Visualisation

March 2, 2021

1 Data-Visualisation

Visualising Data for Modulation Classification

1.1 Imports

```python
[1]: import numpy as np
     import matplotlib.pyplot as plt
     import os
     import scipy.io

     from IPython.display import display, Math, Latex, HTML
     display(HTML("<style>.container { width:100% !important; }</style>"))
```

```
<IPython.core.display.HTML object>
```

1.2 Visualisation

```python
[2]: def PlotData(Path,Channel,ModulationType,SNR):
         S = str(SNR) + "dB-SNR"
         File = scipy.io.loadmat(Path + Channel + "/" + ModulationType + "/" + S + '.
      ↪mat')
         Data = File['rx']
         TrueData = File['txModulated']

         TrueX,TrueY = TrueData.real, TrueData.imag
         X,Y = Data.real, Data.imag

         N = TrueX.shape[0]
         Ind = np.random.randint(0,N,200)

         plt.figure(figsize=(10,10))
         FileName = "Channel-" + Channel + ", " + "ModulationScheme-" +␣
      ↪ModulationType + ", " + "SNR-" + str(SNR) + "dB"
         plt.title(FileName)
```

```
    plt.xlabel("In-Phase Component")
    plt.ylabel("Quadrature-Phase Component")
    plt.scatter(TrueX[Ind],TrueY[Ind],color='green')
    plt.scatter(X[Ind],Y[Ind],color='red')
    plt.grid()
    plt.savefig("Images/" + FileName + ".jpg")
    plt.show()
```
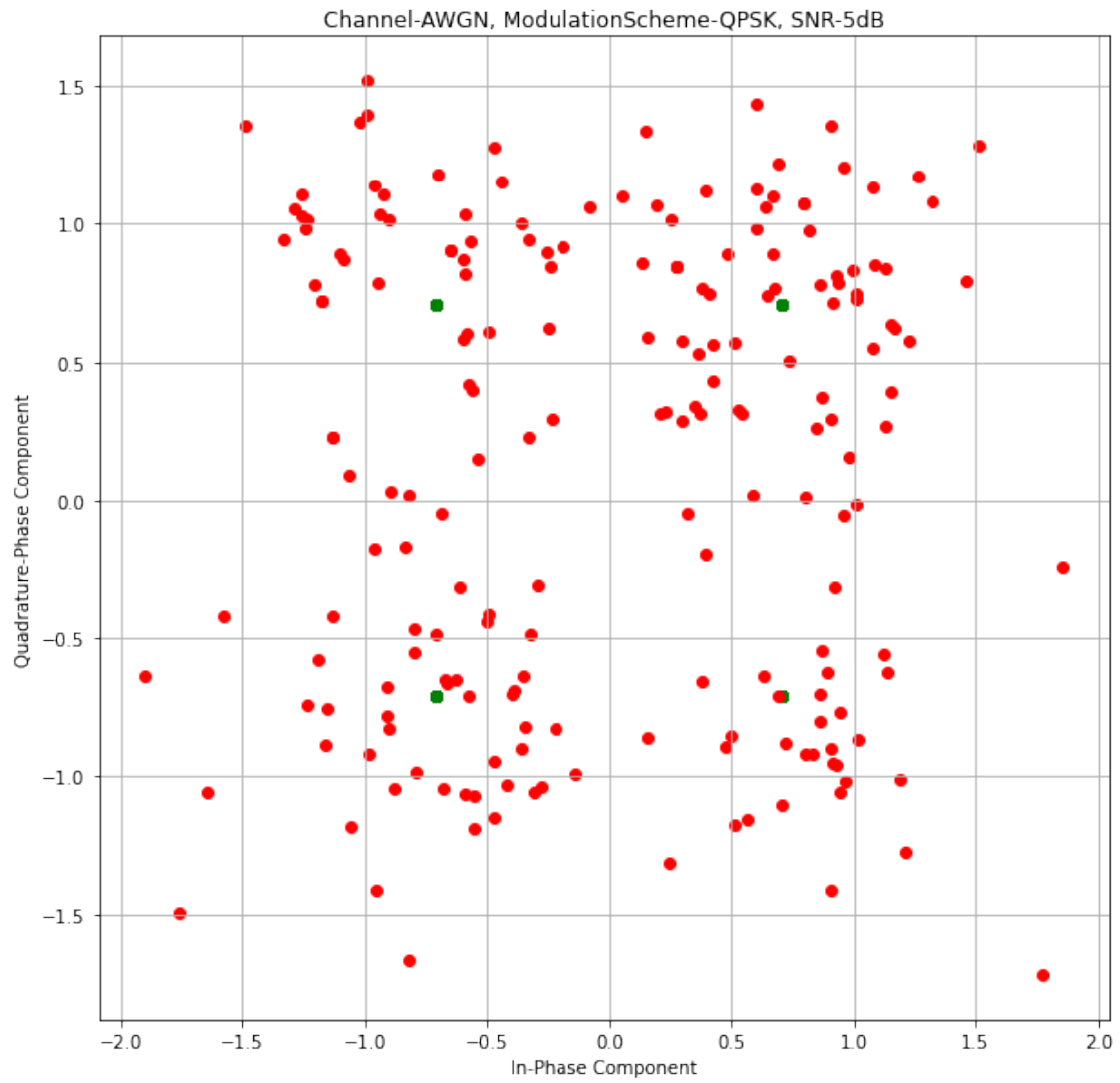
1.2.1 AWGN Channel

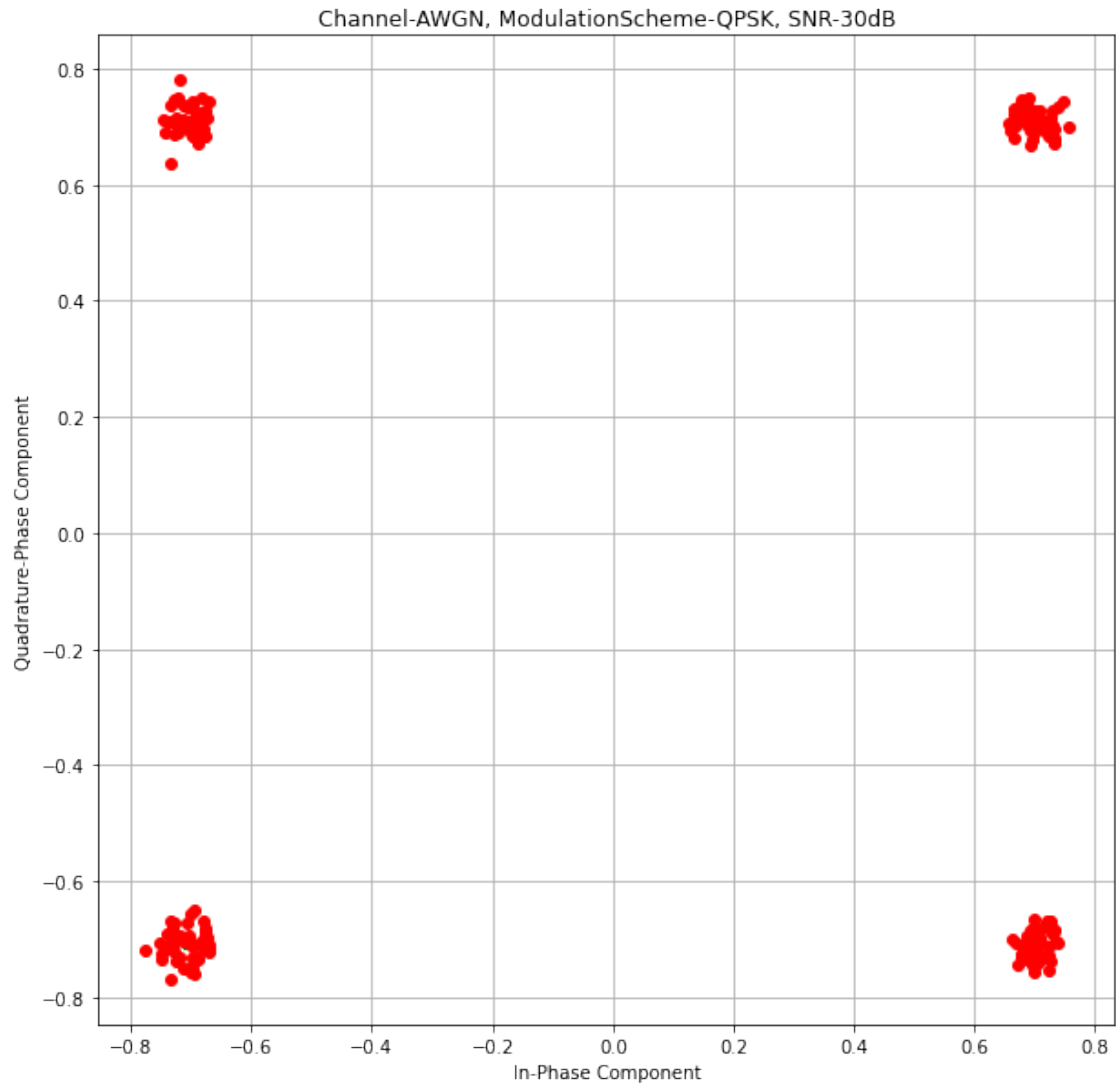**Specifications: - Green:** True Constellations - **Red:** Constellations after adding Noise
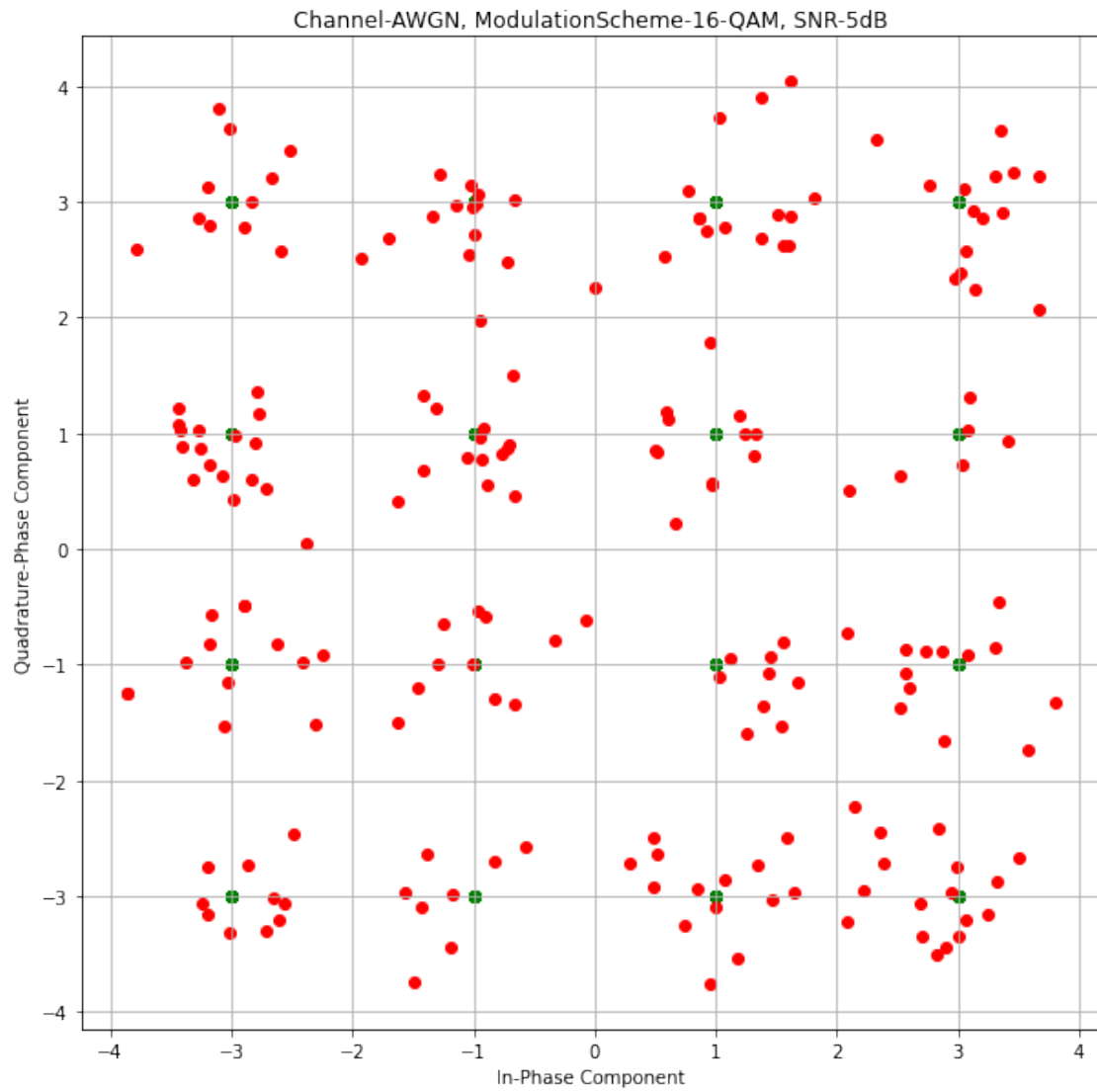
```
[3]: PlotData("../Data/","AWGN","QPSK",5)
     PlotData("../Data/","AWGN","QPSK",30)
     PlotData("../Data/","AWGN","16-QAM",5)
     PlotData("../Data/","AWGN","16-QAM",30)
     PlotData("../Data/","AWGN","64-QAM",5)
     PlotData("../Data/","AWGN","64-QAM",30)
```
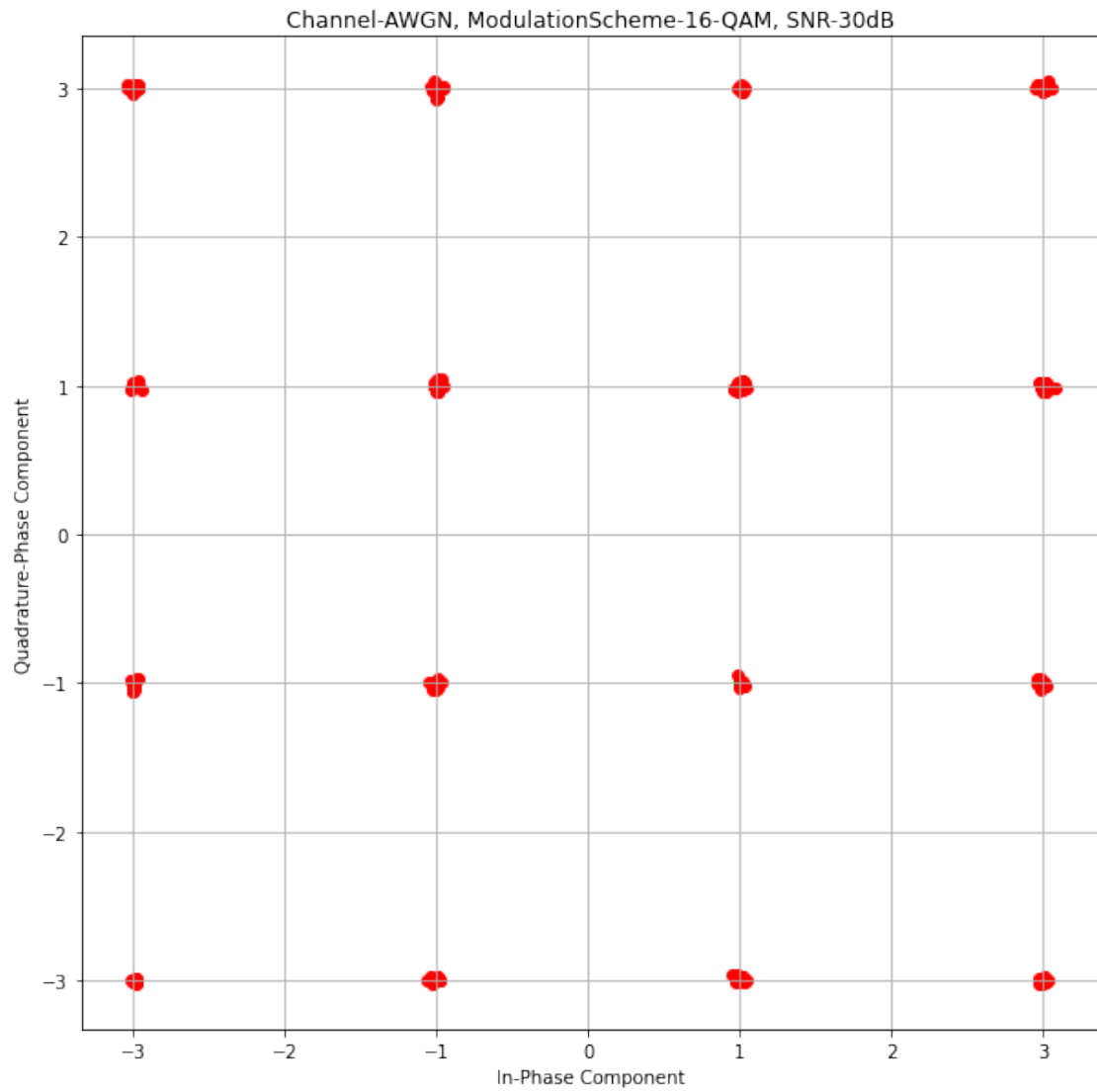
Channel-AWGN, ModulationScheme-QPSK, SNR-5dB

Channel-AWGN, ModulationScheme-QPSK, SNR-30dB

Channel-AWGN, ModulationScheme-16-QAM, SNR-5dB

Channel-AWGN, ModulationScheme-16-QAM, SNR-30dB

Channel-AWGN, ModulationScheme-64-QAM, SNR-5dB

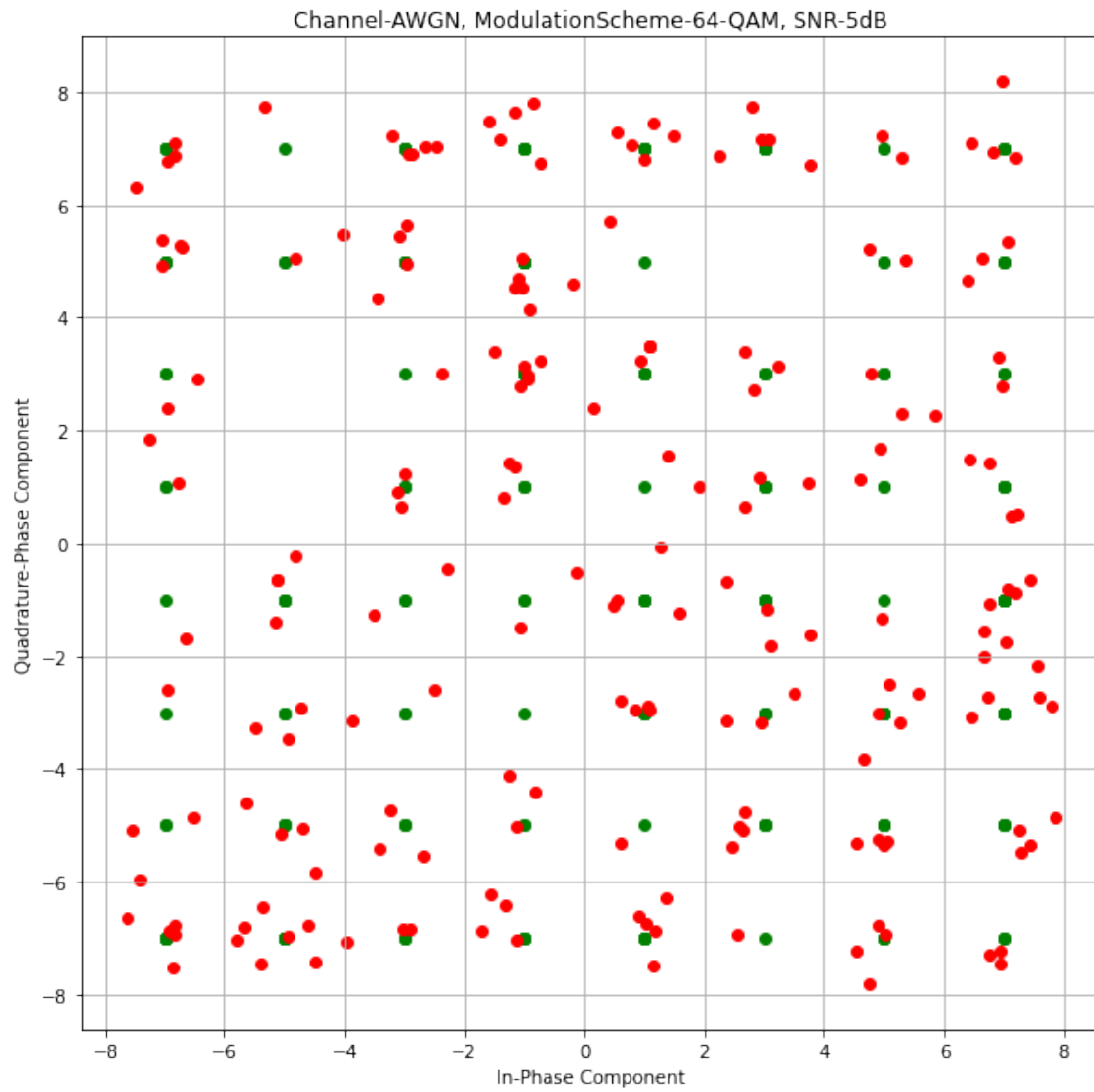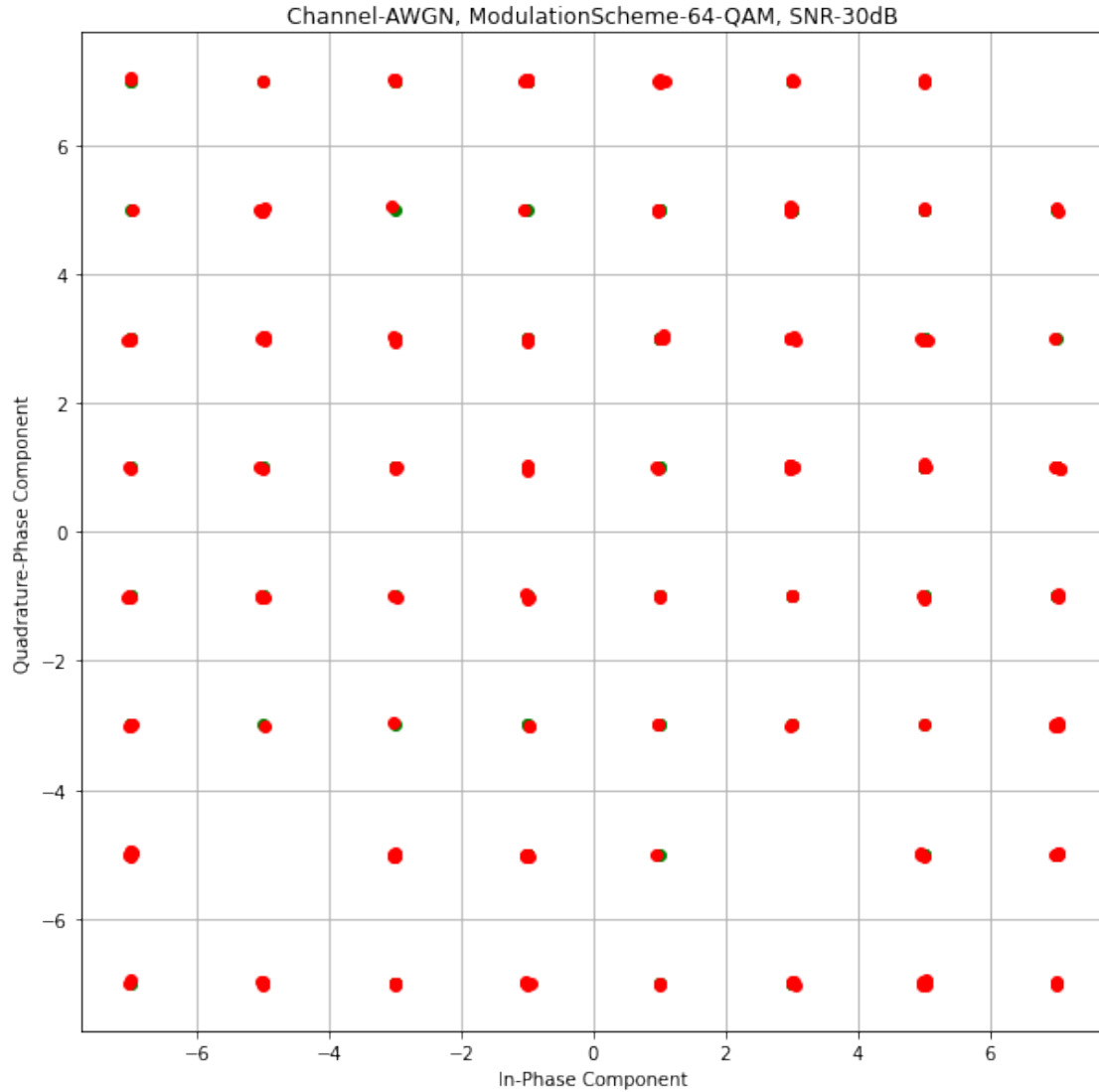Channel-AWGN, ModulationScheme-64-QAM, SNR-30dB

1.2.2 Rayleigh Channel

Specifications: - **Green:** True Constellations - **Red:** Constellations after Fading and adding Noise

```
[4]: PlotData("../Data/","Rayleigh","QPSK",5)
     PlotData("../Data/","Rayleigh","QPSK",30)
     PlotData("../Data/","Rayleigh","16-QAM",5)
     PlotData("../Data/","Rayleigh","16-QAM",30)
     PlotData("../Data/","Rayleigh","64-QAM",5)
     PlotData("../Data/","Rayleigh","64-QAM",30)
```

Channel-Rayleigh, ModulationScheme-QPSK, SNR-5dB

Channel-Rayleigh, ModulationScheme-QPSK, SNR-30dB

Channel-Rayleigh, ModulationScheme-16-QAM, SNR-5dB

Channel-Rayleigh, ModulationScheme-16-QAM, SNR-30dB

Channel-Rayleigh, ModulationScheme-64-QAM, SNR-5dB

Channel-Rayleigh, ModulationScheme-64-QAM, SNR-30dB