

Anhang

1.1 Quellcode

1.1.1 Quellcode Versuch 1

```
# -*- coding: utf-8 -*-
"""
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"""

import numpy as np
import matplotlib.pyplot as plt
import redlab as rl
import time

def AdcRead():
    return np.median(rl.cbVInScan(0,0,0,4000,8000,1))

def AdcScan():
    return rl.cbVInScan(0,0,0,4000,8000,1)

def DAOut(v):
    return rl.cbVOut(0,0,101,v)

def sinus():
    samples = 10
```

```

t = np.linspace(0, 2*np.pi, samples)
y = np.sin(t)
y = y + np.abs(np.min(y))
for i in y:
    DAOut(i)
    time.sleep(1/samples)

def nyquist():
    freq = np.linspace(2000,8000,7)
    x = np.linspace(0,4000/8000, 4000)
    dt=1/8000
    for i in freq:
        print(i)
        input()
        y = AdcScan()
        plot(x,y, 'Zeit ['$s$]', 'Amplitude ['$V$]', '$f={0}$,$f_s={1}$',
              spec=np.abs(np.fft.fft(y)/len(y)))
        fftLen = len(spec)
        f=np.zeros(fftLen)
        for j in range(0,fftLen):
            f[j]=j/(fftLen*dt)
        plot(f, spec, 'frequency ['$f$]', '$|Y(f)|$', '$f={0}$,$f_s={1}$')

def plot(x,y, xlabel, ylabel, title, filename):
    dpi = 75
    fig,ax = plt.subplots(figsize=(800/dpi,600/dpi), dpi=dpi)
    ax.plot(x, y)
    ax.set_title(title)
    ax.set_xlabel(xlabel)
    ax.set_ylabel(ylabel)
    plt.show()
    fig.savefig(filename, transparent=True, pad_inches=0, dpi=75)

```


1.2 Messergebnisse

A/D Wandler Output	Keithley Messgerät	166.75 mV	11.111
0,5	0,511	0,011	
1,0	1,014	0,014	
1,5	1,520	0,02	
2,0	2,031	0,031	
2,5	2,538	0,038	
3,0	3,045	0,045	
3,5	3,556	0,056	
4,0	4,062	0,062	
4,5	4,569	0,069	
5,0	5,071	0,071	
std = 0,0024			
theoretischer Quantisierungsfehler: 0,0049			

Messfehler:

25.6.15 M. J. R.

Eingangsspannung	Messfehler PM	Messfehler A/D
1	+0,01	-0,004
2	+0,023	-0,005
3	+0,010	-0,006
4	+0,001	-0,100
5	+0,003	+0,090
6	+0,006	-0,001
7	-0,001	-0,008
8	-0,004	-0,007
9	-0,002	-0,006
10	-0,1	-0,001

$$std = 0,0021 \quad std = 0,0011$$

theoretischer Quantisierungsfehler: 0,0098 V

Abbildung 1.2: Sinussignal

15.6.15 M. Kör

Gingangsspannung Volt	PM	A/D Wandler
1	1,31	1,00 0,996
2 (1,997)	2,02	1,992
3 (3,014)	3,04	3,008
4 (4,004)	4,005	3,994
5 (5,000)	5,003	4,990
6 (6,007)	6,001	6,006
7 (7,000)	6,999	6,992
8 (8,002)	7,998	7,998
9 (9,002)	8,91	8,994
10 (10,000)	9,9	9,990

Abbildung 1.3: Sinussignal