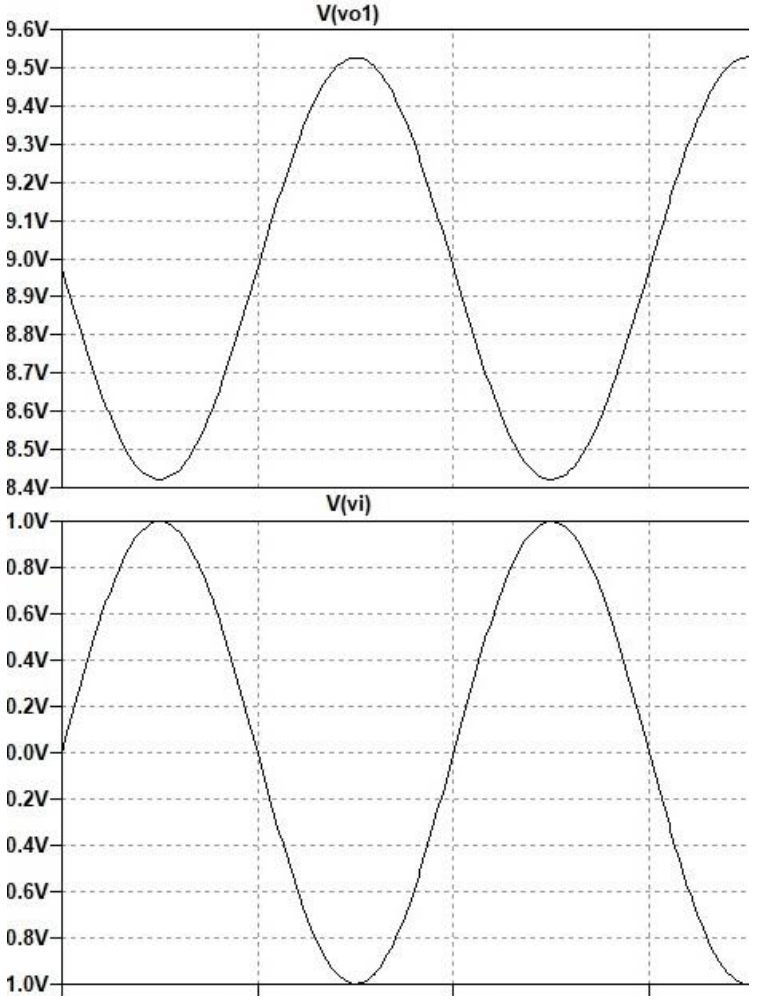

Figura 6 - Intervalo Linear de Operação no Modo Y-T Simulado

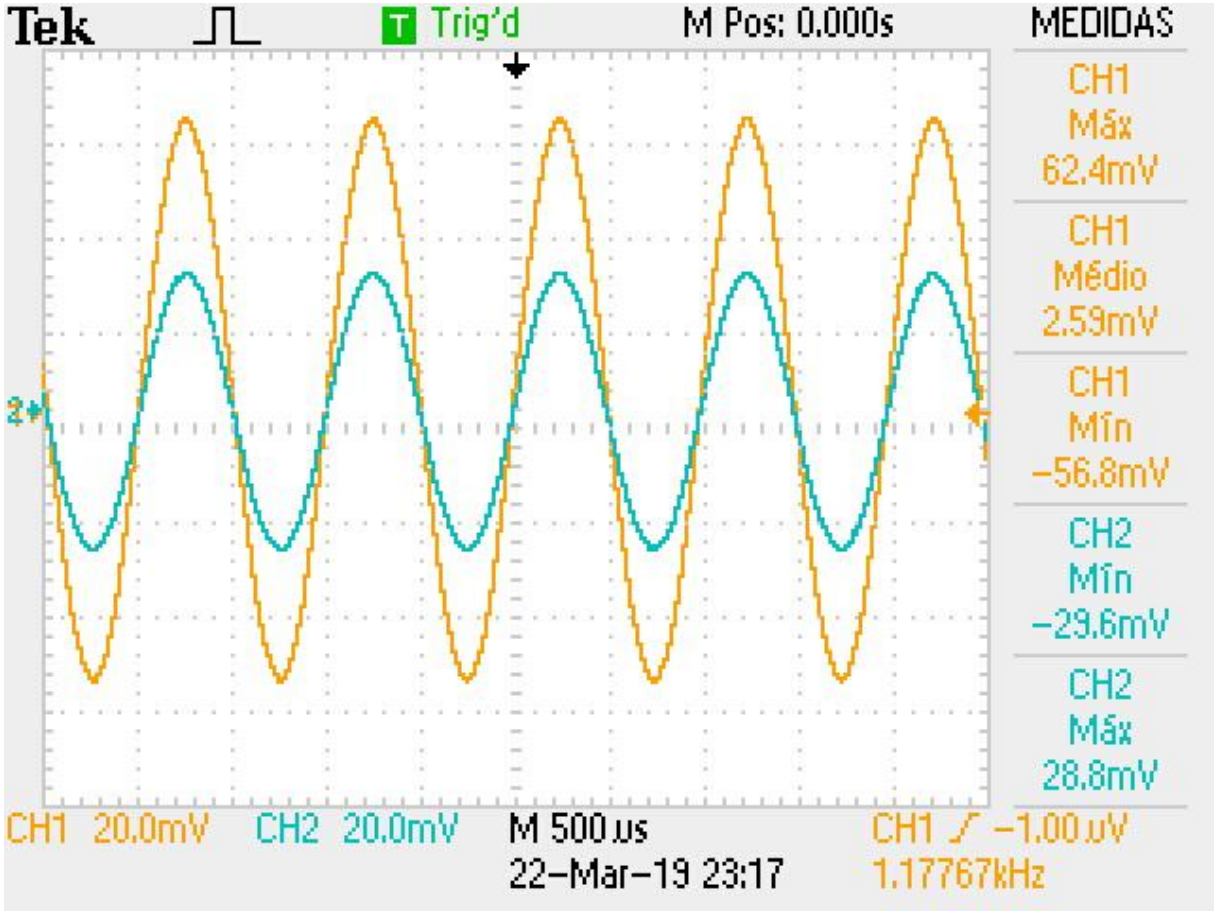

Figura 7 - Formas de onda obtidas para cálculo de Zout1

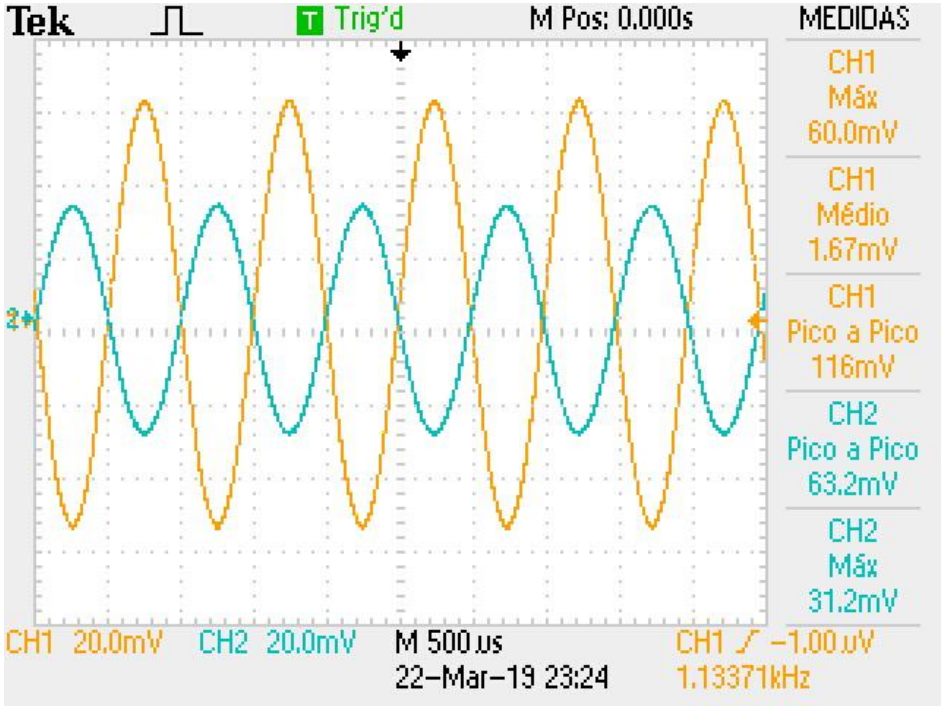

Figura 8 - Formas de onda de Vo1 e Vi em aberto

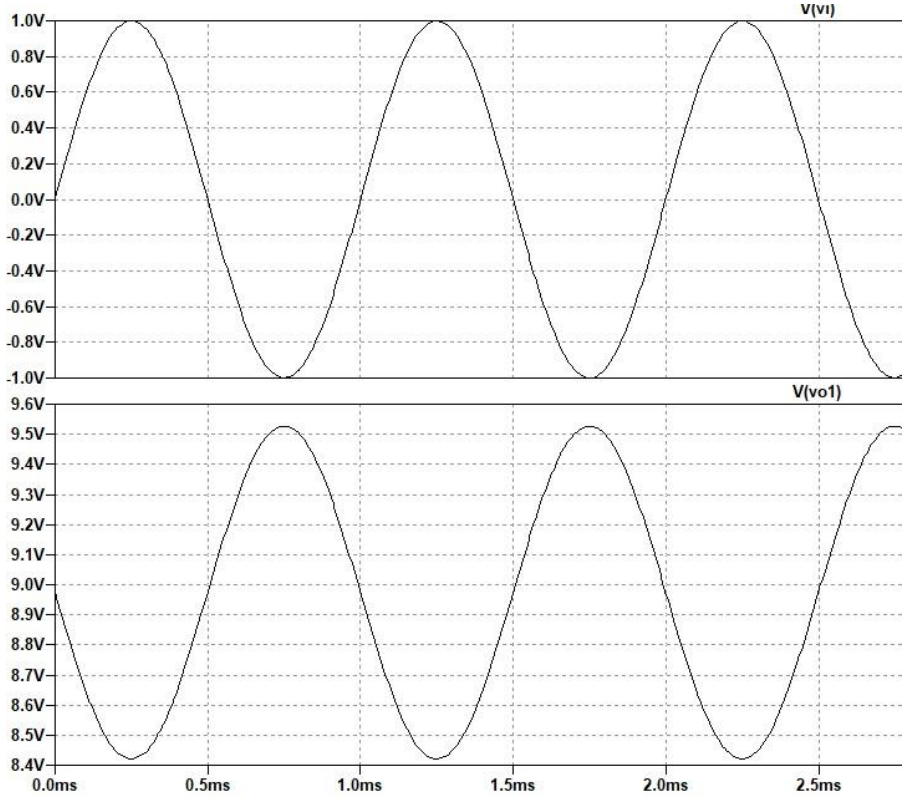

Figura 9 - Formas de onda de Vo1 e Vi em aberto Simuladas

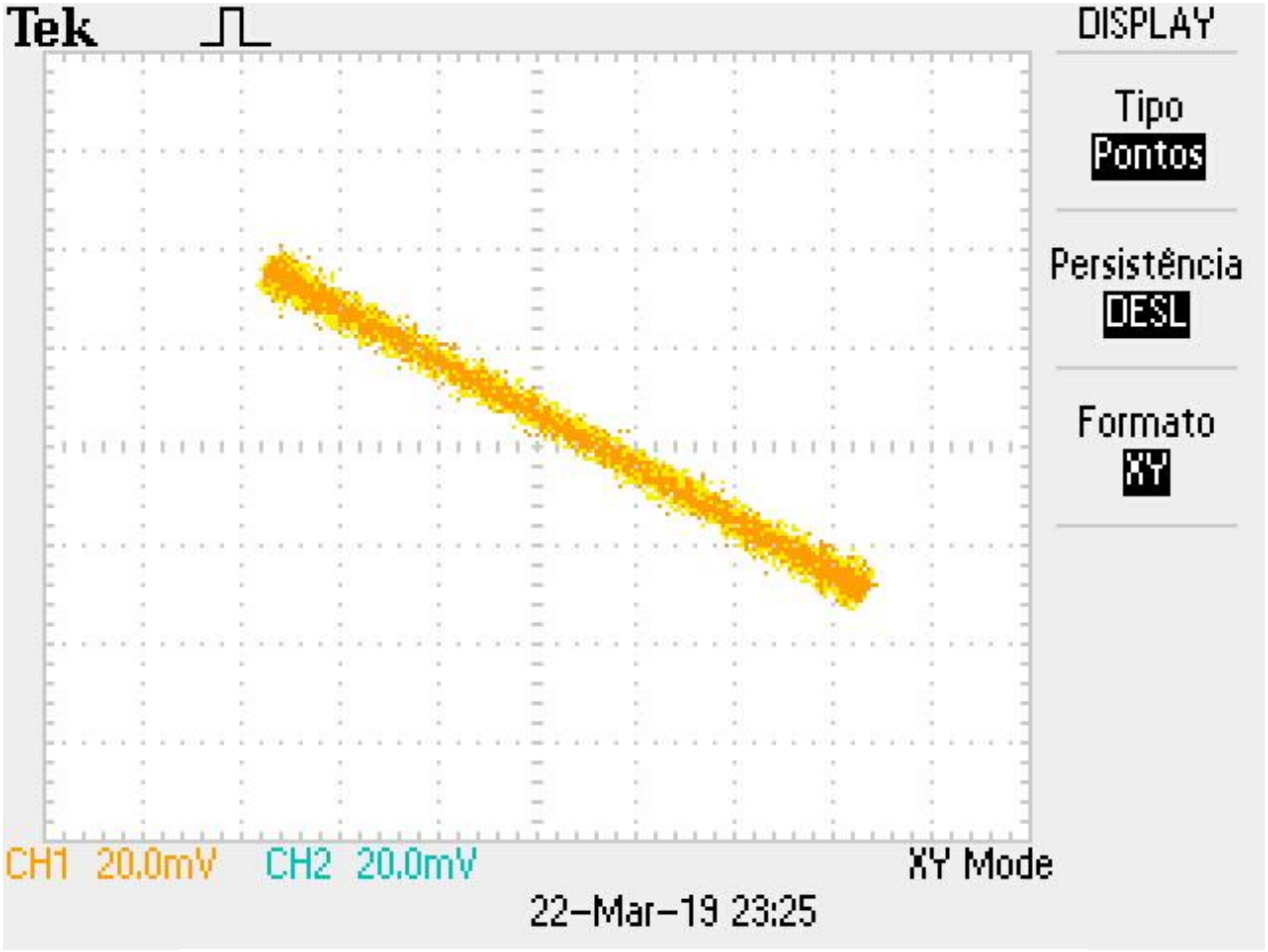

Figura 10 - Modo X-Y para Vo1/Vi em aberto

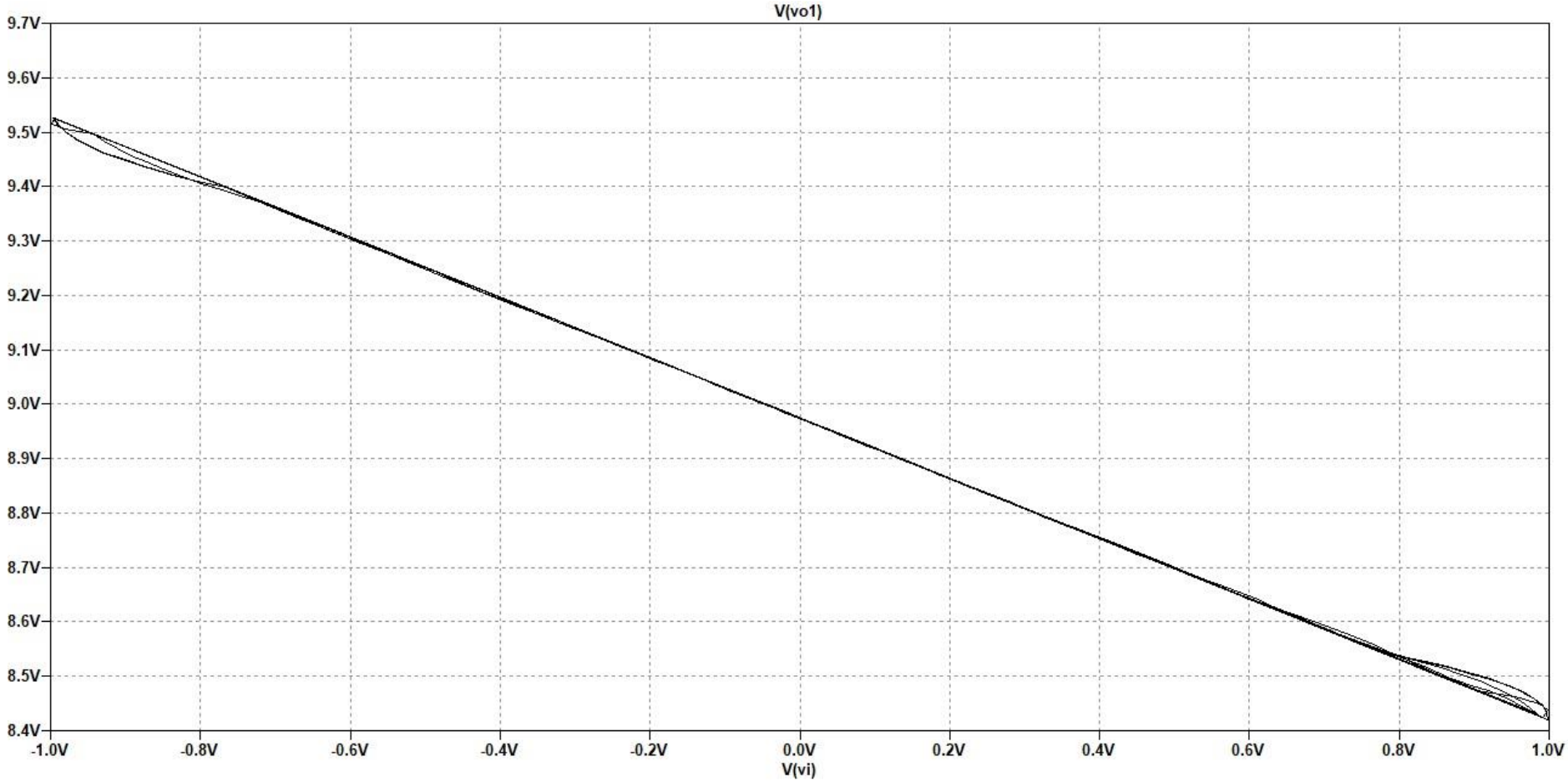

Figura 11 - Modo X-Y para Vo1/Vi em aberto Simulado

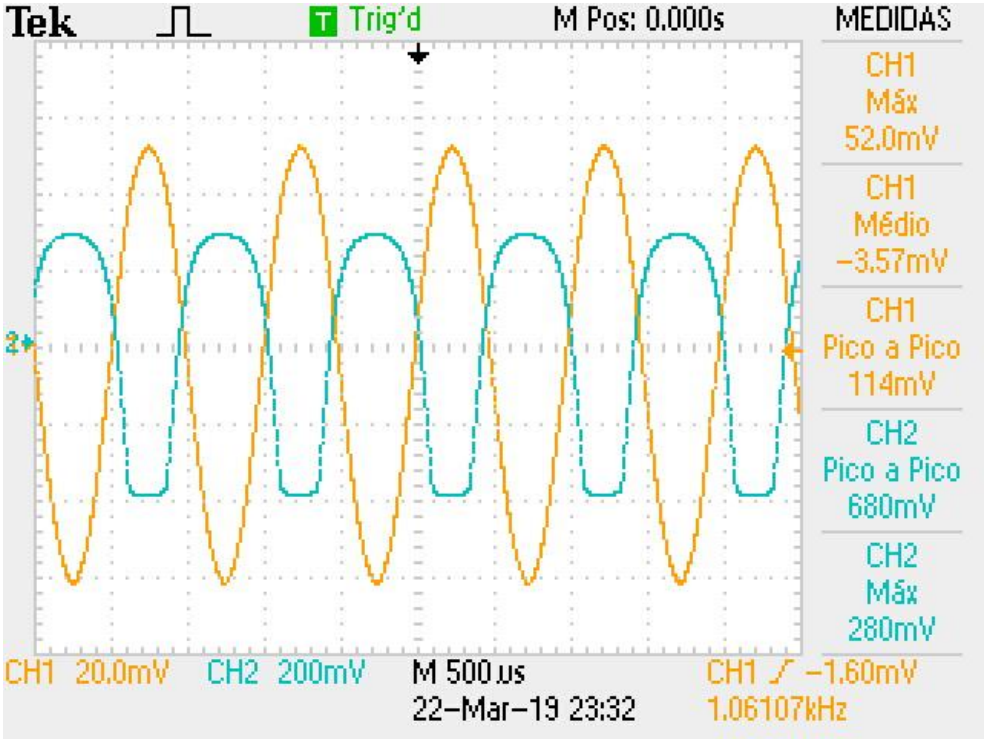

Figura 12 - Formas de onda de Vo2 e Vi2 em aberto

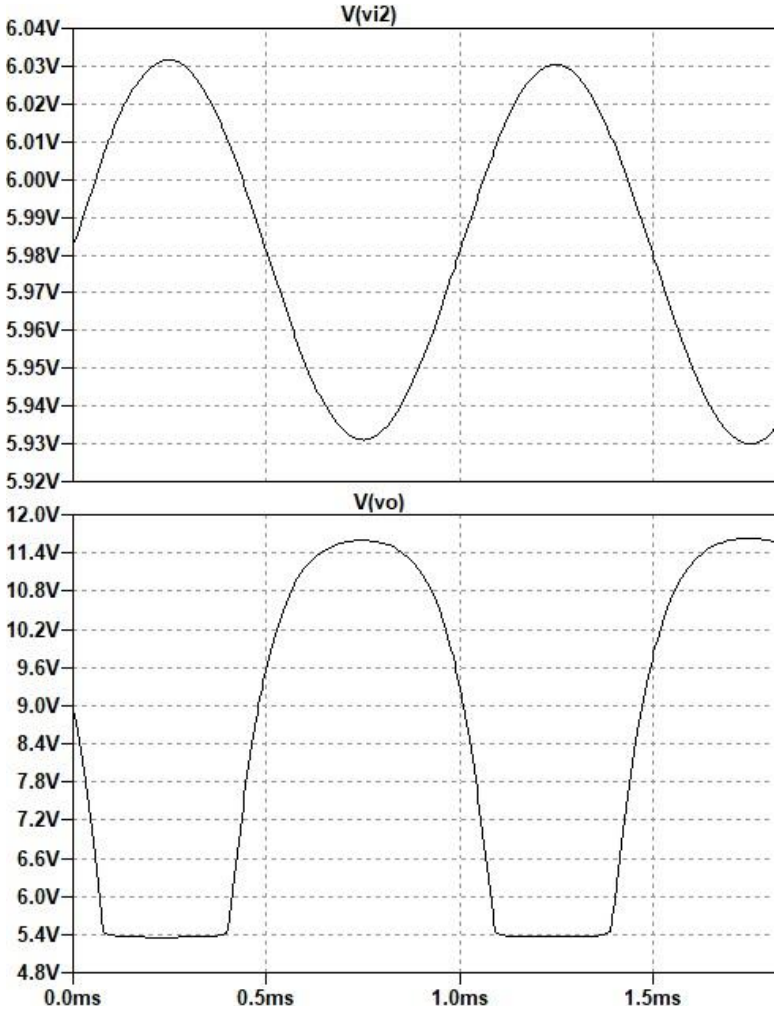

Figura 13 - Formas de onda de Vo2 e V2 em aberto Simuladas

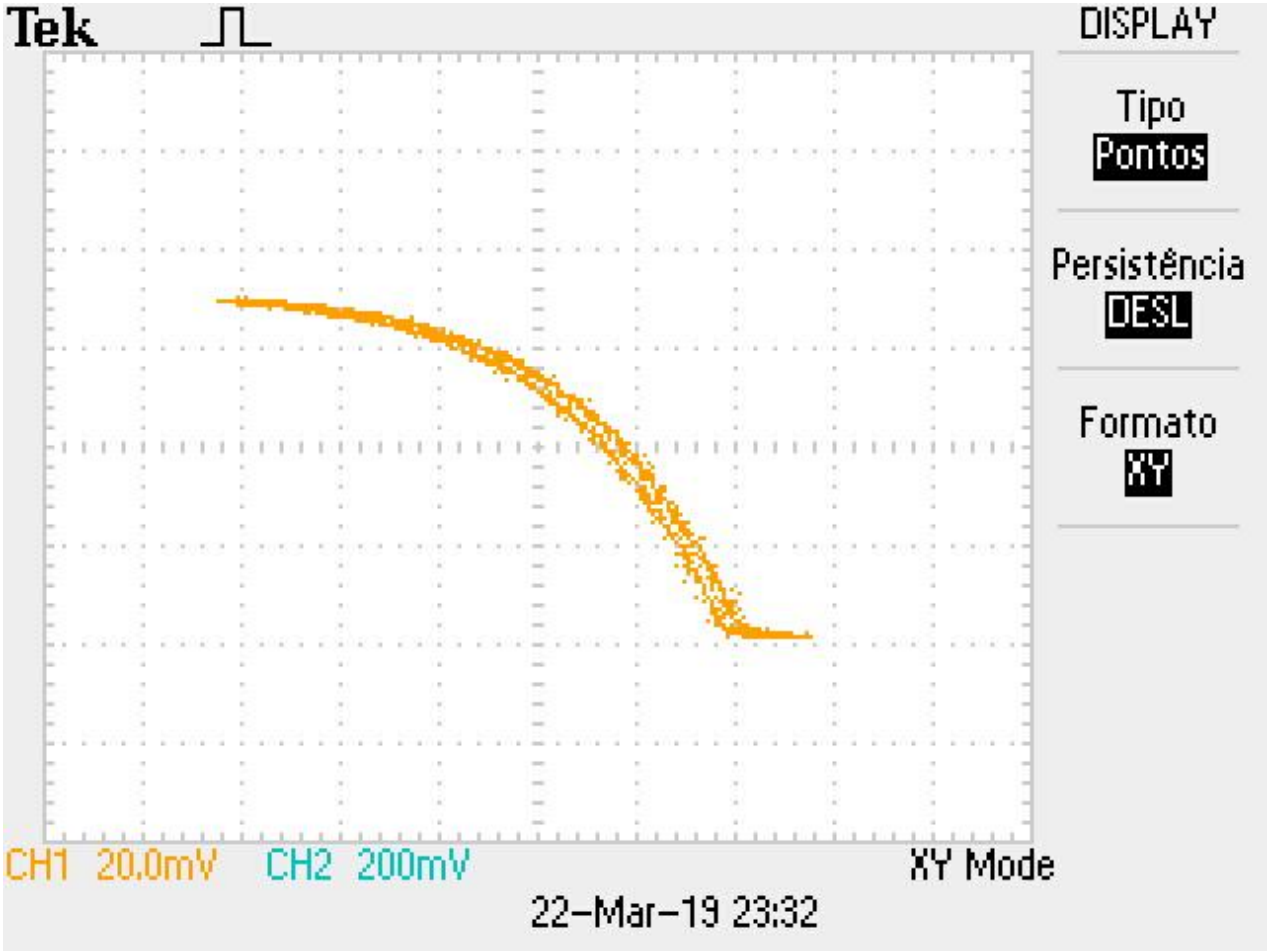

Figura 14 - Modo X-Y para Vo/Vi2 em aberto

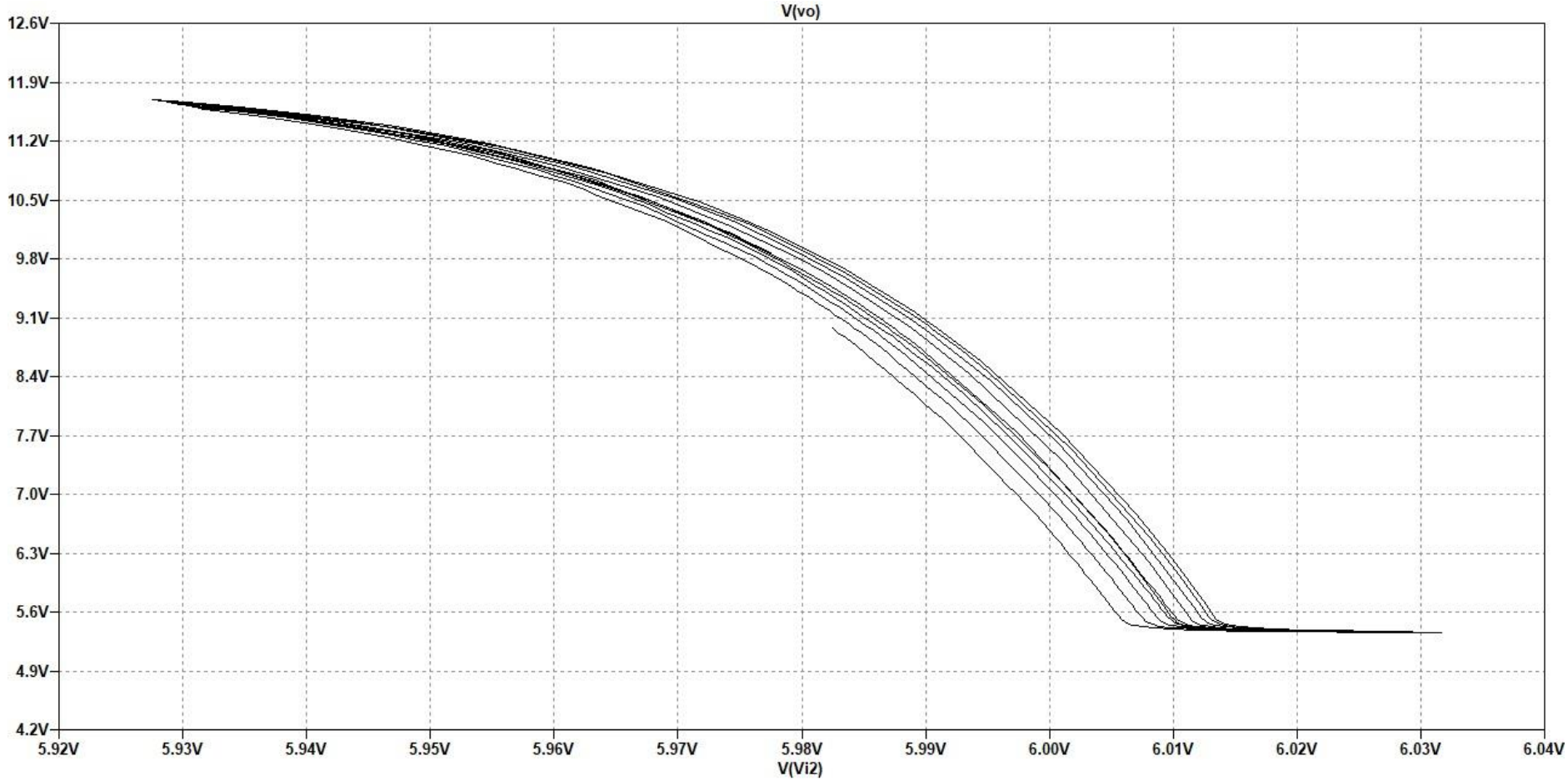

Figura 15 - Modo X-Y para Vo/Vi2 em aberto Simulado

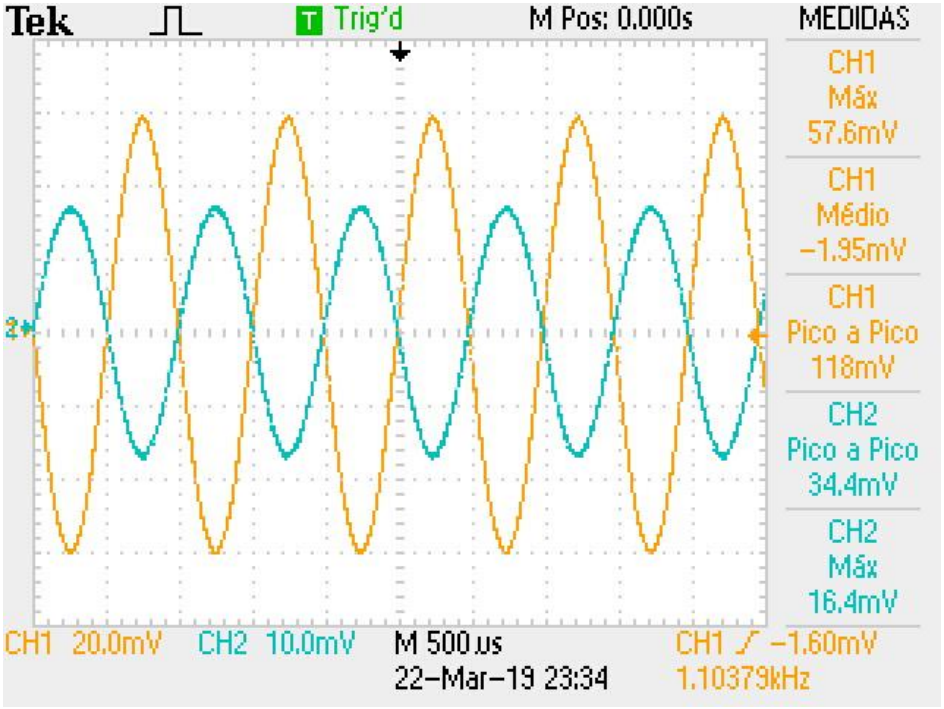

Figura 16 - Formas de onda de Vo1 e Vi com chave fechada

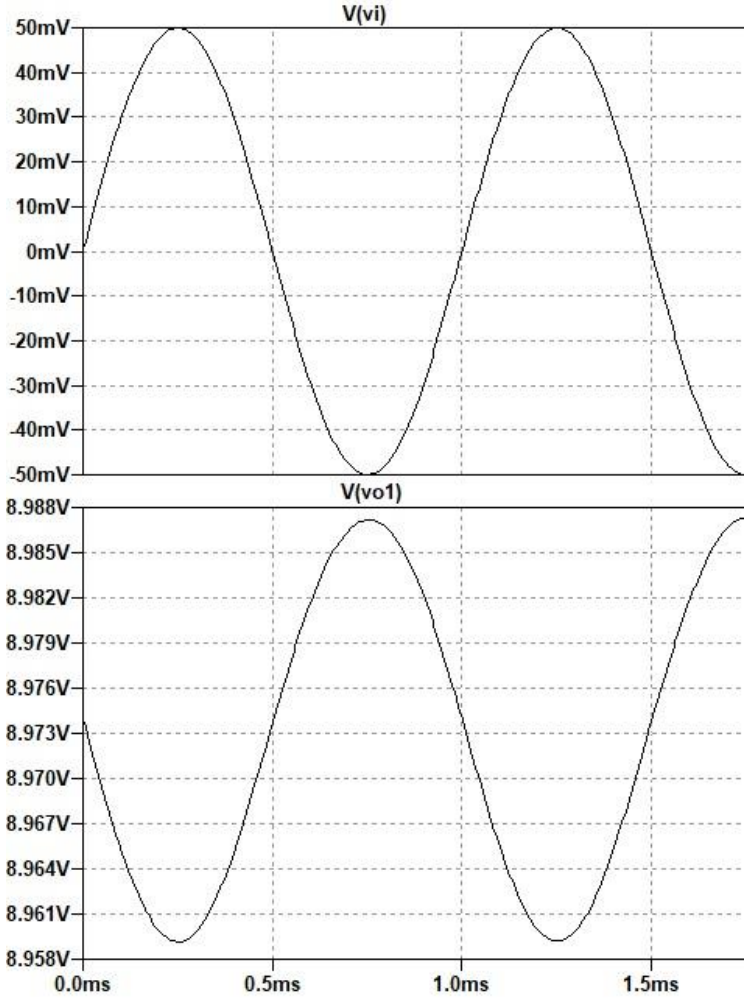

Figura 17 - Formas de onda de Vo1 e Vi com chave fechada Simuladas

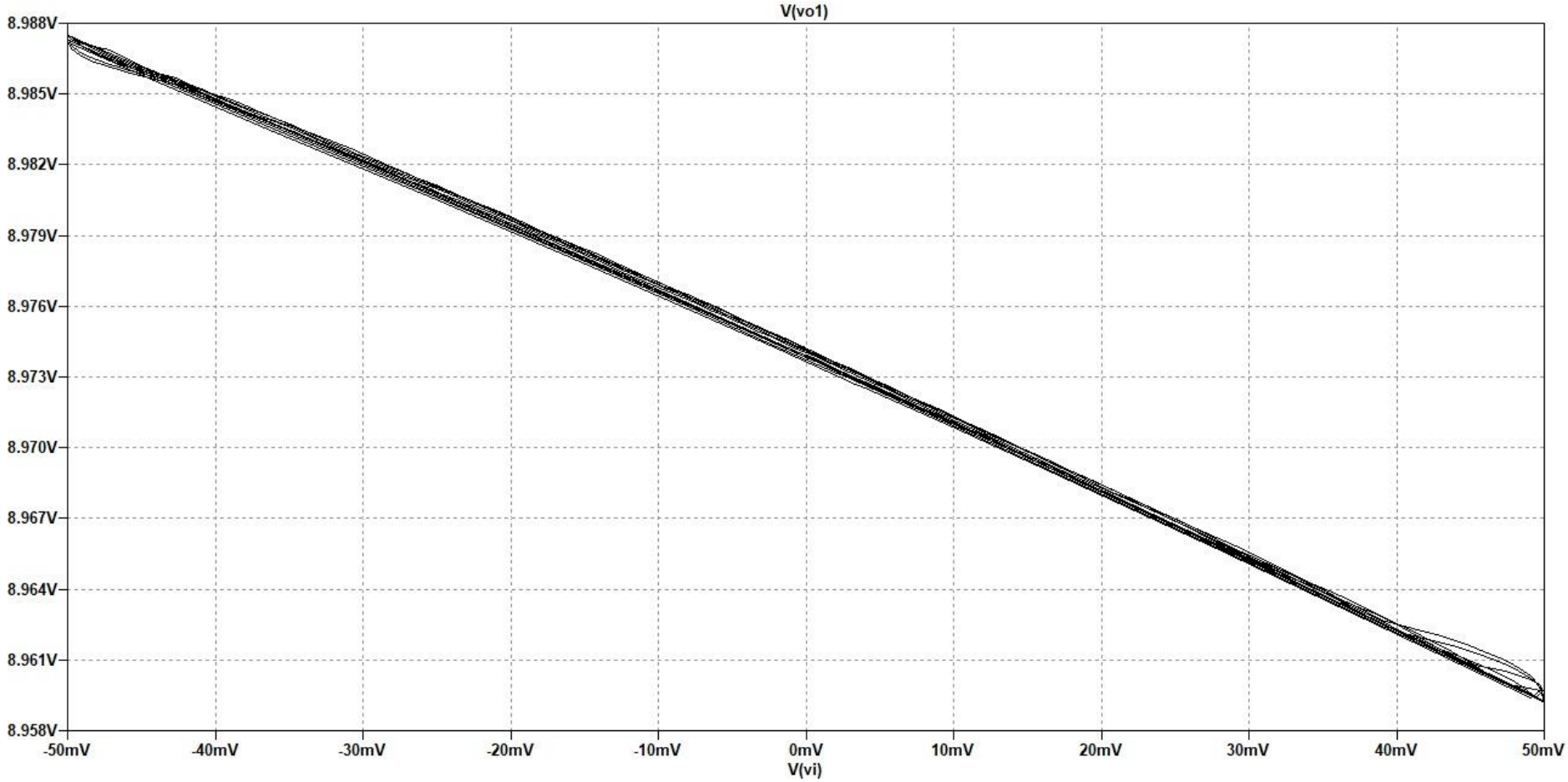

Figura 18 - Modo X-Y para Vo1/Vi com chave fechada Simulado

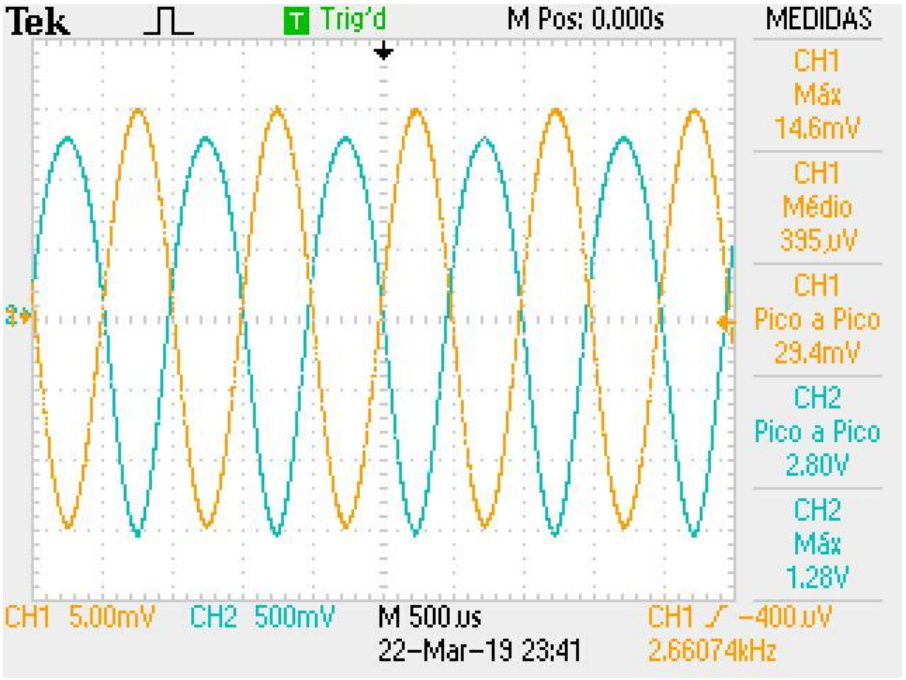

Figura 19 - Formas de onda de Vo e Vi2 com chave fechada

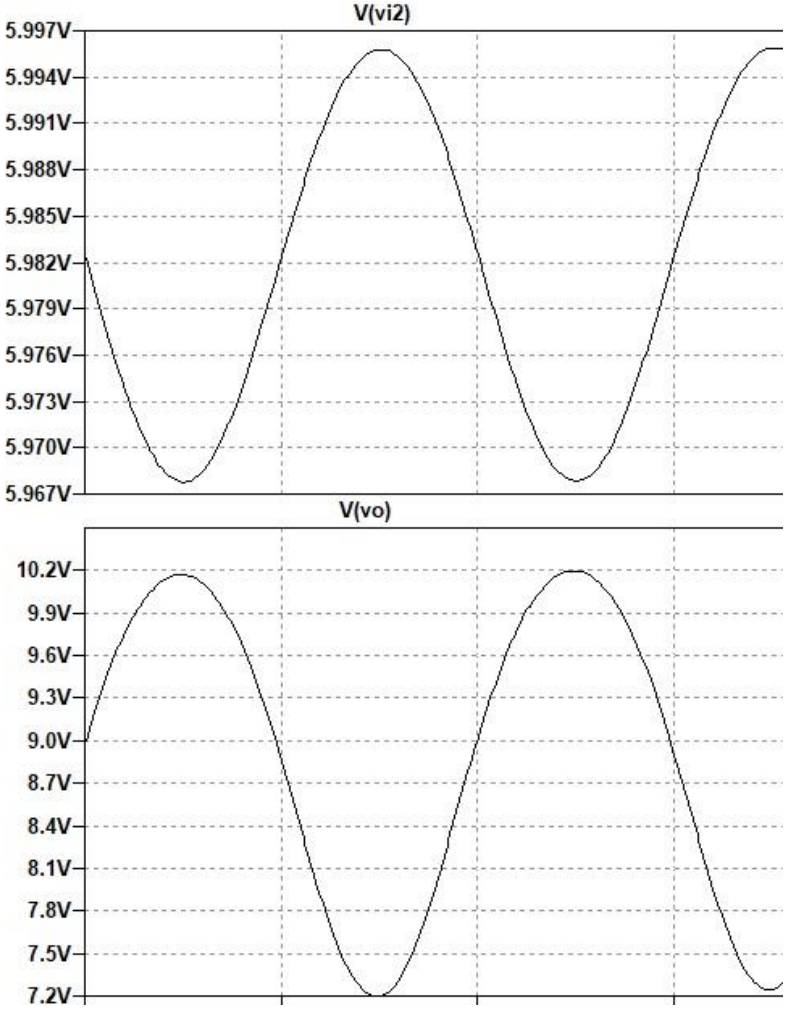

Figura 20 - Formas de onda de Vo e Vi2 com chave fechada Simuladas

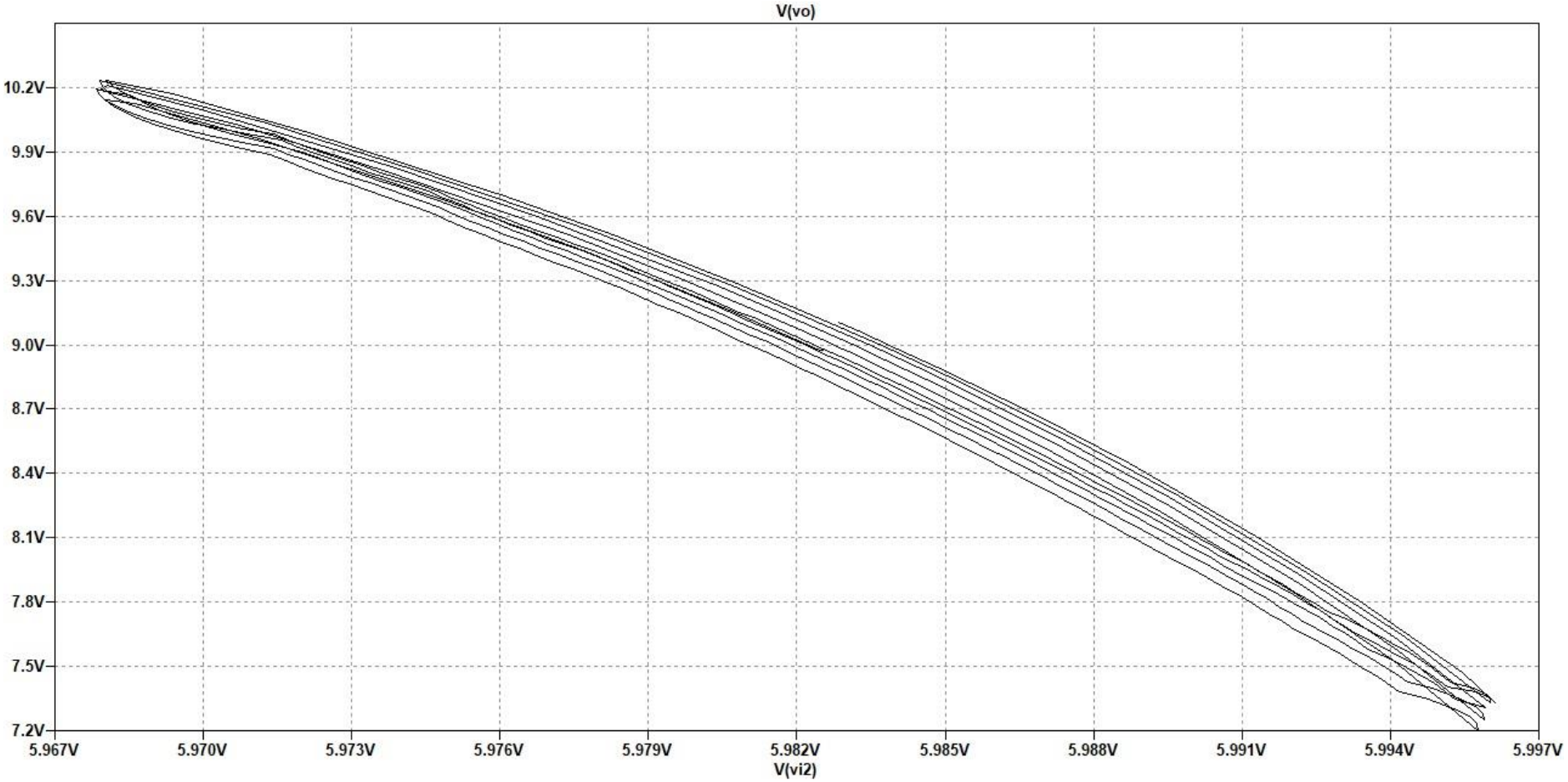

Figura 21 - Modo X-Y para Vo/Vi2 com chave fechada Simulado

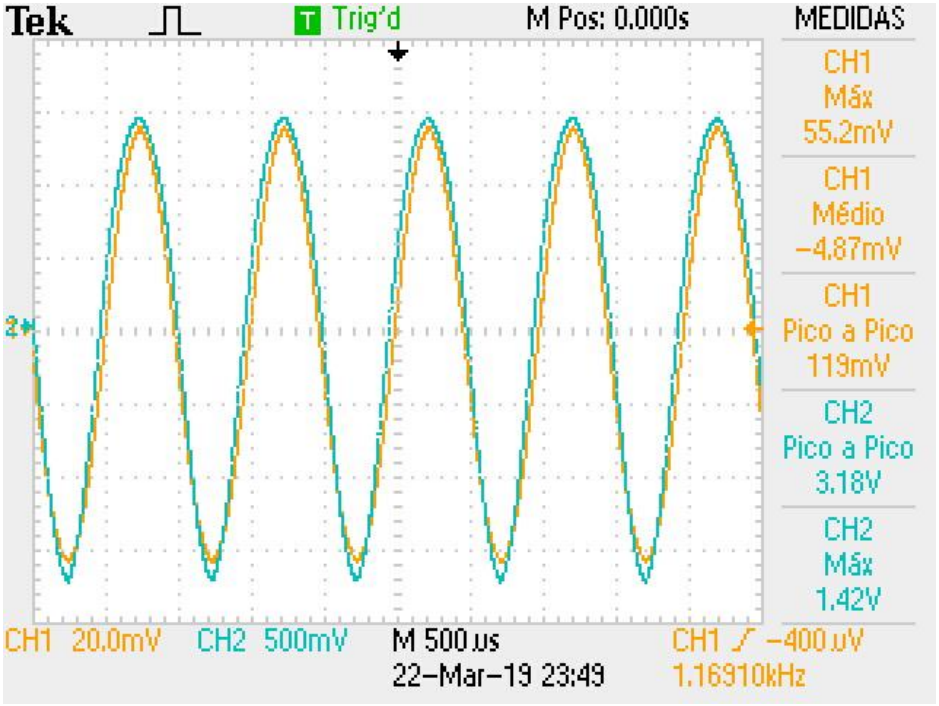

Figura 22 - Formas de onda de Vo e Vi com chave fechada

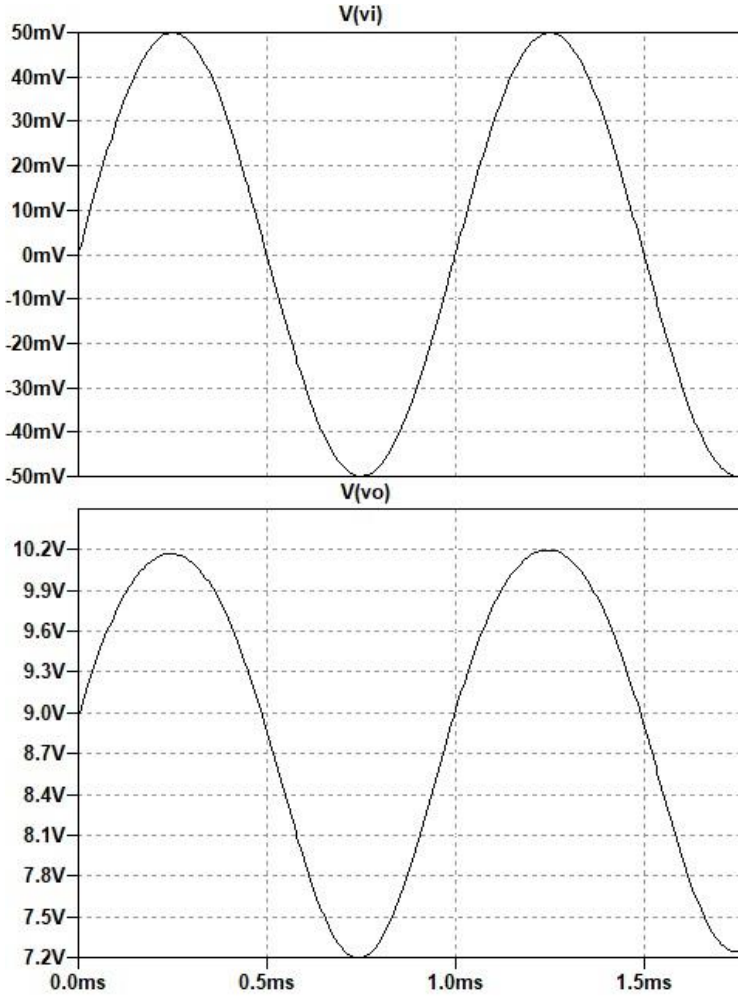

Figura 23 - Formas de onda de Vo e Vi com chave fechada Simuladas

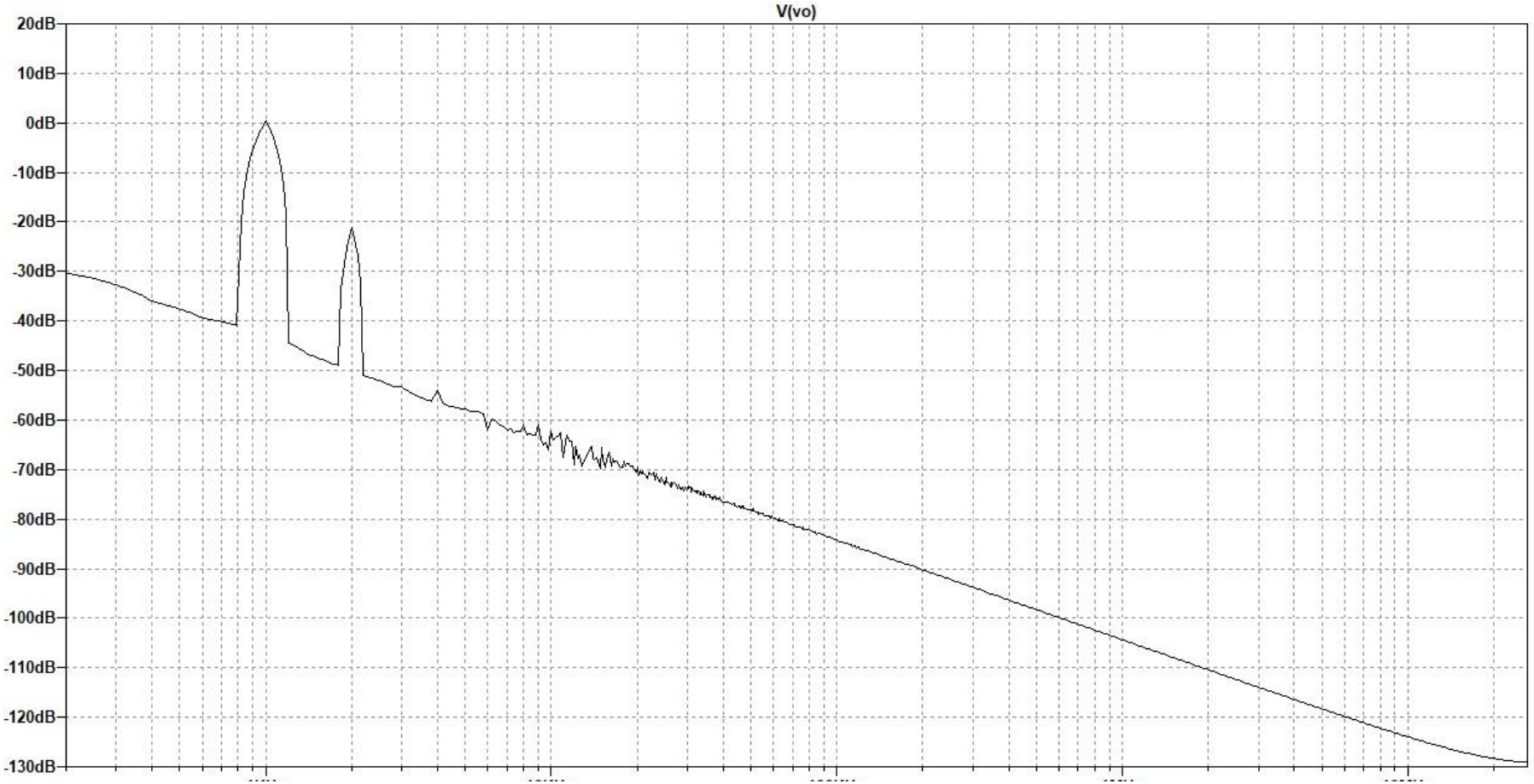

Figura 24 - FFT do sinal Vo Simulada

```
Circuit: * C:\Users\Gustavo\Documents\UFSC\7ª Fase\Circuitos Eletrônicos Analógicos\LAB01\Simulação\Lab01.asc

Direct Newton iteration for .op point succeeded.
N-Period=1
Fourier components of V(vo)
DC component:8.91449

Harmonic          Frequency          Fourier          Normalized          Phase          Normalized
 Number             [Hz]            Component          Component         [degree]        Phase [deg]
    1             1.000e+03          1.457e+00          1.000e+00           2.34°           0.00°
    2             2.000e+03          1.254e-01          8.607e-02          96.67°          94.33°
    3             3.000e+03          1.882e-03          1.292e-03        -157.09°        -159.43°
    4             4.000e+03          1.755e-03          1.205e-03         143.69°         141.35°
    5             5.000e+03          1.334e-03          9.154e-04        -178.11°        -180.45°
    6             6.000e+03          9.691e-04          6.652e-04        -138.03°        -140.37°
    7             7.000e+03          2.493e-04          1.711e-04         172.83°         170.49°
    8             8.000e+03          7.691e-04          5.279e-04         150.02°         147.68°
    9             9.000e+03          6.181e-04          4.243e-04        -173.35°        -175.69°
Total Harmonic Distortion: 8.609987%(8.610978%)



Date: Wed Mar 27 11:54:20 2019
Total elapsed time: 0.304 seconds.

tnom = 27
temp = 27
method = modified trap
totiter = 10043
traniter = 10038
tranpoints = 5018
accept = 5018
rejected = 0
matrix size = 17
fillins = 0
solver = Normal
Matrix Compiler1: 1.04 KB object code size  0.7/0.3/[0.3]
Matrix Compiler2: off  [0.2]/0.3/0.3
```

Figura 25 - THD do sinal Vo