# DSP Tools Docs

### Phase 1 – Conversion to Frequency Domain

#### Load\_sample

##### Sample is a 1d array with length N (Number of Samples) and is loaded from csv.

#### M1\_1 – Window Multiply

##### Multiplies the sample by the window to produce a windowed DFT.

##### Load\_window

###### Window is a 1d array with length N and is loaded from csv.

##### Generate\_window

###### Calculates and returns the 1d array of the window.

###### Standard form for a window function: w(n) = f(n) + bias

#### M1\_2 – DFT Multiply

##### Multiplies sample by DFTmatrix to produce Raw, which is an N x N array of values in complex, rectangular form

##### Load\_DFTmatrix

###### DFTmatrix is a 2d array with dimensions N x N and is normally generated by generate\_DFTmatrix.

##### Generate\_DFTmatrix

###### Generates a 2d array with dimensions N x N to act as the Fourier Operator

###### (m,n) = cos( (2 π n m) / N) – i sin ( (2 π n m) / N)

#### S1 – DFT Sum

##### Sum is a 1d array of the DFT values in complex, rectangular form.

#### Polar\_Conversion

##### Calculates the amplitude and phase angle (Polar Form) of the DFT values.

##### Load\_PhasorArray

###### Loads a 2d array with dimensions N x 2, where each pair is an amplitude and a phase angle.

##### Generate\_PhasorArray

###### Produces a 2d array of amplitudes and phase angles to synthesize a waveform.

### Phase 2 – Conversion to Time Domain

#### M2\_1 – Masking Multiply

##### Load\_mask

###### Mask is a 1d array with length N

##### Generate\_mask

###### Generates a mask to alter the amplitudes of the partials.

#### M2-2 – IDFT Multiply

##### Load\_IDFTmatrix

###### IDFTmatrix is a 2d array with dimensions N x N and is normally generated by generate\_IDFTmatrix

##### Generate\_IDFTmatrix

###### Generates a 2d array with dimensions N x N to act as the Inverse Fourier Operator

#### S2 – IDFT of Sample

##### Signal is a 1d array with the sequential values of the synthesized wave in the time domain.

### Utility Functions

#### Savedata(filename, data)

##### Saves a file as a csv and appends a timestamp to the filename.

### Graphing Functions

#### Save\_plot(filename)

##### Is closely related to savedata, saves an svg of the graph after adding a timestamp

#### Plot\_DFTamplitude

##### Plots the calculated amplitude of each frequency bin of the DFT. Gets called by Polar\_Conversion.

#### Plot\_DFTphase\_angle

##### Plots the calculated phase angle of each frequency bin of the DFT. Gets called by Polar\_Conversion.

#### Plot\_signal

##### Plots the calculated IDFT output. Gets called by S2.