

Impedanz verschiedener Dipole des Durchmessers d, ungeradzahlicher Vielfacher von Lambda/2 im freien Raum, sinusförmige Stromverteilung

- `reset():digits:=16:d:=1/1000:ZF0:=120*PI:ur:=1:er:=1:lambda:=1:`

BALANIS-Funktionen

- `Z_Re:=(k)->ZF0*sqrt(ur/er)/(2*PI)*(EULER+ln(2*PI*k)-Ci(2*PI*k)+1/2*sin(2*PI*k)*(Si(4*PI*k)-2*Si(2*PI*k))+1/2*cos(2*PI*k)*(EULER+ln(PI*k)+Ci(4*PI*k)-2*Ci(2*PI*k))):`
- `Z_Im:=(k)->ZF0*sqrt(ur/er)/(4*PI)*(2*Si(2*PI*k)+cos(2*PI*k)*(2*Si(2*PI*k)-Si(4*PI*k))-sin(2*PI*k)*(2*Ci(2*PI*k)-Ci(4*PI*k)-Ci(2*2*PI*d^2/4/k*(ur*er)/lambda^2))):`
- `m:=[(2*i-1)/2 $ i=1..10];`
$$\left[\frac{1}{2}, \frac{3}{2}, \frac{5}{2}, \frac{7}{2}, \frac{9}{2}, \frac{11}{2}, \frac{13}{2}, \frac{15}{2}, \frac{17}{2}, \frac{19}{2} \right]$$
- `for i from 1 to 10 do
Z[i]:=[op(m,i),float(Z_Re(op(m,i))+I*Z_Im(op(m,i)))]:
end_for:`

Dipol-Impedanzen für l/Lambda laut Liste m

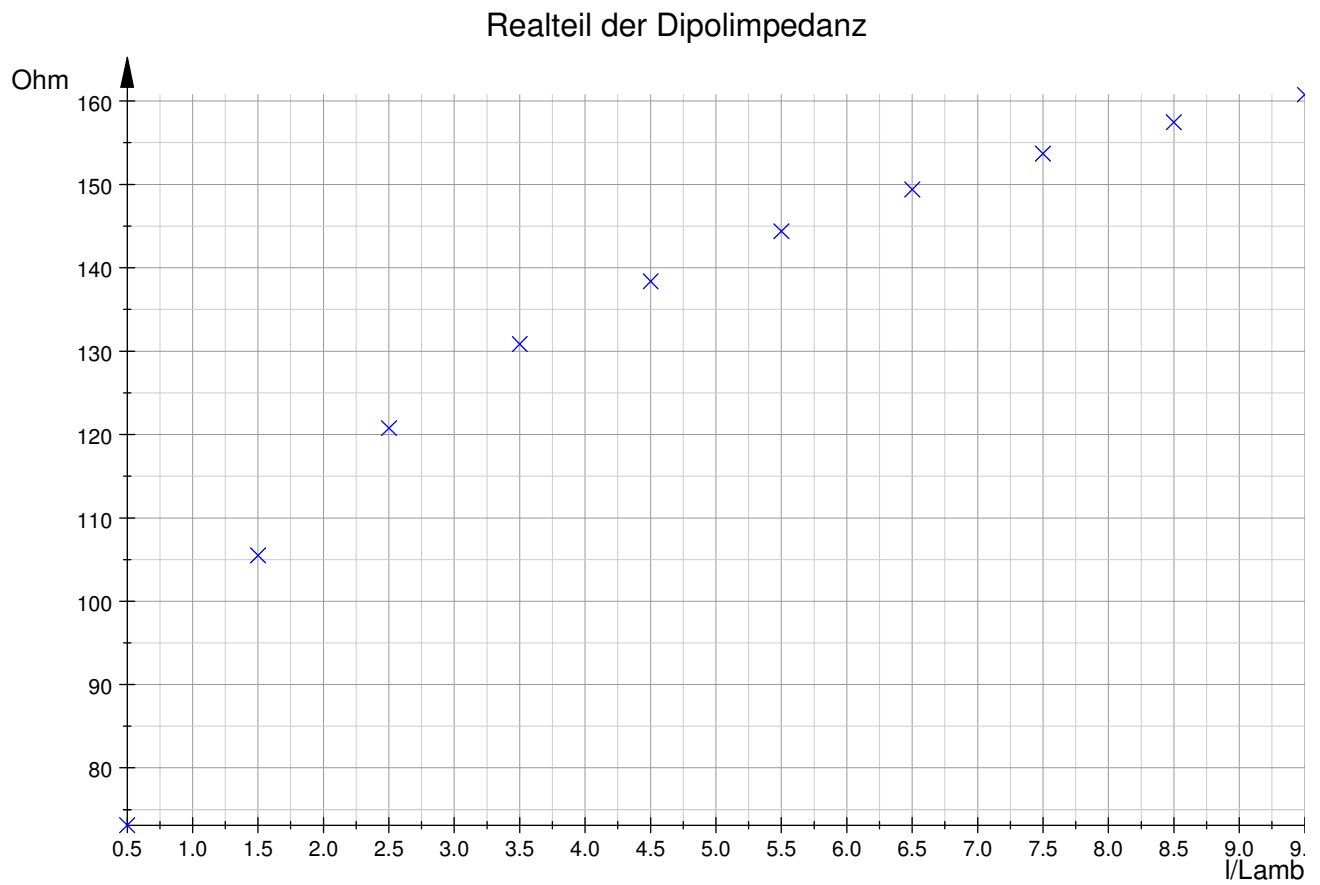
- `Z;`
$$\left[\begin{array}{l} 1 = \left[\frac{1}{2}, 73.12960179 + 42.54454728 \cdot i \right] \\ 2 = \left[\frac{3}{2}, 105.4942314 + 45.54101884 \cdot i \right] \\ 3 = \left[\frac{5}{2}, 120.7661345 + 46.17087239 \cdot i \right] \\ 4 = \left[\frac{7}{2}, 130.8455471 + 46.44249809 \cdot i \right] \\ 5 = \left[\frac{9}{2}, 138.3788851 + 46.59370815 \cdot i \right] \\ 6 = \left[\frac{11}{2}, 144.3959125 + 46.69001215 \cdot i \right] \\ 7 = \left[\frac{13}{2}, 149.4057551 + 46.75671907 \cdot i \right] \\ 8 = \left[\frac{15}{2}, 153.6976631 + 46.80565149 \cdot i \right] \\ 9 = \left[\frac{17}{2}, 157.4518103 + 46.84307732 \cdot i \right] \\ 10 = \left[\frac{19}{2}, 160.7880554 + 46.87262776 \cdot i \right] \end{array} \right.$$

- `Liste:=[[op(Z[i],1),Re(op(Z[i],2)),RGB::Blue] $ i=1..10]:`
- `plot(plot::PointList2d(Liste, PointStyle=XCrosses, PointSize=2, Color=RGB::Blue, GridVisible=TRUE, SubgridVisible=TRUE,`

```

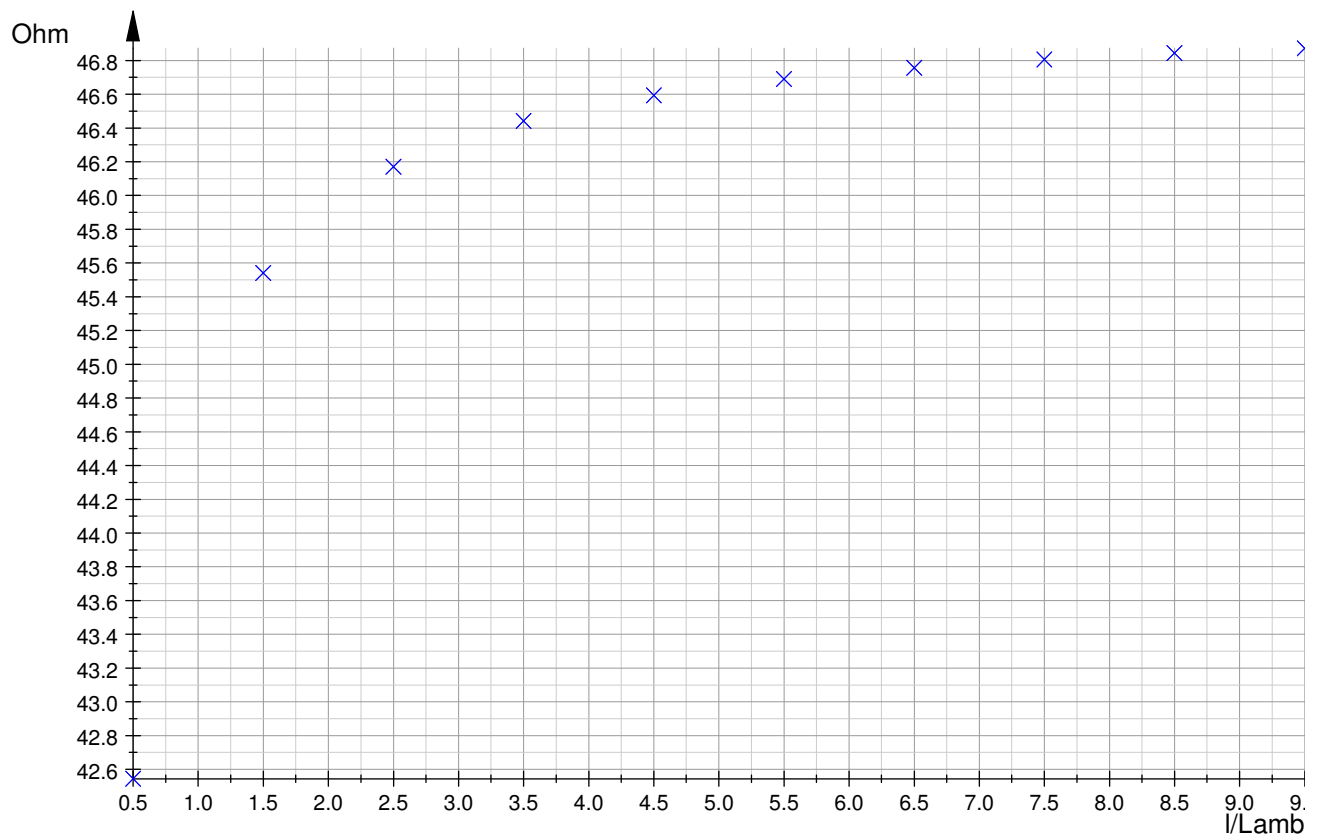
Scaling=Unconstrained,
AxesTitles=["l/Lambda", "Ohm"], Height=120*unit::mm,
Width=180*unit::mm, Header="Realteil der Dipolimpedanz"):

```



- `Liste:=[op(Z[i],1),Im(op(Z[i],2)),RGB::Blue] $ i=1..10]:`
- `plot(plot::PointList2d(Liste, PointStyle=XCrosses, PointSize=2, Color=RGB::Blue, GridVisible=TRUE, SubgridVisible=TRUE, Scaling=Unconstrained, AxesTitles=["l/Lambda", "Ohm"], Height=120*unit::mm, Width=180*unit::mm, Header="Imaginärteil der Dipolimpedanz")):`

Imaginärteil der Dipolimpedanz



Impedanz verschiedener Dipole des Durchmessers d , geradzahliges Vielfaches von $\lambda/2$ im freien Raum, sinusförmige Stromverteilung

- `m:=[i $ i=1..10];`
`[1, 2, 3, 4, 5, 6, 7, 8, 9, 10]`
- `for i from 1 to 10 do`
`Z[i]:=[op(m,i), float(Z_Re(op(m,i))+I*Z_Im(op(m,i)))]:`
`end_for:`

Dipol-Impedanzen für l/λ laut Liste `m`

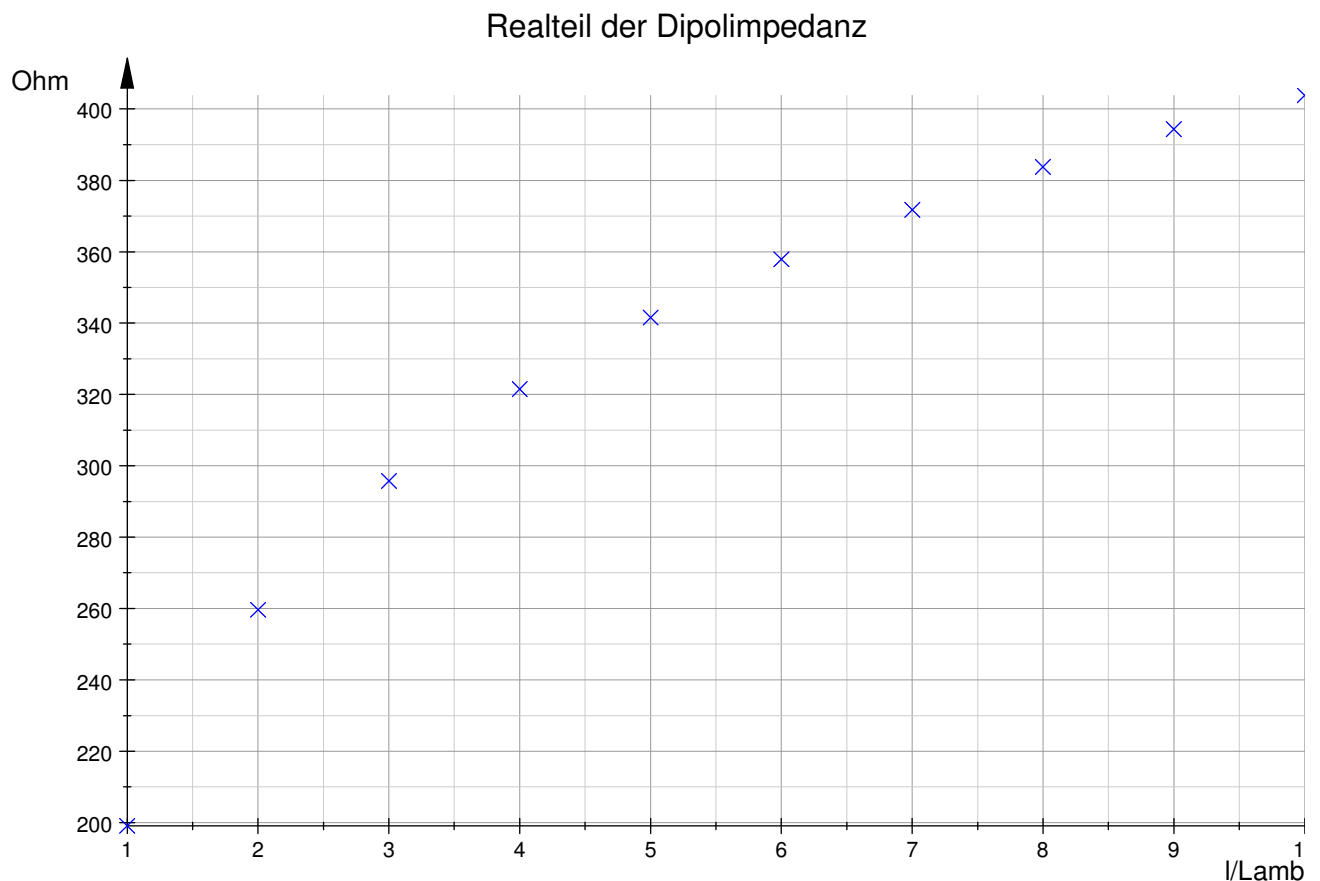
- `Z;`

```

1 = [1, 199.0877106 + 125.4133524 · i]
2 = [2, 259.6341168 + 133.1254085 · i]
3 = [3, 295.7503387 + 135.8348497 · i]
4 = [4, 321.5068037 + 137.2082252 · i]
5 = [5, 341.5256327 + 138.0378209 · i]
6 = [6, 357.9010938 + 138.5907605 · i]
7 = [7, 371.7538126 + 138.9870608 · i]
8 = [8, 383.7580849 + 139.2845827 · i]
9 = [9, 394.3492613 + 139.5161596 · i]
10 = [10, 403.8289717 + 139.697487 · i]

```

- `Liste:=[op(Z[i],1),Re(op(Z[i],2)),RGB::Blue] $ i=1..10]:`
- `plot(plot::PointList2d(Liste, PointStyle=XCrosses, PointSize=2, Color=RGB::Blue, GridVisible=TRUE, SubgridVisible=TRUE, Scaling=Unconstrained, AxesTitles=["l/Lambda", "Ohm"]), Height=120*unit::mm, Width=180*unit::mm, Header="Realteil der Dipolimpedanz"):`



- `Liste:=[op(Z[i],1),Im(op(Z[i],2)),RGB::Blue] $ i=1..10]:`
- `plot(plot::PointList2d(Liste, PointStyle=XCrosses, PointSize=2, Color=RGB::Blue, GridVisible=TRUE, SubgridVisible=TRUE,`

```
Scaling=Unconstrained,  
AxesTitles=["l/Lambda", "Ohm"], Height=120*unit::mm,  
Width=180*unit::mm, Header="Imaginärteil der Dipolimpedanz"):
```

Imaginärteil der Dipolimpedanz

