

MOBILE COMPUTING LAB (CSD-427) LAB ASSIGNMENT 1

AKSHAT RAJ VANSI (185520)

JANUARY 30, 2022



Contents

1	Communication Toolbox	2
1.1	Waveform Generator	2
1.1.1	App Based OFDM Wafeform Generation	2
1.1.2	App Based QAM Wafeform Generation	3
1.1.3	App Based 5G NR Wafeform Generation	3

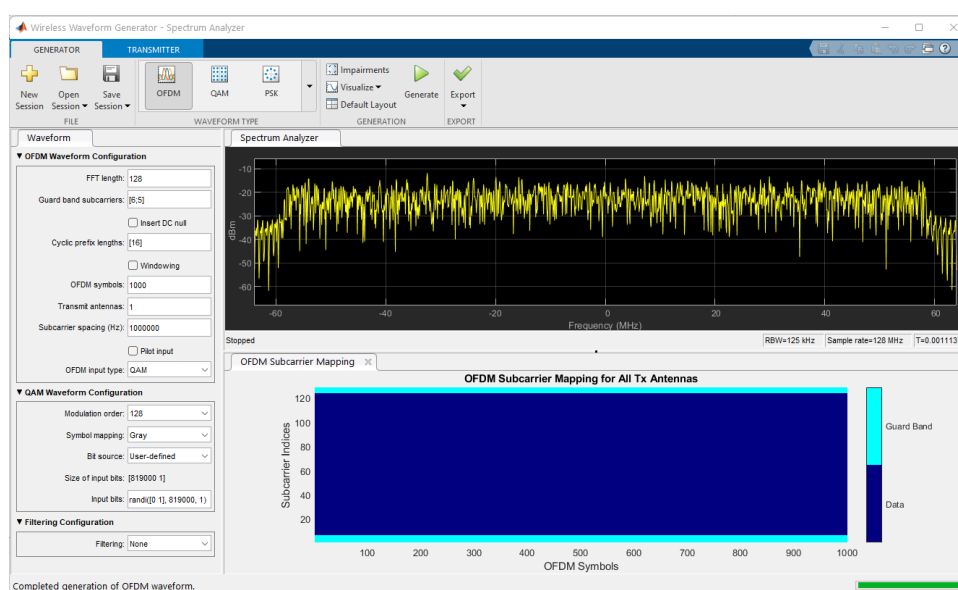
1 Communication Toolbox

1.1 Waveform Generator

The *Wireless Waveform Generator* app enables you to create, impair, visualize, and export modulated waveforms. Using the app, you can: Generate custom OFDM, QAM, and PSK modulated waveforms. Generate sine wave test waveforms. Generate 5G NR uplink and downlink carrier waveforms. This feature requires 5G Toolbox. For more information, see the *5G Waveform Generator (5G Toolbox)* app reference page. Generate LTE modulated waveforms. This feature requires the *LTE Toolbox*. For more information, see the *LTE Waveform Generator (LTE Toolbox)* app reference page. Generate WLAN (802.11™) modulated waveforms. This feature requires the *WLAN Toolbox*. For more information, see the *WLAN Waveform Generator (WLAN Toolbox)* app reference page. Generate Bluetooth modulated waveforms. To use this functionality, download and install the *Communications Toolbox Library for the Bluetooth Protocol* add-on. Export the waveform to your workspace or to a .mat or a .bb file. Export waveform generation parameters to a runnable MATLAB® script or a Simulink® block. Use the exported script to generate your waveform without the app from the command line. Use the exported block as a waveform source in a Simulink model. For more information, see *Waveform From Wireless Waveform Generator App*. Visualize the waveform in constellation diagram, spectrum analyzer, OFDM grid, and time scope plots. Distort the waveform by adding RF impairments, such as AWGN, phase offset, frequency offset, DC offset, IQ imbalance, and memoryless cubic nonlinearity. Generate a waveform that you can transmit using a connected lab test instrument. The app can transmit a waveform by using instruments supported by the *rfsiggen* (*Instrument Control Toolbox*) function. Use of the transmit feature in the app requires *Instrument Control Toolbox™* software. For more information, see the documentation for *Instrument Control Toolbox*.

1.1.1 App Based OFDM Wafeform Generation

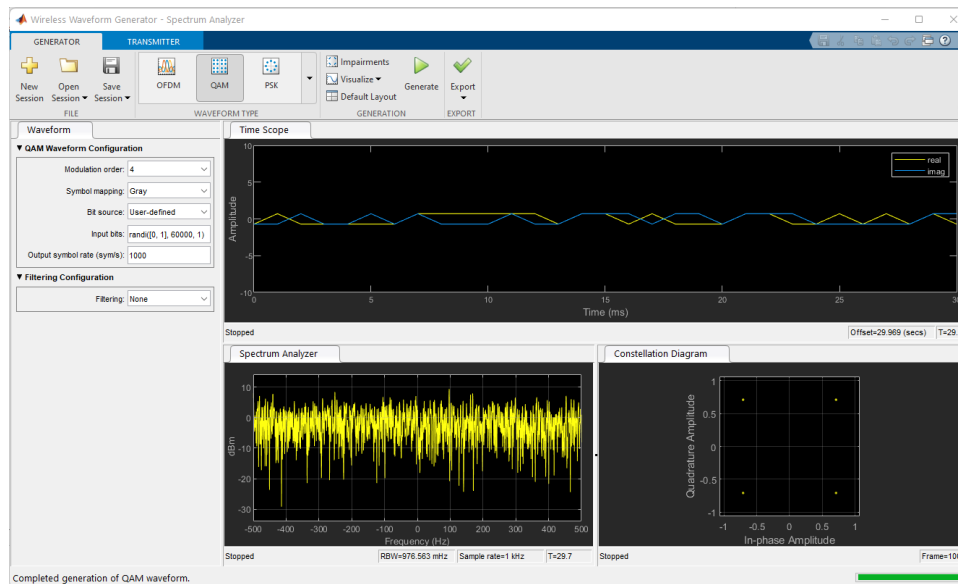
Open the *Wireless Waveform Generator* app and generate the default waveform by clicking *Generate*. The displayed waveform is an OFDM waveform with QPSK-modulated symbols.



OFDM Waveform Generator

1.1.2 App Based QAM Waveform Generation

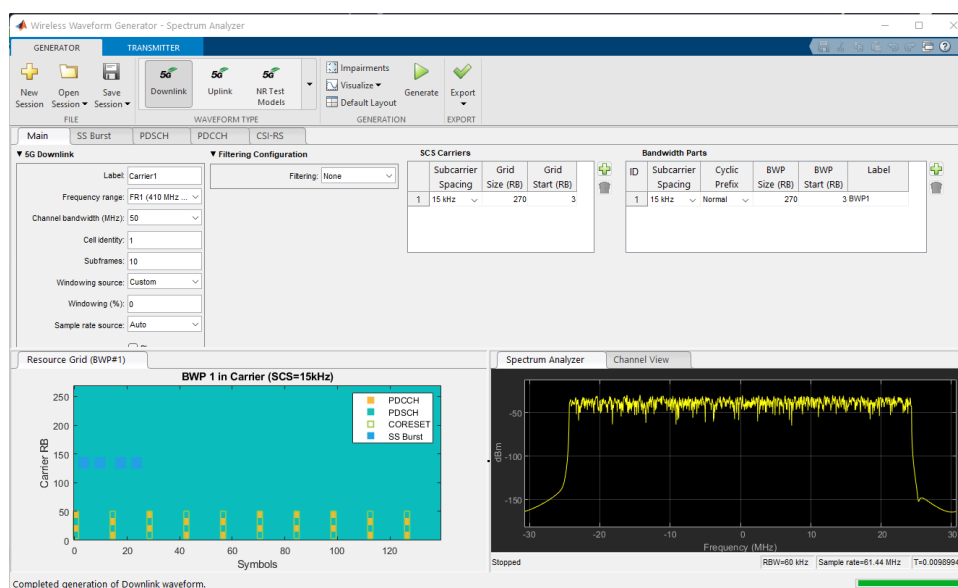
Open the Wireless Waveform Generator app and configure a 16-QAM waveform. Specify a phase imbalance of 11.25 degrees ($\pi/16$ radians) and an amplitude imbalance of 1.5 dB. Click Generate to generate the waveform.



QAM Waveform Generator

1.1.3 App Based 5G NR Waveform Generation

This example shows how you can generate 5G NR waveforms. For more information, see the 5G Waveform Generator (5G Toolbox) app reference page. Open 5G Waveform Generator App On the Apps tab of the MATLAB toolstrip, under Signal Processing and Communications, click the 5G Waveform Generator app icon. This app opens the Wireless Waveform Generator app configured for 5G waveform generation. This feature requires 5G Toolbox. Generate 5G NR Waveform This image shows the visualization results for 5G downlink waveform generation using default parameters.



5G NR Waveform Generator