ELEKTROTEHNIČKI FAKULTET U BEOGRADU

KATEDRA ZA ELEKTRONIKU

ENERGETSKA ELEKTRONIKA

LABORATORIJSKE VEŽBE

VEŽBA BROJ 4:

UPRAVLJANJE BUCK KONVERTOROM:

IMPULSNO-ŠIRINSKA MODULACIJA

IME I PREZIME	BR. INDEKSA	GRUPA	OCENA
1.			
2.			

DATUM _____

VREME _____

DEŽURNI U LABORATORIJI_____

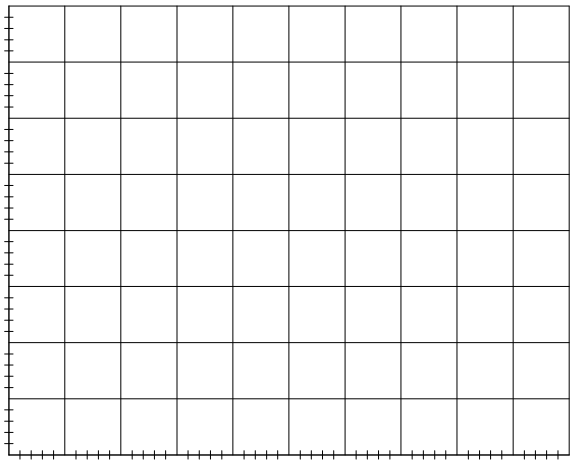
D.0

V_0 = _____ V R_X = _____ Ω

D.1. Snimanje karakteristike impulsno-širinskog modulatora, $D(v_{TP2})$

Tabela 4.1.

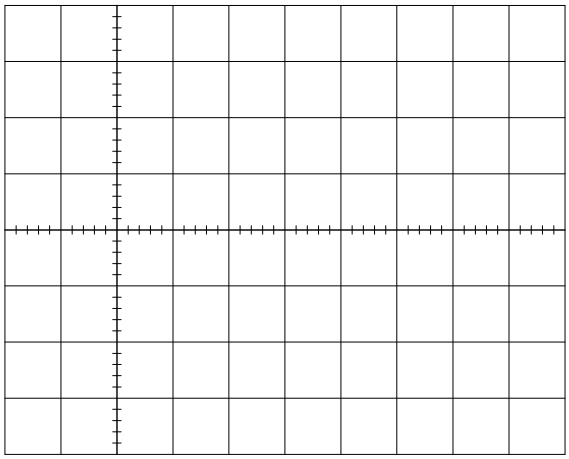
$v(\text{TP2})[\text{V}]$	T_{POS} [μs]	T_S [μs]	D



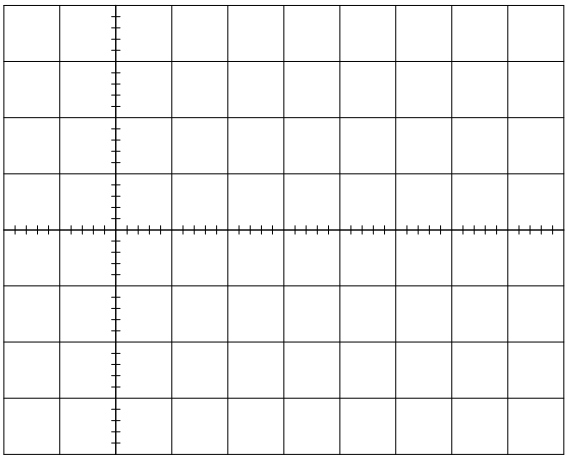
Slika 4.2. $D(v_{TP2})$

D.2. Integralni regulator

D.2.1. Integralni regulator sa 10 nF.

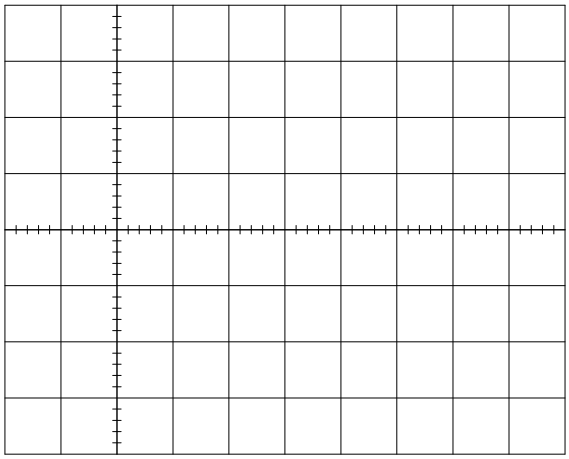


Slika 4.3. Struja kalema, $R_L = 100\ \Omega$

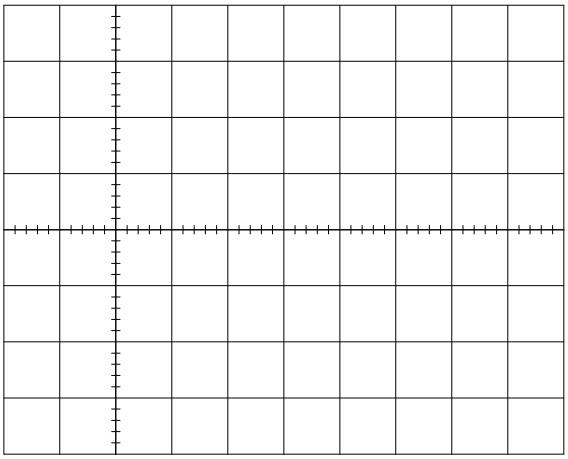


Slika 4.4. Izlazni napon regulatora, $R_L = 100\ \Omega$

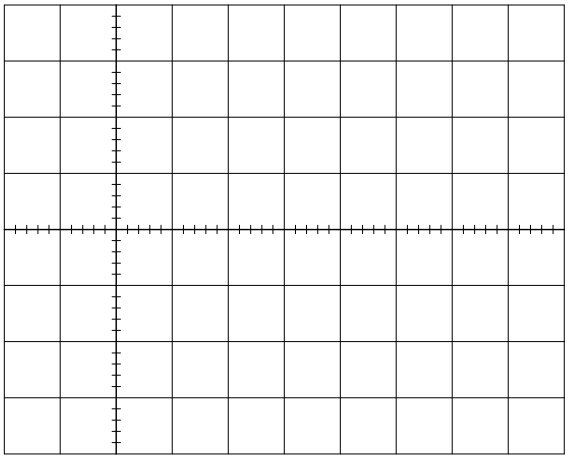
$I_{OUT\ stable/unstable}$ = _____ mA



Slika 4.5. Struja kalema, $R_L = 16{,}5\ \Omega$



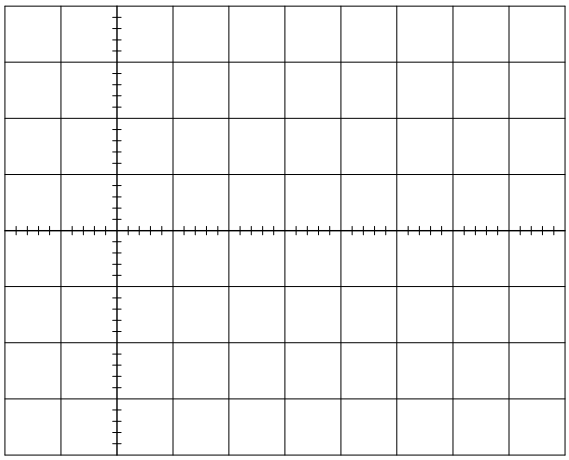
Slika 4.6. Izlazni napon regulatora, $R_L = 16{,}5\ \Omega$



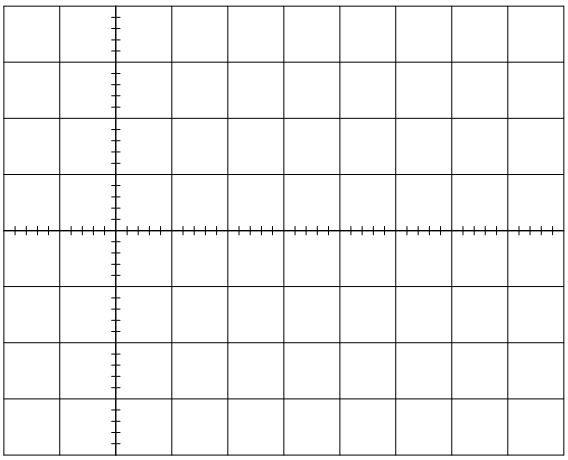
Slika 4.7. Izlazni napon konvertora, $R_L = 16{,}5\ \Omega$

$V_{out\ p-p}$ = _____ mV

D.2.2. Integralni regulator sa 47 nF.

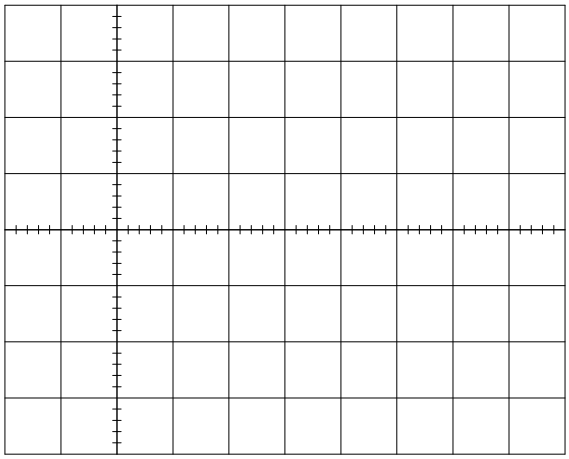


Slika 4.8. Struja kalema, $R_L = 100\ \Omega$

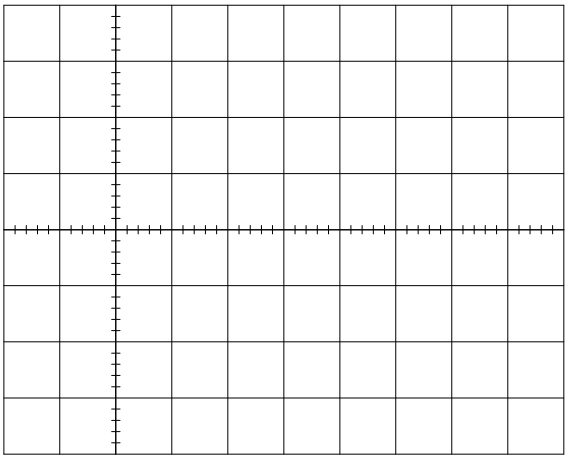


Slika 4.9. Izlazni napon regulatora, $R_L = 100\ \Omega$

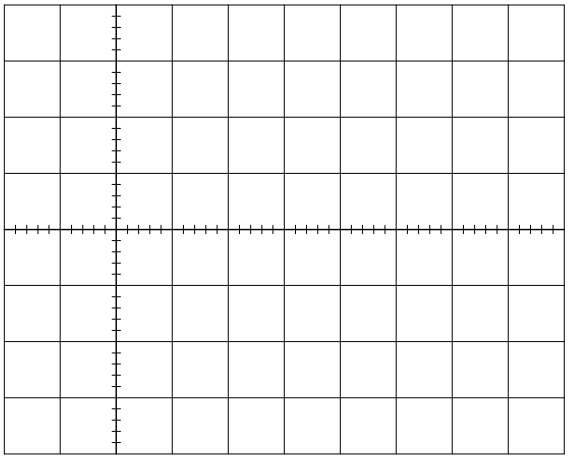
$I_{OUT\ stable\,/\,unstable}$ = _____ mA



Slika 4.10. Struja kalema, $R_L = 16{,}5\ \Omega$



Slika 4.11. Izlazni napon regulatora, $R_L = 16{,}5\ \Omega$



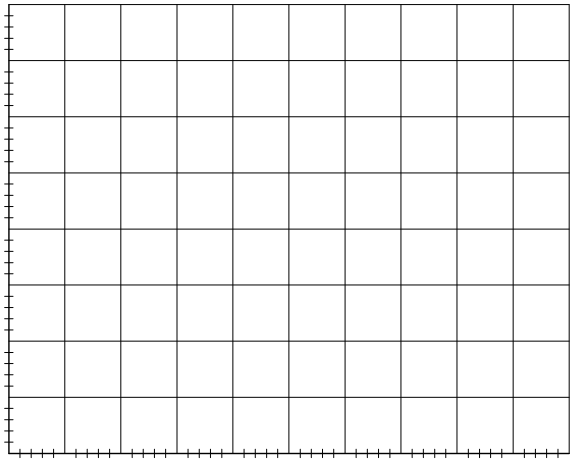
Slika 4.12. Izlazni napon konvertora, $R_L = 16{,}5\ \Omega$

$V_{out\ p-p}$ = _____ mV

D.2.3. Integralni regulator sa 100 nF.

Tabela 4.2.

I_{OUT} [mA]	V_{OUT} [V]



Slika 4.13. $V_{OUT}(I_{OUT})$

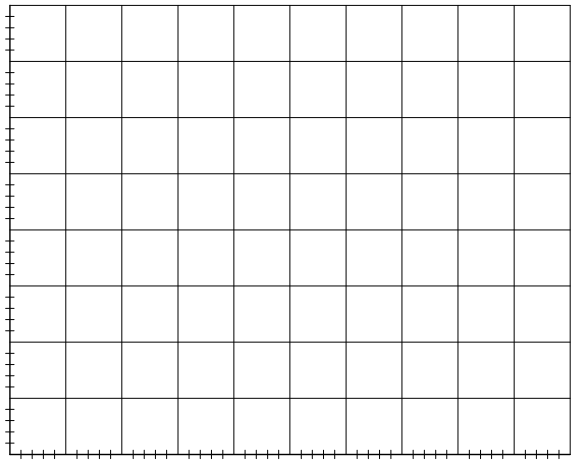
Zaključak:

<u>D.3.</u> Proporcionalni regulator

D.3.1. Proporcionalni regulator sa 100 kΩ.

Tabela 4.3.

I_{OUT} [mA]	V_{OUT} [V]

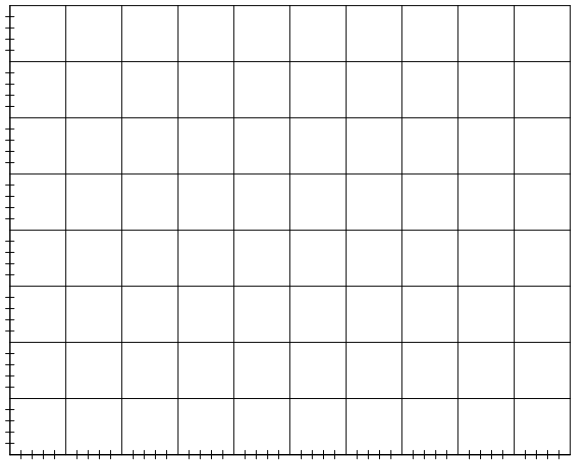


Slika 4.14. $V_{OUT}(I_{OUT})$

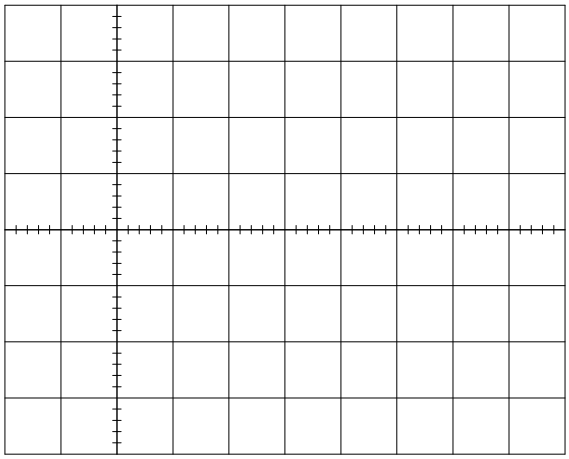
D.3.2. Proporcionalni regulator sa 470 kΩ.

Tabela 4.4.

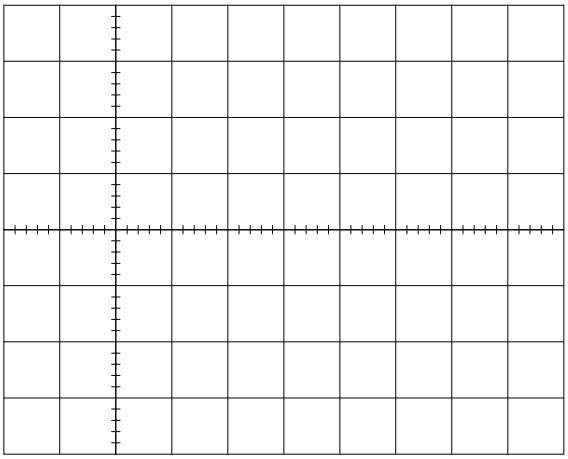
I_{OUT} [mA]	V_{OUT} [V]



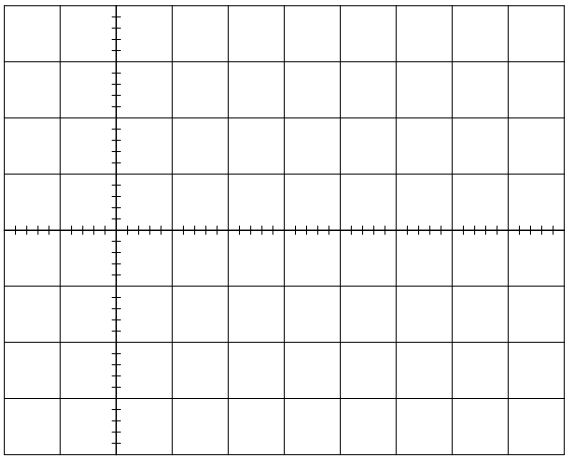
Slika 4.15. $V_{OUT}(I_{OUT})$



Slika 4.16. Struja kalema, $I_{OUT} = 500$ mA



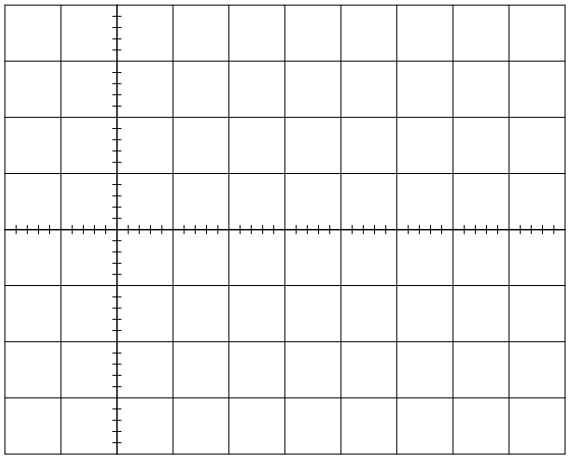
Slika 4.17. Izlazni napon regulatora, $I_{OUT} = 500$ mA



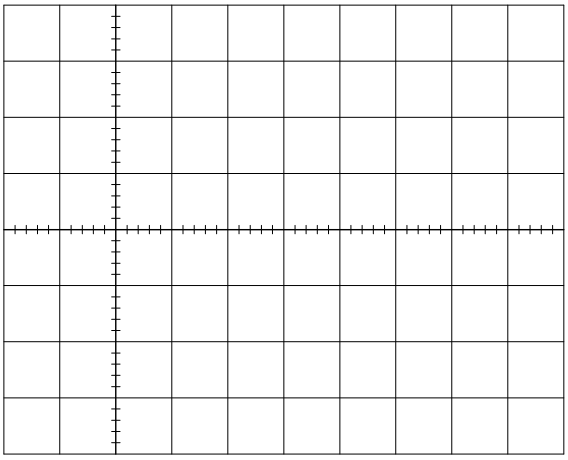
Slika 4.18. Naizmenična komponenta izlaznog napona konvertora, $I_{OUT} = 500$ mA

Zaključak:

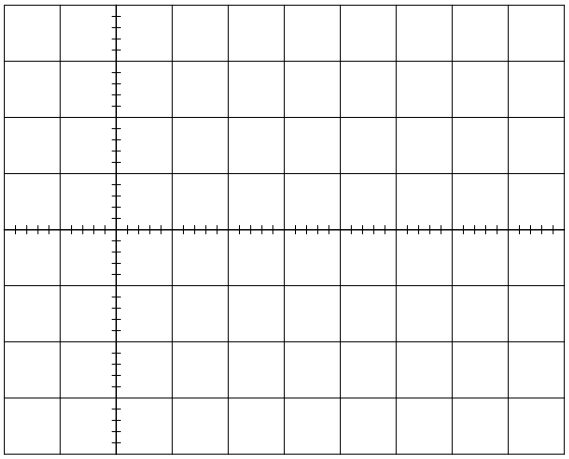
<u>D.4.</u> Proporcionalno-integralni regulator



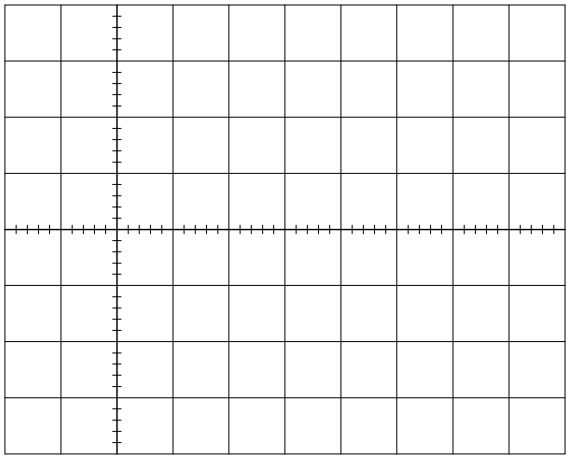
Slika 4.19. Struja kalema, $R_L = 16{,}5\ \Omega$



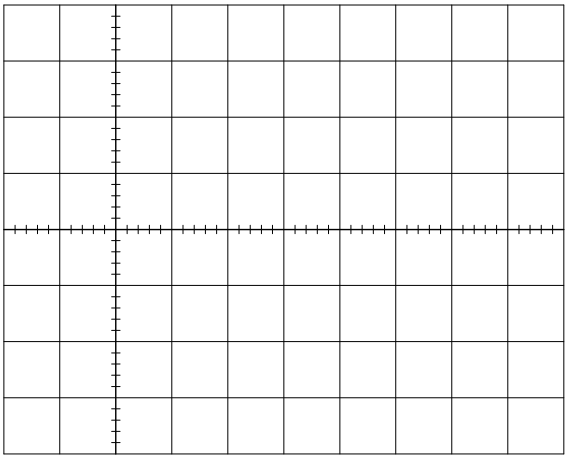
Slika 4.20. Izlazni napon regulatora, $R_L = 16{,}5\ \Omega$



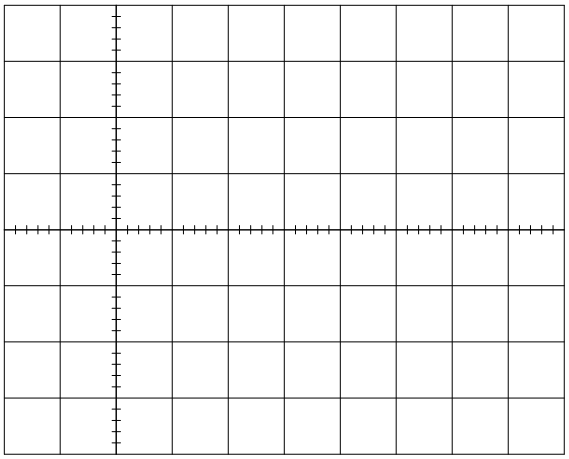
Slika 4.21. Naizmenična komponenta izlaznog napona konvertora, $R_L = 16{,}5\ \Omega$



Slika 4.22. Struja kalema



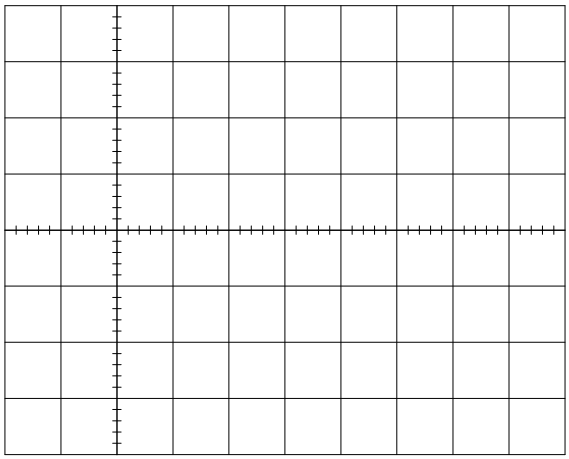
Slika 4.23. Izlazni napon regulatora



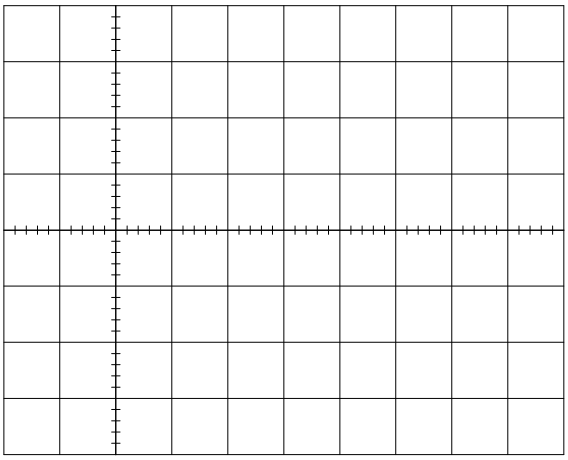
Slika 4.24. Izlazni napon konvetora

D5. Dinamički odziv konvertora

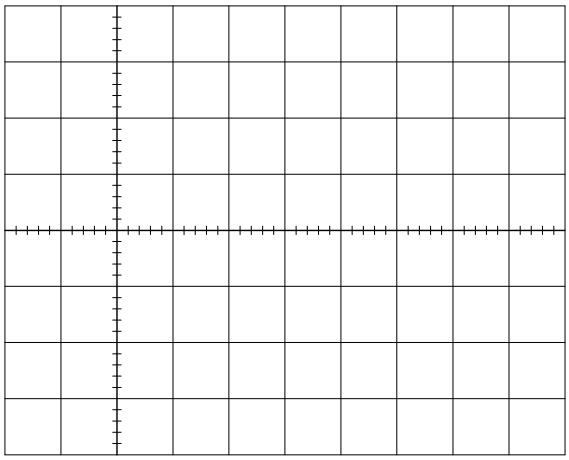
D.5.1. Proporcionalni regulator sa 100 kΩ



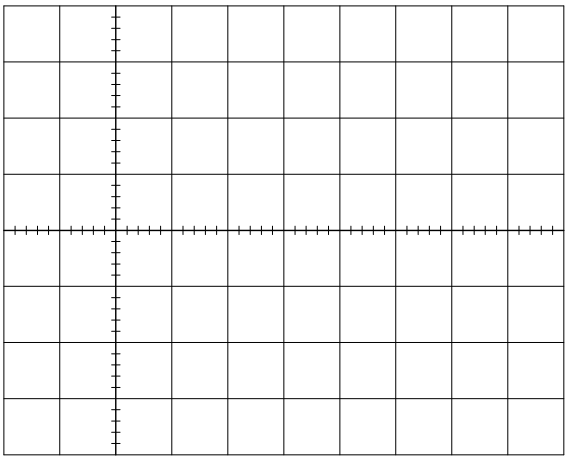
Slika 4.25. Struja kalema, $R_L = 16{,}5\ \Omega$, $R_{L2} = 8{,}2\ \Omega$



Slika 4.26. Naizmenična komponenta izlaznog napona, isto



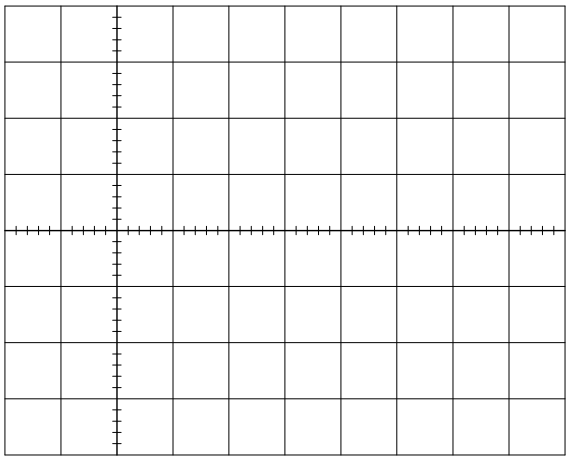
Slika 4.27. Struja kalema, $R_L = 47\ \Omega$, $R_{L2} = 8{,}2\ \Omega$



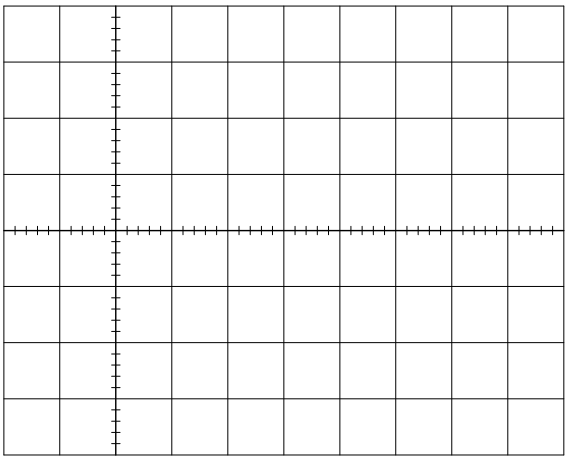
Slika 4.28. Naizmenična komponenta izlaznog napona, isto

Zaključak:

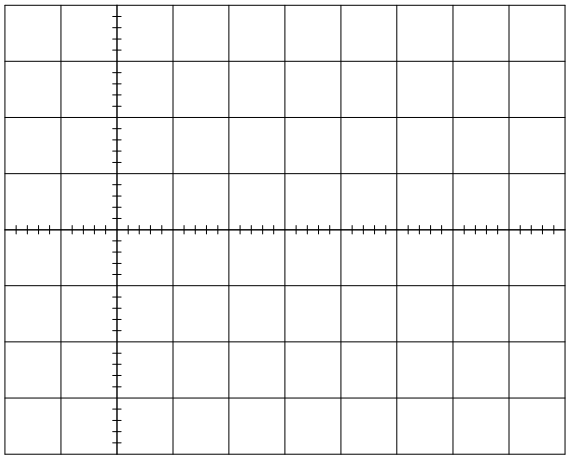
D.5.2. Proporcionalni regulator sa 470 kΩ.



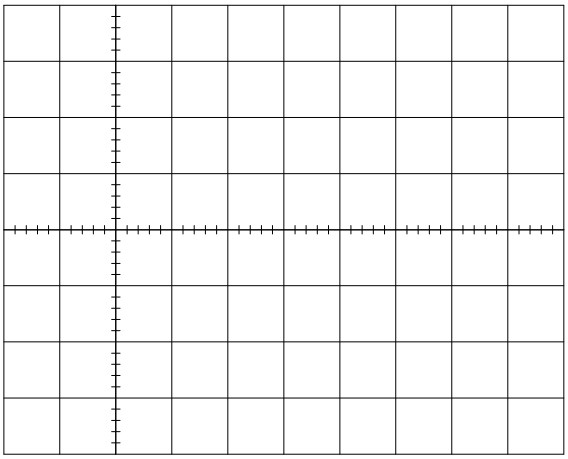
Slika 4.29. Struja kalema, $R_L = 16{,}5\ \Omega$, $R_{L2} = 8{,}2\ \Omega$



Slika 4.30. Naizmenična komponenta izlaznog napona, isto



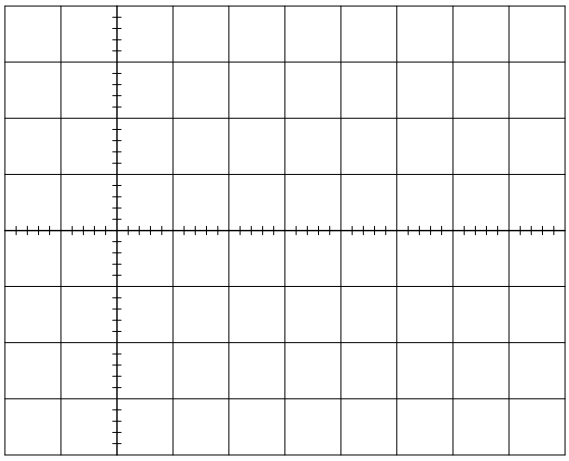
Slika 4.31. Struja kalema, $R_L = 47\ \Omega$, $R_{L2} = 8{,}2\ \Omega$



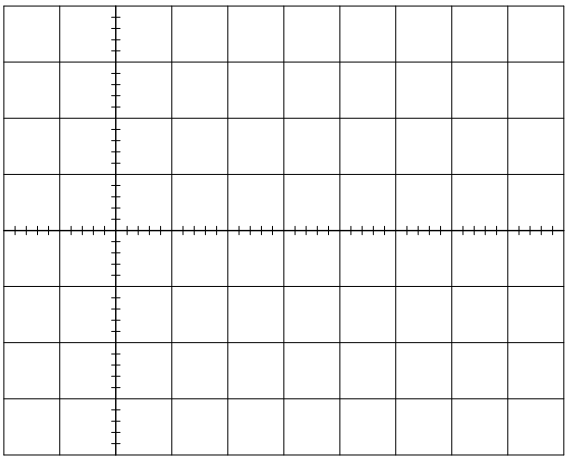
Slika 4.32. Naizmenična komponenta izlaznog napona, isto

Zaključak:

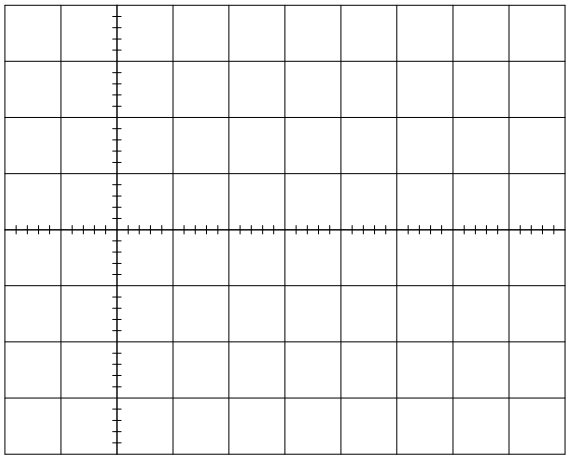
D.5.3. Integralni regulator sa 100 nF.



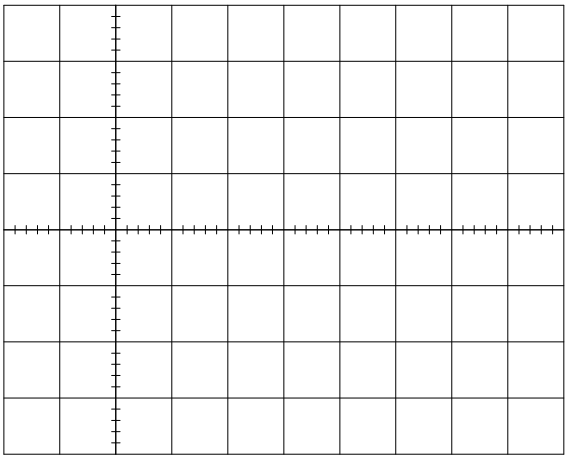
Slika 4.33. Struja kalema, $R_L = 16{,}5\ \Omega$, $R_{L2} = 8{,}2\ \Omega$



Slika 4.34. Naizmenična komponenta izlaznog napona, isto



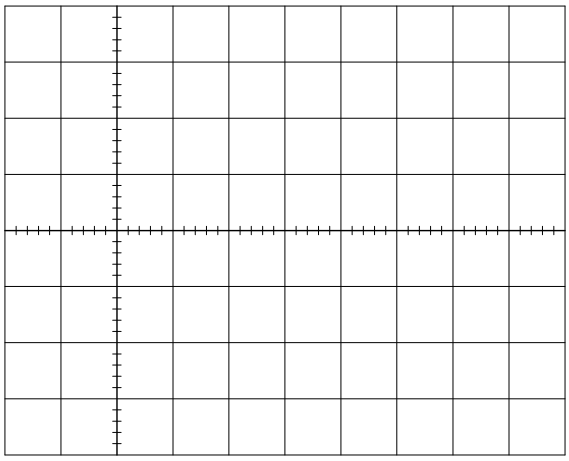
Slika 4.35. Struja kalema, $R_L = 47\ \Omega$, $R_{L2} = 8{,}2\ \Omega$



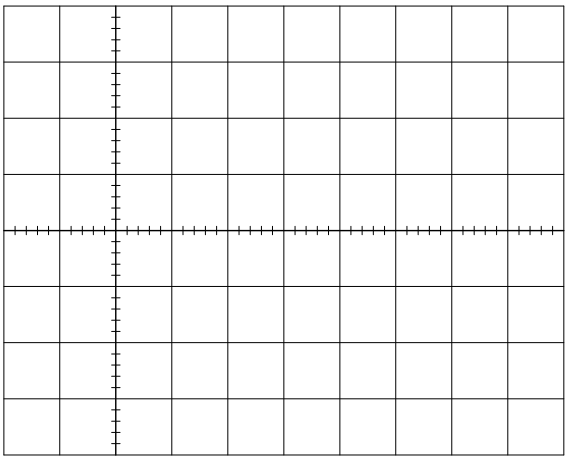
Slika 4.36. Naizmenična komponenta izlaznog napona, isto

Zaključak:

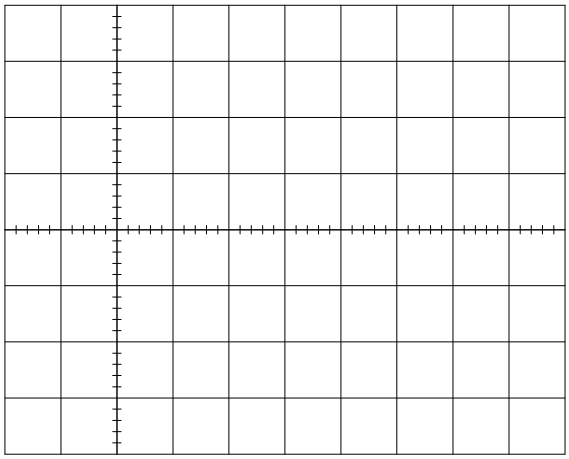
D.5.4. Proporcionalno-integralni regulator.



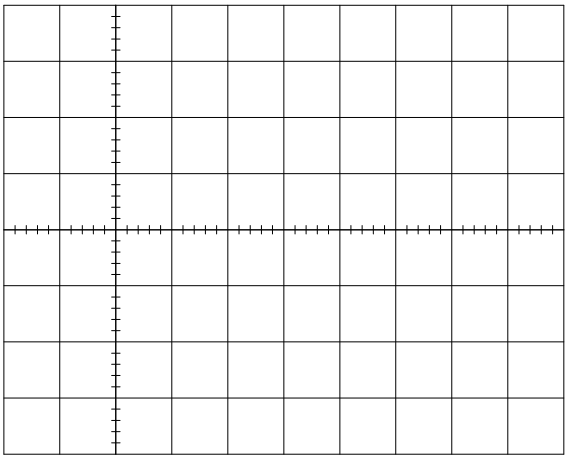
Slika 4.37. Struja kalema, $R_L = 16{,}5\ \Omega$, $R_{L2} = 8{,}2\ \Omega$



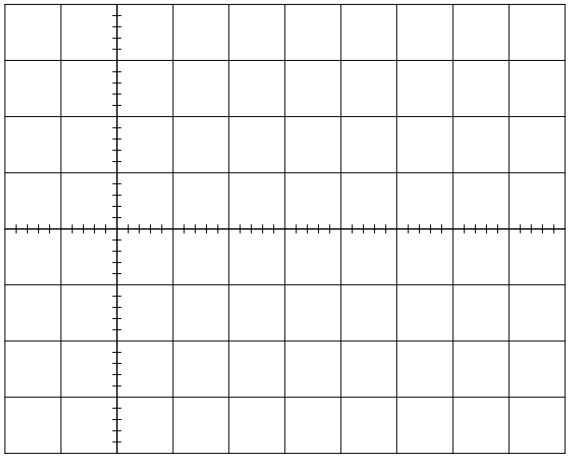
Slika 4.38. Naizmenična komponenta izlaznog napona, isto



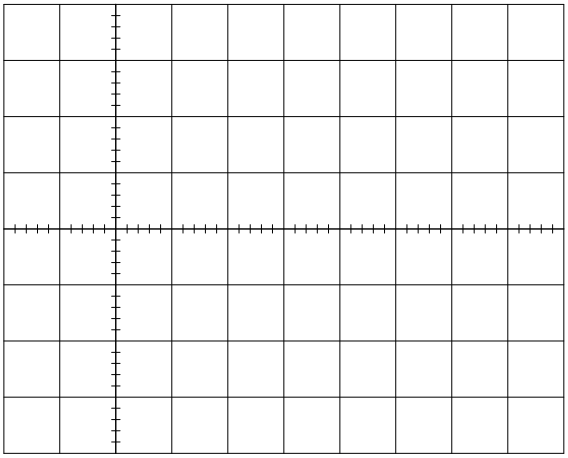
Slika 4.39. Struja kalema



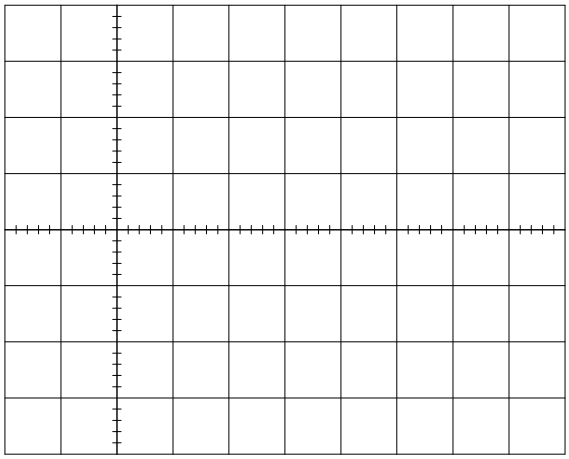
Slika 4.40. Naizmenična komponenta izlaznog napona



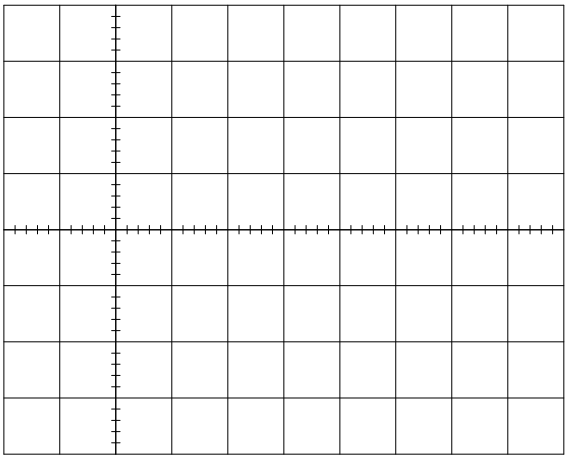
Slika 4.41. Struja kalema, 2 kHz



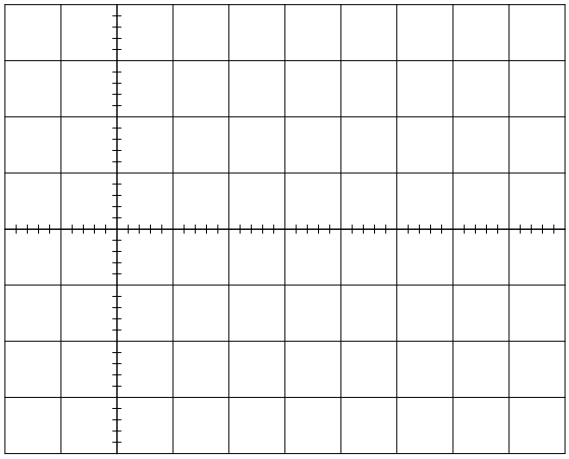
Slika 4.42. Naizmenična komponenta izlaznog napona, 2 kHz



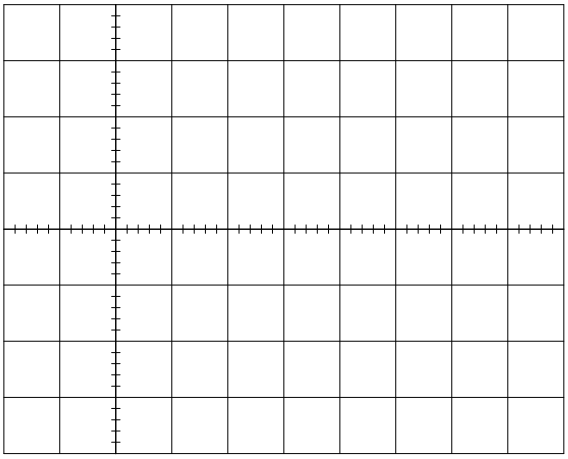
Slika 4.43. Struja kalema, $R_L = 47\ \Omega$, $R_{L2} = 8{,}2\ \Omega$



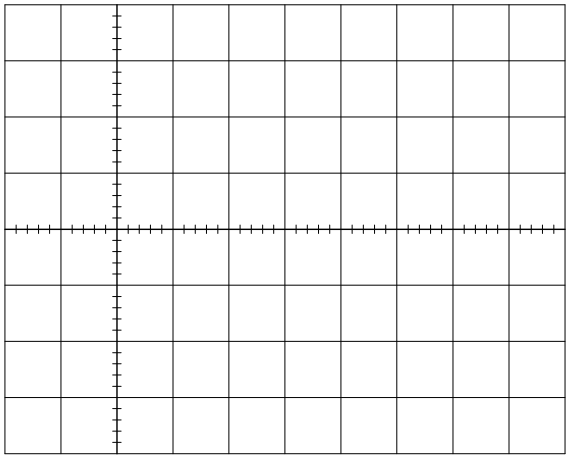
Slika 4.44. Naizmenična komponenta izlaznog napona, isto



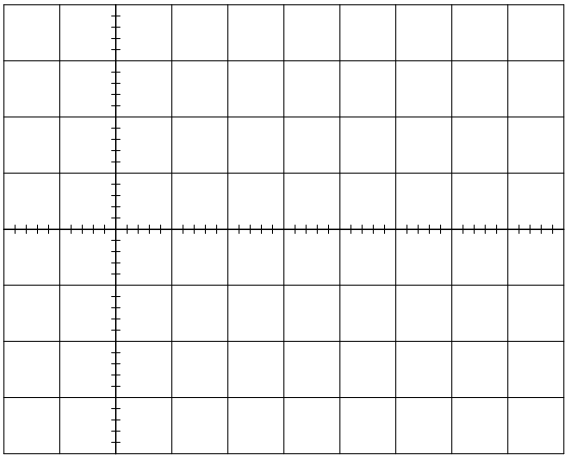
Slika 4.45. Struja kalema



Slika 4.46. Naizmenična komponenta izlaznog napona



Slika 4.47. Struja kalema, 2 kHz



Slika 4.48. Naizmenična komponenta izlaznog napona, 2 kHz

Zaključak:

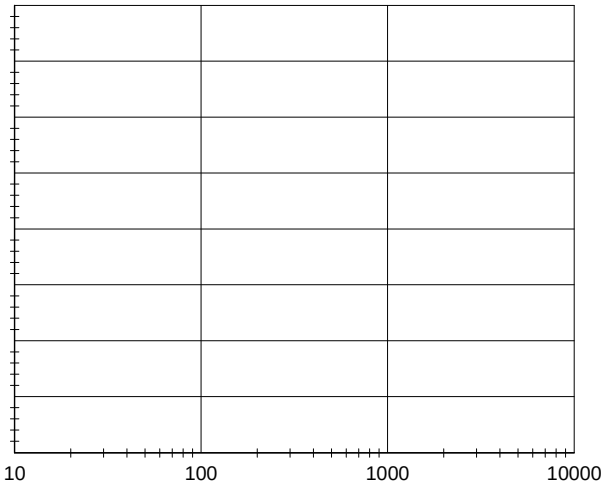
D.6. Prenosna karakteristika konvertora i kružno pojačanje

V_{TP2} = _____ V

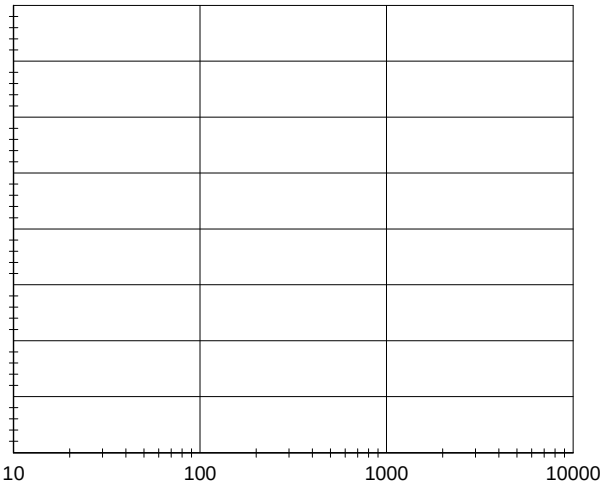
D.6.1. Prenosna karakteristika konvertora

Tabela 4.5.

f [Hz]	$V_{out\ p-p}$ [mV]	$\lvert H_1(s)\rvert$	$\arg(H_1(s))$



Slika 4.49. $\lvert H_1(s)\rvert$

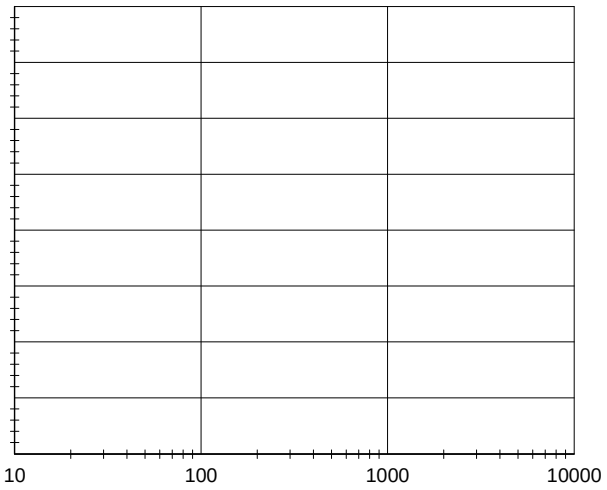


Slika 4.50. $\arg(H_1(s))$

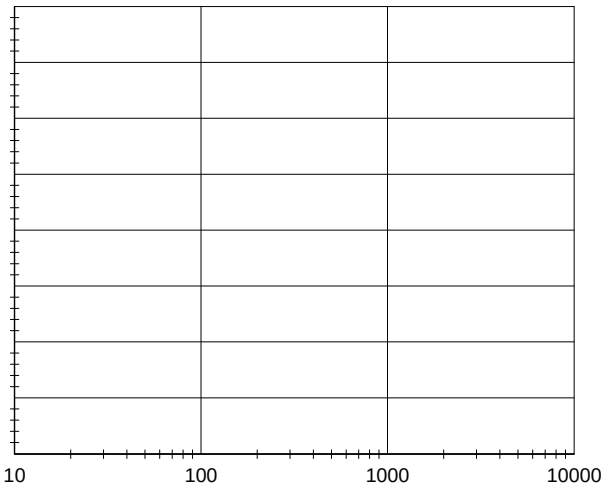
D.6.2. Kružno pojačanje

Tabela 4.6.

$f\ [\mathrm{Hz}]$	$V_{TP2\,p-p}\ [\mathrm{mV}]$	$\lvert H_2(s)\rvert$	$\arg(H_2(s))$



Slika 4.51. $\lvert H_2(s)\rvert$



Slika 4.52. $\arg(H_2(s))$