# *Transferring variables between MatDeck and Python*

In this example, we will illustrate how variables defined in MatDeck script are transfered to Python, and vice versa. Furthermore, we will also demonstrate the use of graphs with exchanged variables. The demonstration is performed by the calculating the FFT of the random signal in both MatDeck, and Python.

In order to calculate FFT in Python, it is necessary to import scipy package, and matplotlib package is required to plot graph. Therefore it is necessary to add these two packages to successfully run example below. In Windows, packages can be added using cmd window via commands such as:
>python -m pip install scipy
>python -m pip install matplotlib

Here is how we generate the random signal and calculate FFT in MatDeck. We use a MatDeck 2-D graph to show the amplitude spectrum of the signal.

```
1   nn := 4096 //length of the signal
2   x_in := normrandvec(0, 1, nn) //signal as random noise
3   X_in1 := fft1(x_in)
4   freq := ynodes(f, 0, 1, nn) //frequency axis
5   graph := join_mat_cols(freq, abs(X_in1)) //amplitude spectrum of the signal
```
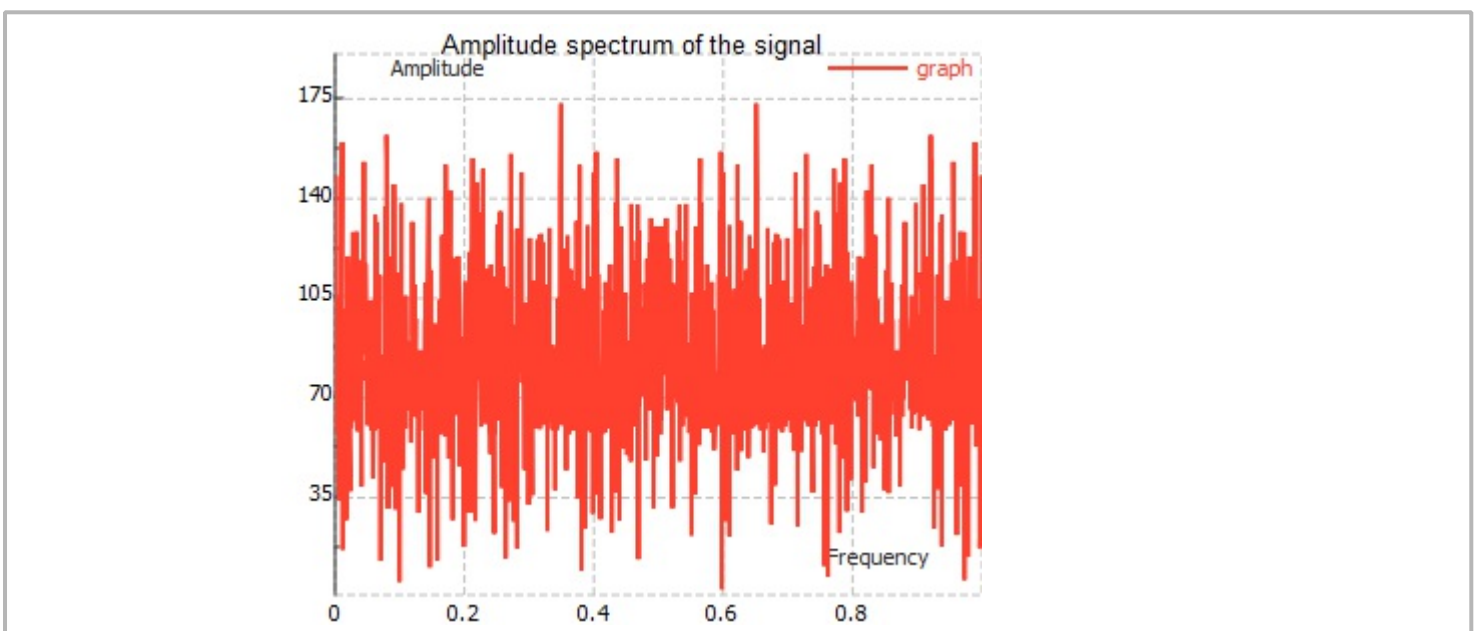

Here is how Python is used to calculate FFT. The Python code is written inside the MatDeck document, using the MatDeck variables ss and freq. The amplitude spectrum is plotted using the Python graph.

```
6   ss := 0 //Variable defined to store result in Python
7
8   #py
9   #This is python code
10  from scipy.fftpack import fft #we need fft function
11  ss1 = fft(x_in)
12  ss=ss1.tolist() #convert ss1 to list which is converted in C++ vector
13  import matplotlib.pyplot as plt  #we need pyplot to plot result
14  #It is possible to plot signal in Python, as well.
15  plt.plot(freq, abs(ss1))
```

```
16
17  plt.grid()
18  plt.show()
19  ###
20  // End of python code
```

The variable ss contains the frequency spectrum of the signal calculated in Python. We can plot the amplitude spectrum in MatDeck.

```
21  graphP := join_mat_rows(freq, abs(ss))
```
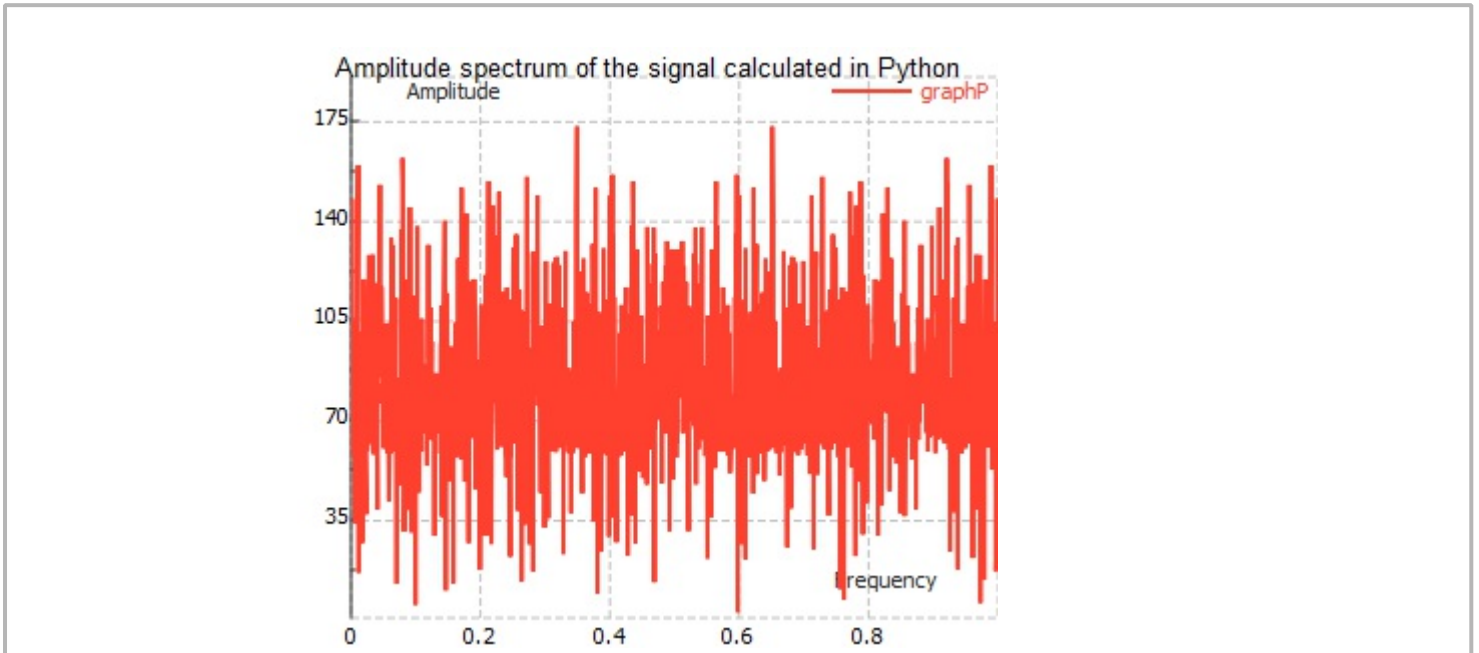

Conclusions

From this example, you can see how easy and intuitive it is to switch between MatDeck and Python whether it be for variable exchange or convenient use of 2-D graphs.