E7

May 23, 2023

1 Jupyter-Notebook zur Experimentalphysik II, SS 2023

von Dr. Markus Merschmeyer und Sebastian Wiedenbeck, III. Physikalisches Institut A, RWTH Aachen University

1.1 Übungsaufgabe: Feldstärke einer Leiterplatte (numerisch)

[1]:
```
import numpy as np
import matplotlib.pyplot as plt
import scipy.constants as scc

eps0  = scc.epsilon_0
e     = scc.e
sigma = 1
```

[2]:
```
def getFieldStrength(d=1.0, N=11, l=1.0):
    E = np.array([eps0 * e / d**2])
    for i in range(0, int(np.ceil(N/2))):
        for j in range(0, int(np.floor(N/2))):
            r = np.array([i*l, j*l, d])
            E += (4 * eps0 * e / r.dot(r)**(3/2) * r)[2]
    return E
```

[3]:
```
for v_d in [0.1, 1.0, 10.0] :
    for v_N, v_l in [(21,0.5), (201,0.05), (2001,0.05)]:
        print ("E_z(d=",v_d,",N=",v_N,",l=",v_l,") = ",␣
 ↪getFieldStrength(v_d,v_N,v_l),"V/m")
```

```
E_z(d= 0.1 ,N= 21 ,l= 0.5 ) =  [7.23739541e-28] V/m
E_z(d= 0.1 ,N= 201 ,l= 0.05 ) =  [4.91959098e-27] V/m
E_z(d= 0.1 ,N= 2001 ,l= 0.05 ) =  [4.97758522e-27] V/m
E_z(d= 1.0 ,N= 21 ,l= 0.5 ) =  [4.32869808e-29] V/m
E_z(d= 1.0 ,N= 201 ,l= 0.05 ) =  [3.04787637e-27] V/m
E_z(d= 1.0 ,N= 2001 ,l= 0.05 ) =  [3.61743842e-27] V/m
E_z(d= 10.0 ,N= 21 ,l= 0.5 ) =  [5.09481199e-30] V/m
E_z(d= 10.0 ,N= 201 ,l= 0.05 ) =  [4.62125736e-28] V/m
E_z(d= 10.0 ,N= 2001 ,l= 0.05 ) =  [2.94492815e-27] V/m
```