RĪGAS TEHNISKĀ UNIVERSITĀTE

ELEKTRONIKAS UN TELEKOMUNIKĀCIJU FAKULTĀTE

2.Laboratorijas darbs

Signālu teorijas pamatos

"Iepazīšanās ar periodisku signālu izvērsi trigonometrisku funkciju Furjē rindā"

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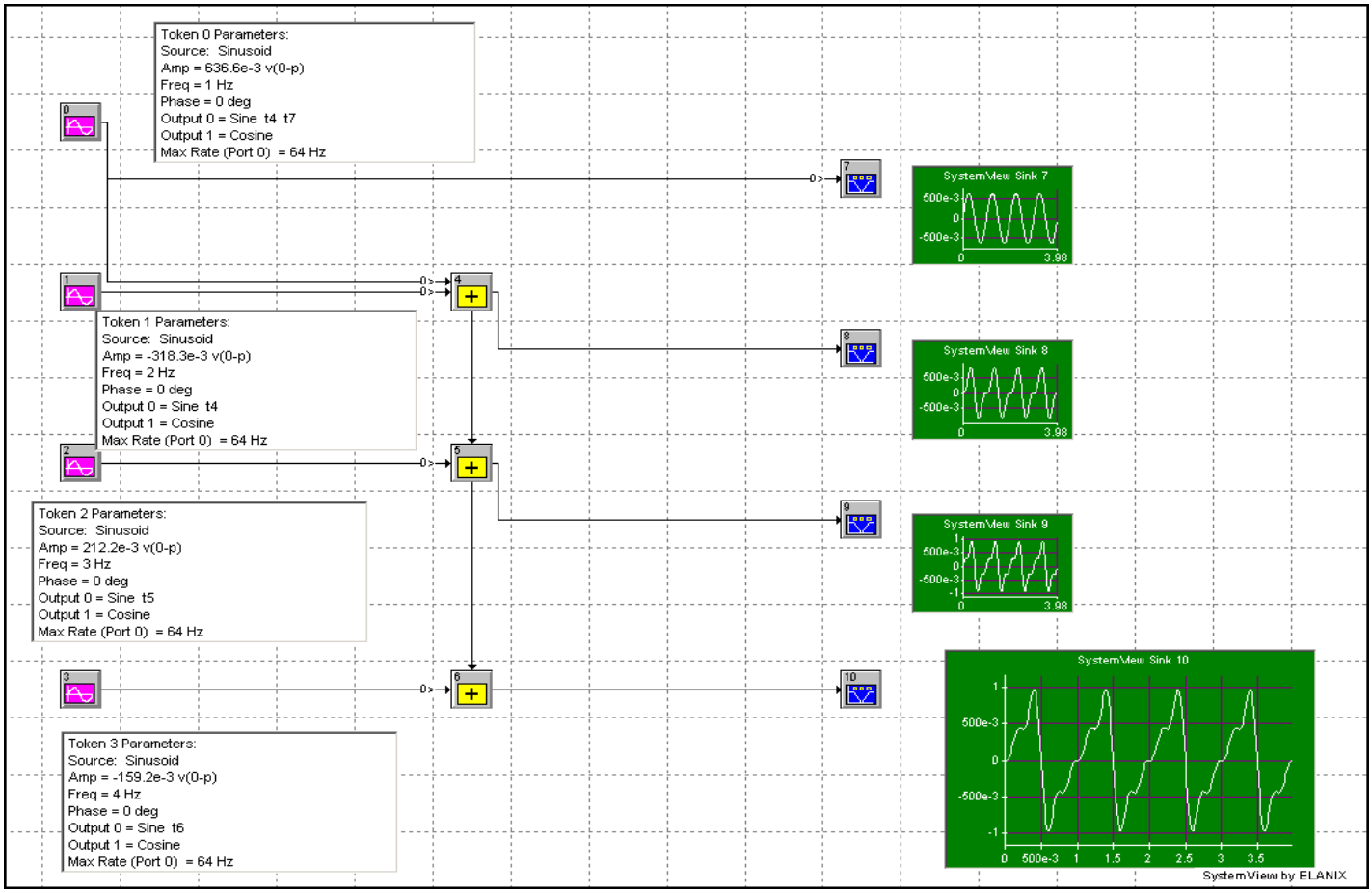
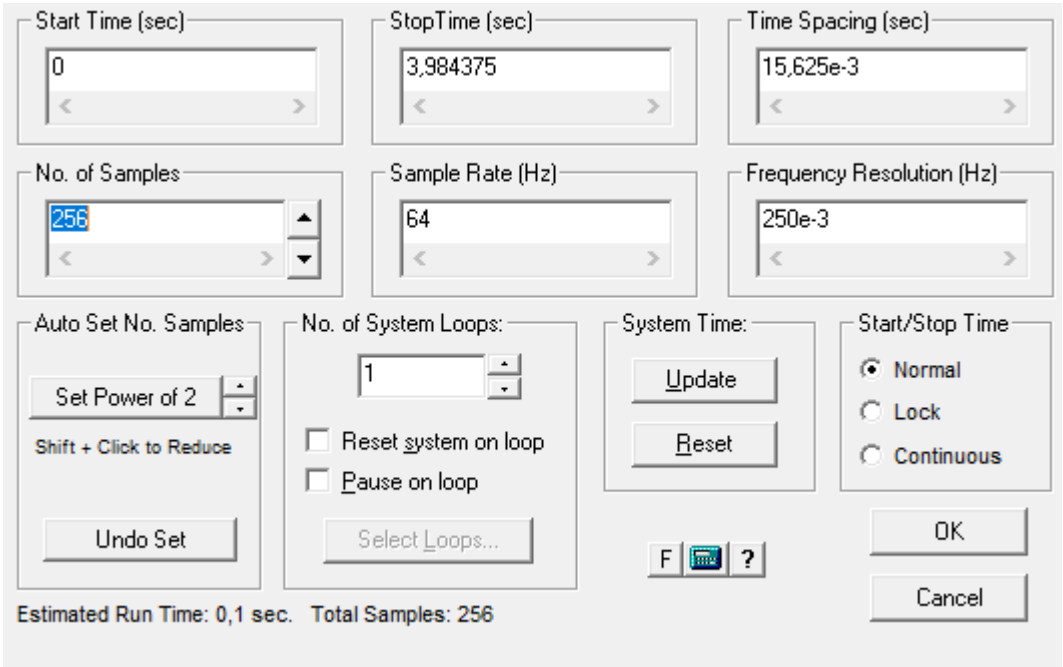
151REB085
REBM0-1

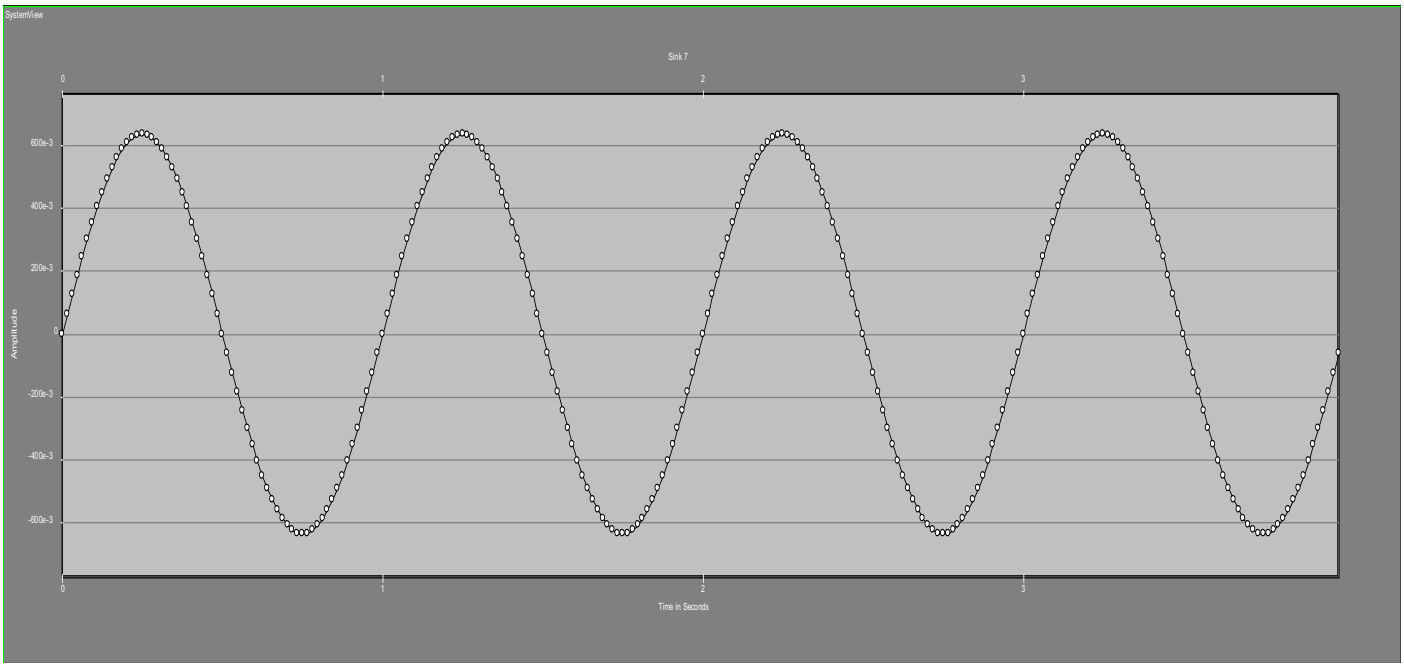
Mērījumu blokshēma

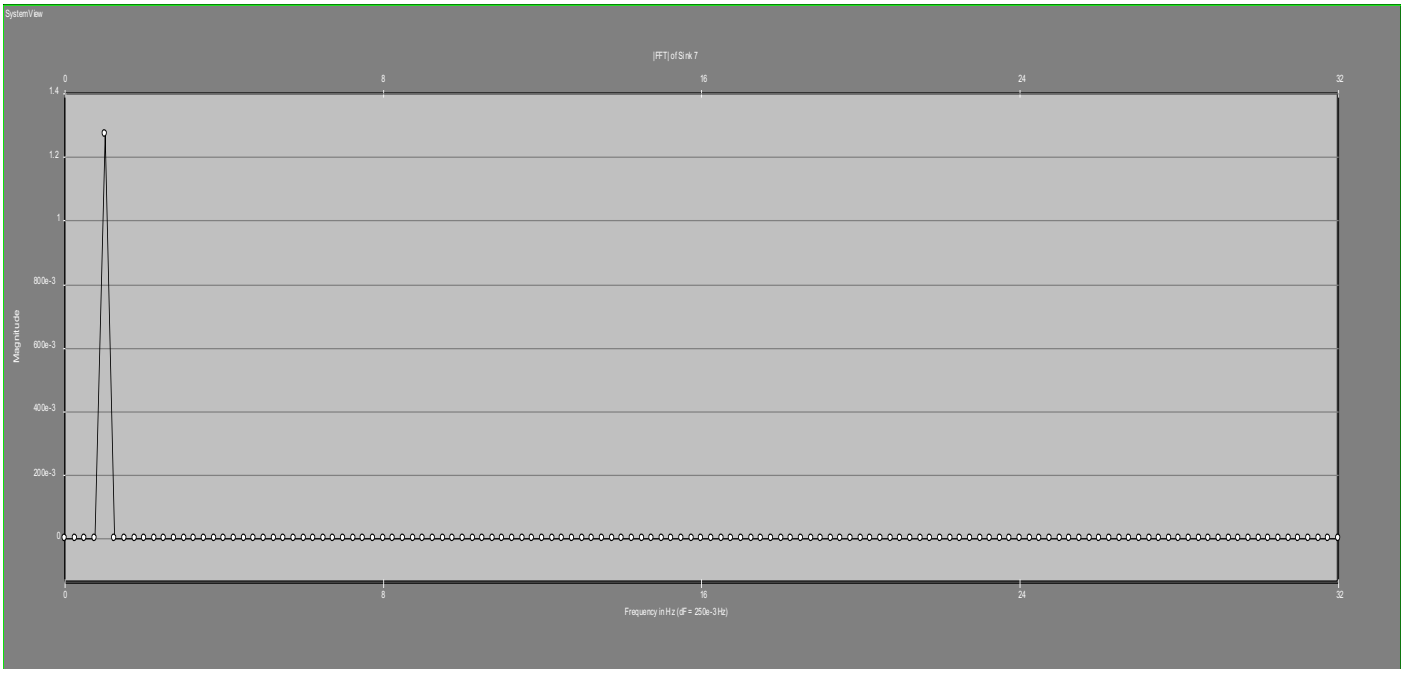


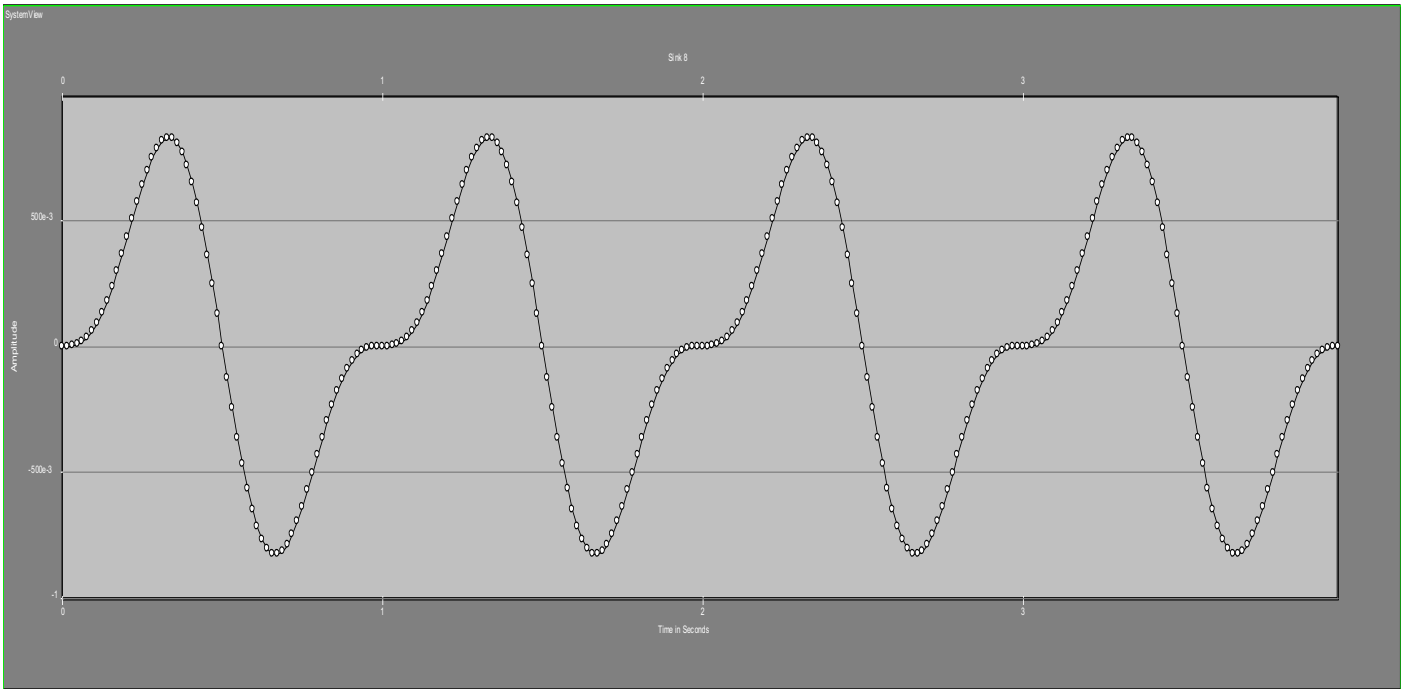
Simulēšanas laika parametri

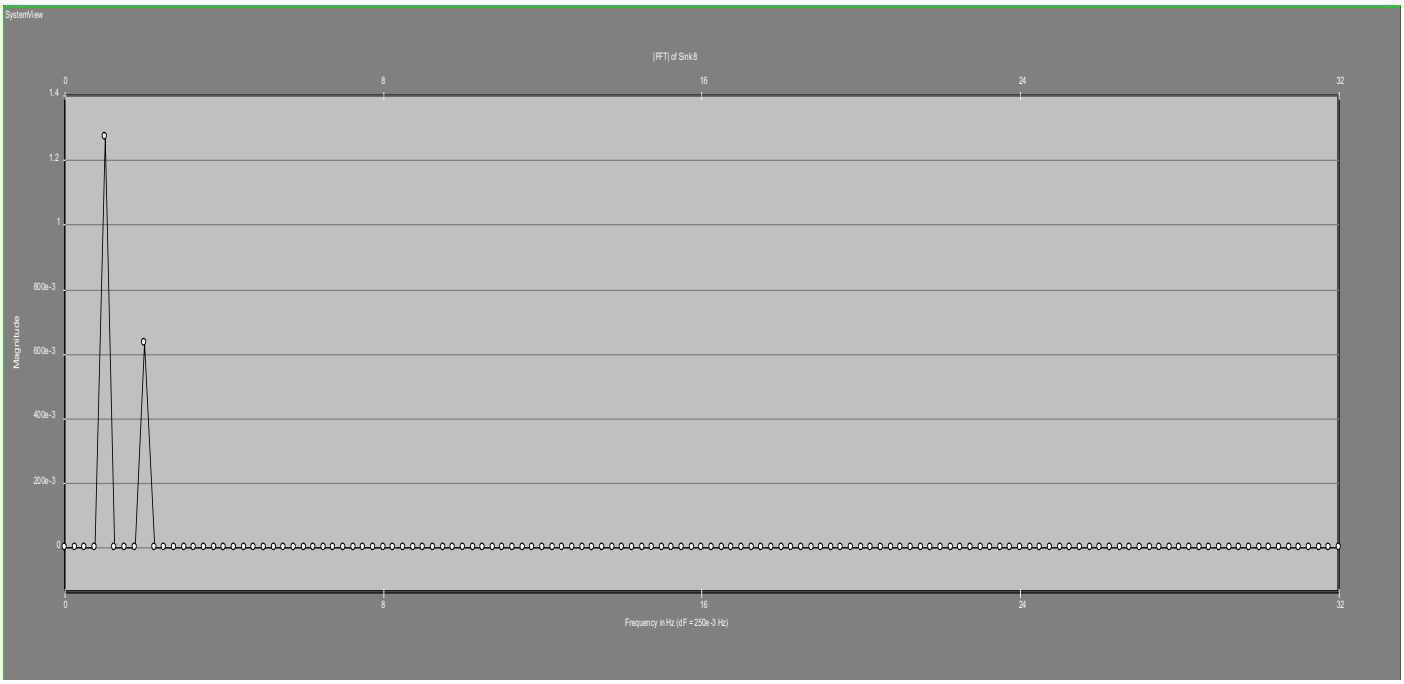


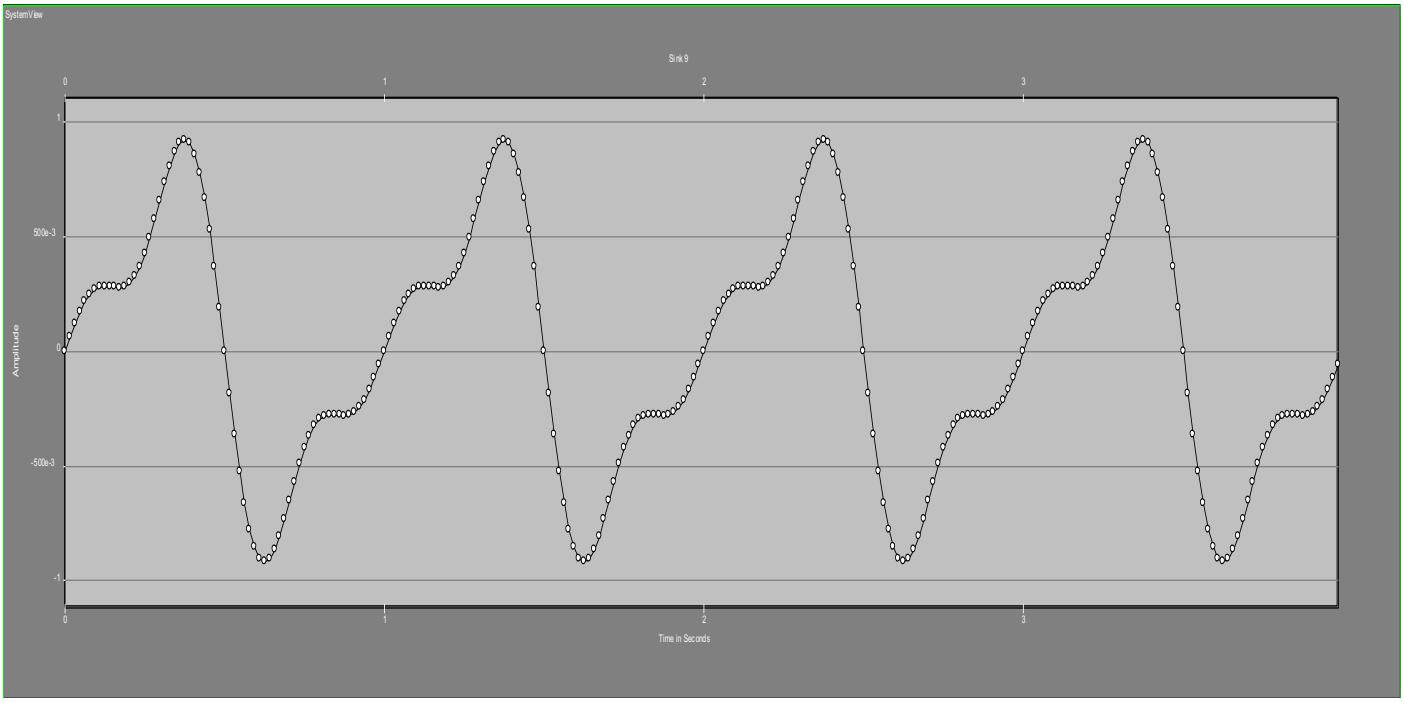
Iegūtās oscilogrammas

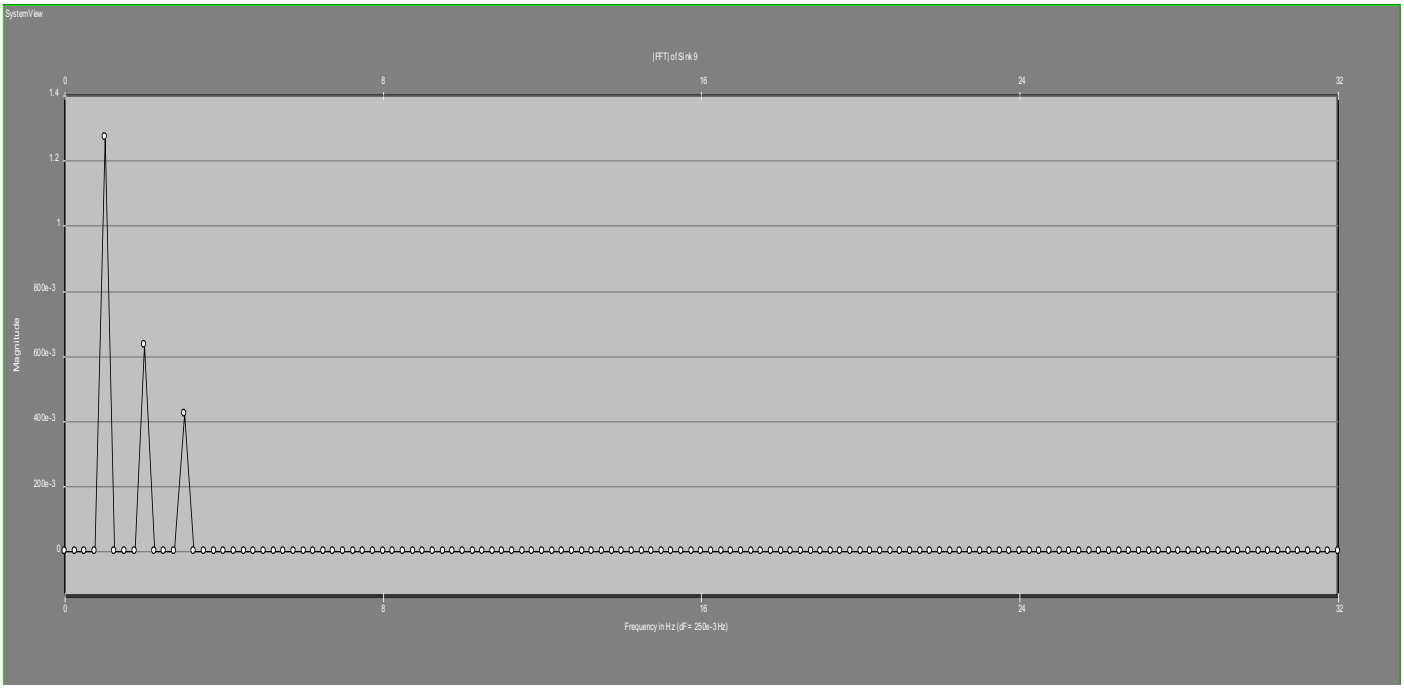


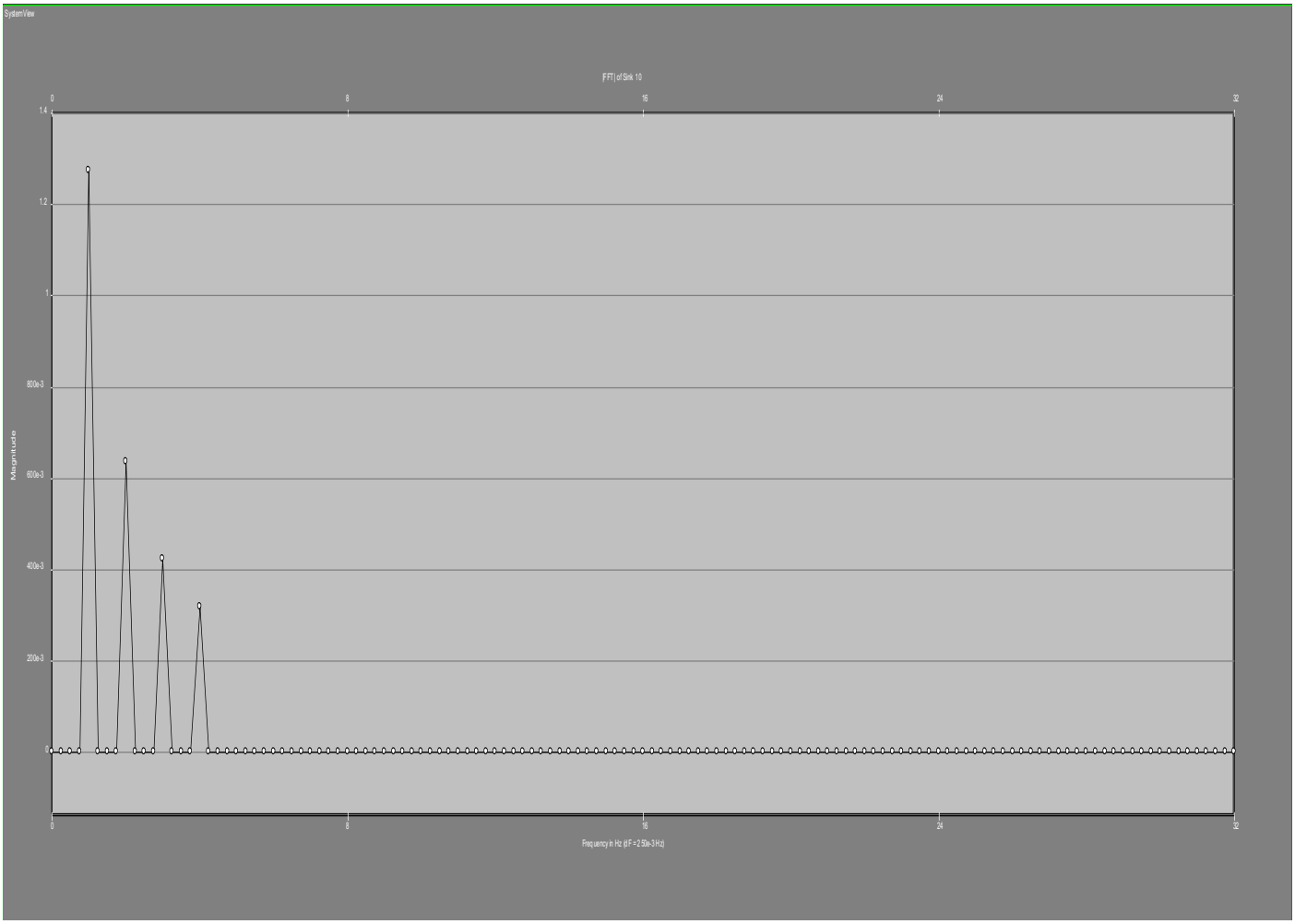


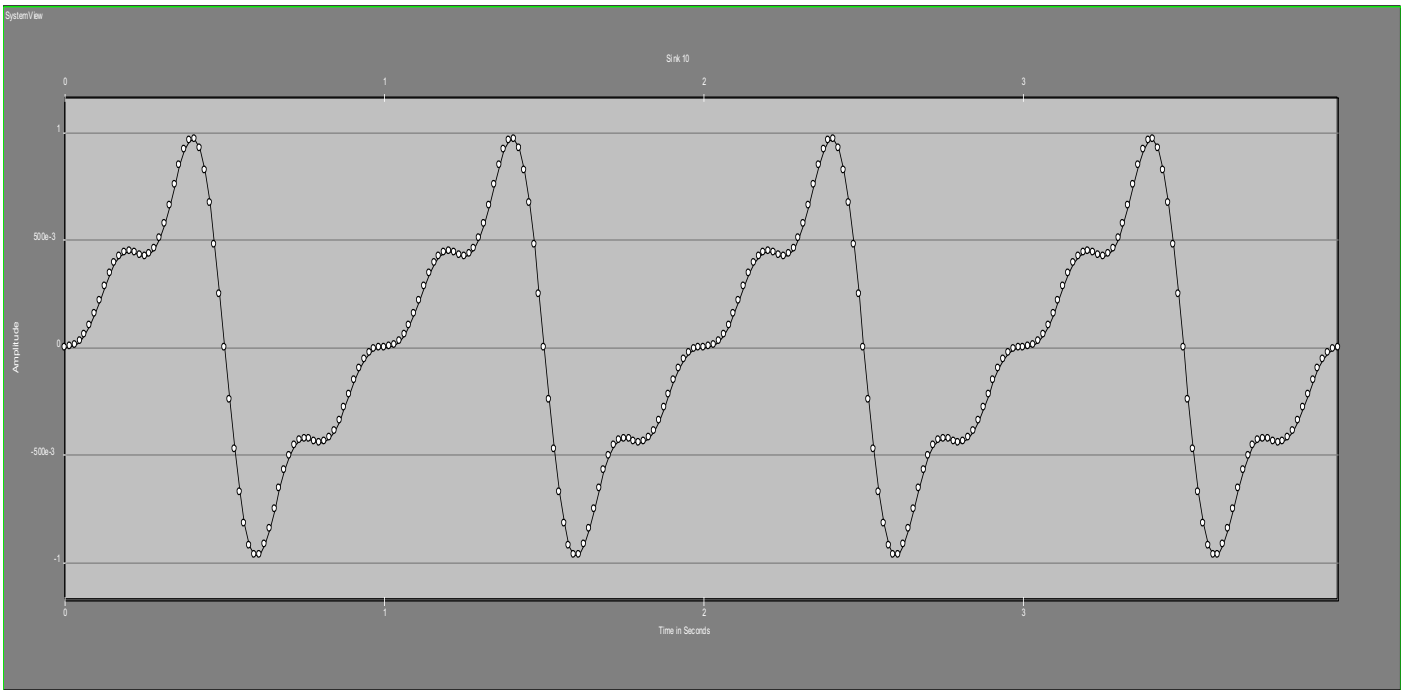

SystemView
Sink 8
0
1
2
3
500e-3
0
-500e-3
-1
Amplitude
Time in Seconds


SystemView
[FFT] of Sink 8
0
8
16
24
32
1.4
1.2
1
800e-3
600e-3
400e-3
200e-3
0
Magnitude
Frequency in Hz (dF = 250e-3 Hz)

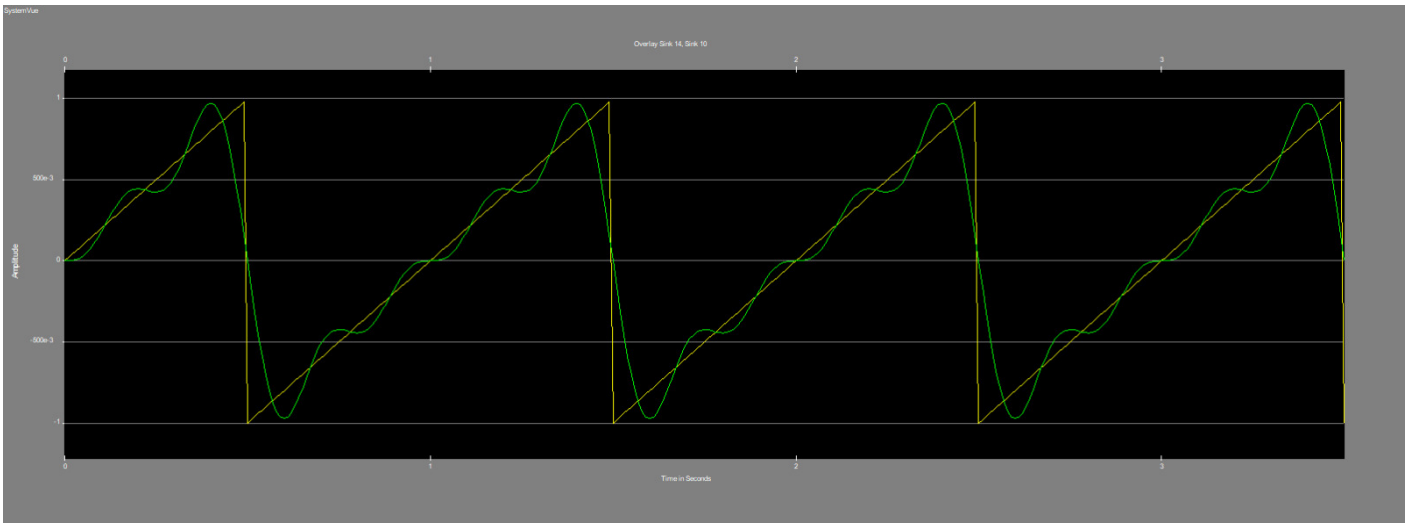

SystemView
Sink 9
0
1
2
3
1
500e-3
0
-500e-3
-1
Amplitude
Time in Seconds


SystemView
|FFT| of Sink 9
0
8
16
24
32
1.4
1.2
1
800e-3
600e-3
400e-3
200e-3
0
Magnitude
Frequency in Hz (dF = 250e-3 Hz)

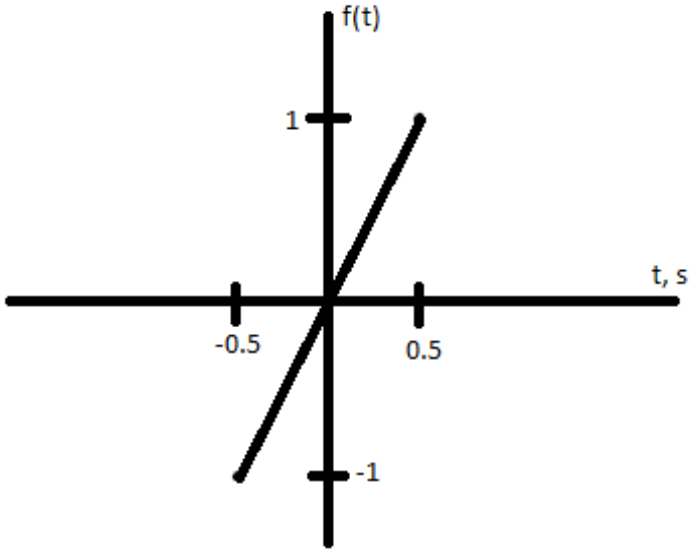

SystemView
FFT of Sink 10
0
8
16
24
32
1.4
1.2
1
800e-3
600e-3
400e-3
200e-3
Magnitude
Frequency in Hz (dF = 250e-3 Hz)


SystemView
Sink 10
0
1
2
3
500e-3
-500e-3
-1
Amplitude
Time in Seconds

Salīdzinājums

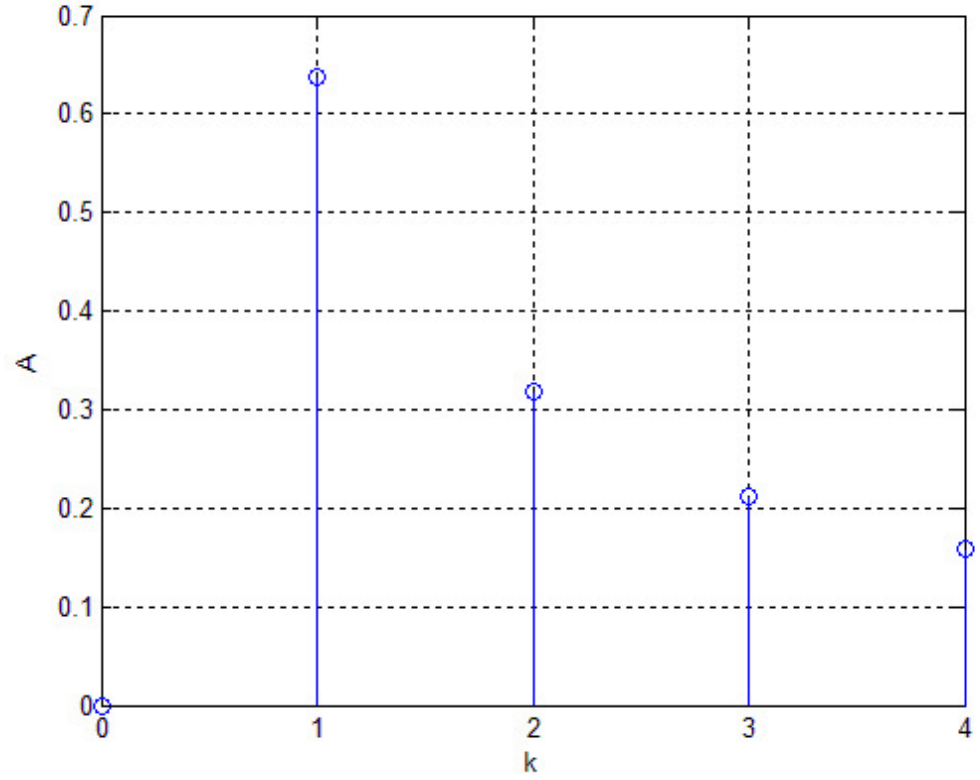


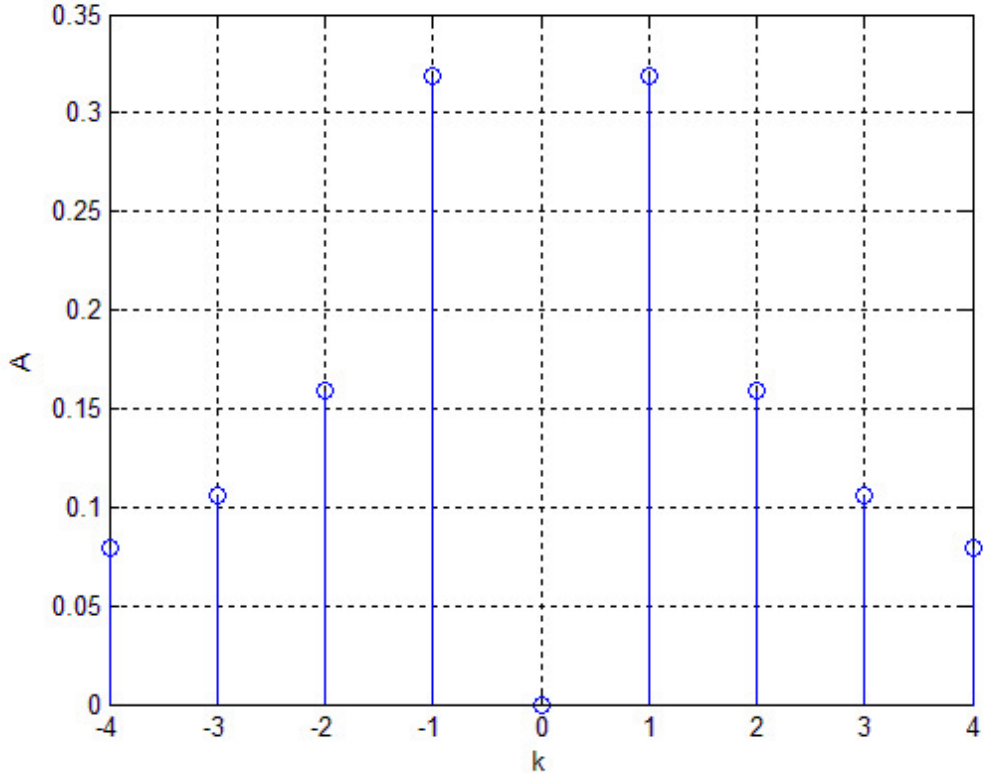
Mājas darbs
2. variants



T = 1s
T= 2l
l = 0.5

f(t) = 2t
$s(t) = \frac{a0}{2} + \sum_{n=1}^{\infty}(a_n \cos\frac{\pi nt}{l} + b_n \sin\frac{\pi nt}{l})$
tā kā f(t) ir nepara funkcija a_n nav
$a_0 = \frac{1}{l}\int_{-l}^{l} f(t)dt = \frac{1}{0.5}\int_{-0.5}^{0.5} 2tdt = 0$
$b_n = \frac{1}{l}\int_{-l}^{l} f(t) * \sin(\frac{\pi nt}{l})\, dt = \frac{1}{0.5}\int_{-0.5}^{0.5} 2t * \sin(\frac{\pi nt}{0.5})\, dt = -\frac{1}{\pi n} * \cos(\pi n) + \frac{1}{\pi n \pi n} * \sin(\pi n) - \frac{1}{\pi n} * \cos(-\pi n) - \frac{\sin(-\pi n)}{\pi n \pi n}$
$b_0 = -\frac{1}{\pi n} * \cos(\pi n) - \frac{\sin(\pi n)}{\pi n \pi n} - \frac{\cos(-\pi n)}{\pi n} - \frac{\sin(-\pi n)}{\pi n \pi n}$
$b_1 = -\frac{1}{\pi n} * \cos(\pi) - \frac{\sin(\pi)}{\pi\pi} - \frac{\cos(-\pi)}{\pi} - \frac{\sin(-\pi)}{\pi\pi} = 0.3183 + 0 + 0.3183 - 0 = 0.666$
$b_2 = -\frac{1}{2\pi} * \cos(2\pi) - \frac{\sin(2\pi)}{4\pi\pi} - \frac{\cos(-2\pi)}{2\pi} - \frac{\sin(-2\pi)}{4\pi\pi} = -0.318$
$b_3 = 0.2122$
$b_4 = -0.1592$


0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
A
0
1
2
3
4
k


0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
A
-4
-3
-2
-1
0
1
2
3
4
k

Secinājumi

Laboratorijas darbā izmantojam trigonometrisku funkciju Furjē rindu ar kuru palīdzību var izveidot gandrīz jebkuru periodisku signālu tuvinājumu. Šim nolūkam tika izmantoti harmoniskas svarstības summas. Jo vairāk ir harmoniku, jo mazāk bus kļūda. No SystemView iegūtiem grafikiem var redzēt, ka četras harmonikas nepietiek, lai izveidotu nekropļotu zagveida signālu. No teorētiskiem grafiekiem var redzēt, ka teorētiski aprēķinātas amplitūdas 2 reiz lielākas par SystemView iegūtiem grafikiem, jo spektra iegūšanai programma izmanto diskrēto Furjē transformāciju.