Table of Contents

c3_check_modulation.m

```
%{
Description:
  This script verifies the consistency between the original baseband
  signals (before modulation) and the signals recovered after
 modulation
  and resampling from PA simulation data.

Input:
  - lte_real.csv (f1_source_data)
  - lte_imag.csv (f1_source_data)
  - wlan11n_real.csv (f1_source_data)
  - wlan11n_imag.csv (f1_source_data)
  - pa_data.mat
%}
clear; clc; close all;
tic
```

Paths

Functions

```
current_folder = fileparts(mfilename('fullpath'));
root_folder = fileparts(current_folder);
functions_folder = fullfile(root_folder, 'f0_functions');
addpath(functions_folder);

% Source
source_folder = fullfile(root_folder, 'f1_source_data');
```

Importing input data after modulation

```
pa_data_file = fullfile(current_folder, 'pa_data.mat');
load(pa_data_file);
```

Importing input data before modulation

```
[s1_time, s1_signal] = read_complex_csv( ...
```

```
    fullfile(source_folder, 'lte_real.csv'), ...
    fullfile(source_folder, 'lte_imag.csv'));

[s2_time, s2_signal] = read_complex_csv( ...
    fullfile(source_folder, 'wlan11n_real.csv'), ...
    fullfile(source_folder, 'wlan11n_imag.csv'));
```

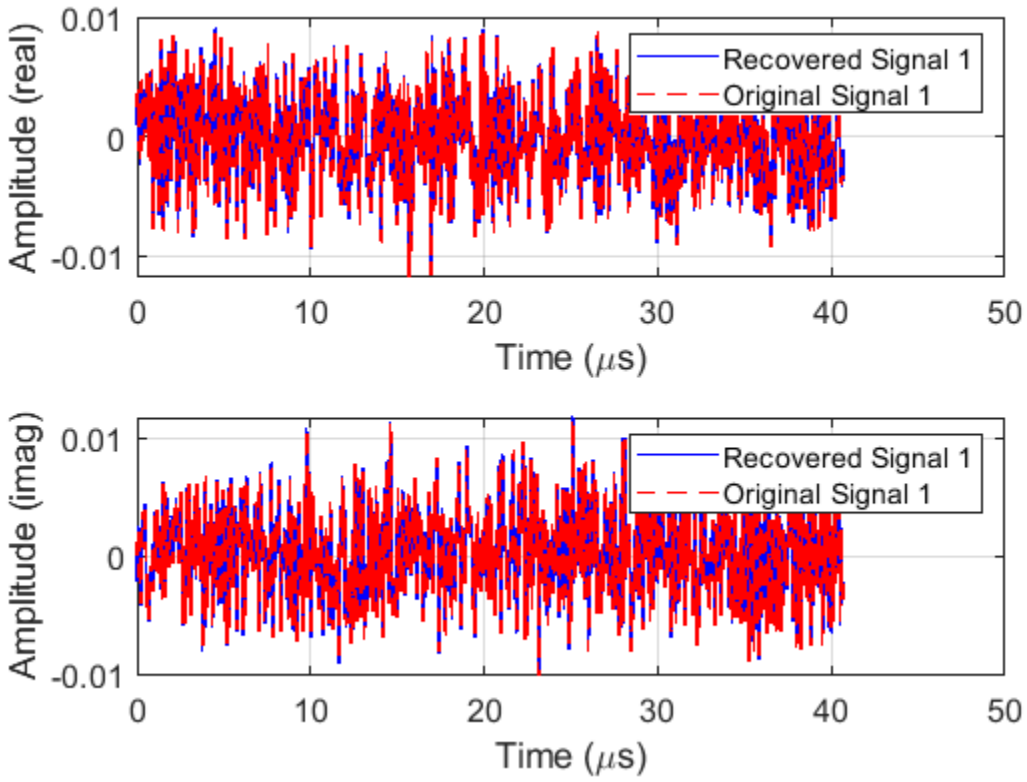
Resample

```
s1_baseband = interp1(s1_time, s1_signal,
 time_baseband, 'linear', 'extrap');
s2_baseband = interp1(s2_time, s2_signal,
 time_baseband, 'linear', 'extrap');

% Adjust amplitudes so that both baseband signals (before modulation)
 match
% the maximum values of the recovered signals (after demodulation).
% This adjustment is necessary because during modulation a gain was
 applied
% to push the PA input signal close to its limit, introducing a slight
% nonlinear behavior for analysis.

max_s1_recovered = max(abs(signal_1_in));
max_s1_original = max(abs(s1_baseband));
ratio = max_s1_recovered / max_s1_original;
s1_baseband = s1_baseband * ratio;

max_s2_recovered = max(abs(signal_2_in));
max_s2_original = max(abs(s2_baseband));
ratio = max_s2_recovered / max_s2_original;
s2_baseband = s2_baseband * ratio;
```

Plot signal 1 (real & imag)

```
figure('Name','Signal 1 Baseband Comparison','Color','w');

% --- Real part ---
ax1 = subplot(2,1,1);
plot(time_baseband*1e6, real(signal_1_in), 'b', 'LineWidth', 1.2);
 hold on;
plot(time_baseband*1e6, real(s1_baseband),  'r--', 'LineWidth', 1.2);
xlabel('Time (\mus)');
ylabel('Amplitude (real)');
legend('Recovered Signal 1','Original Signal 1');
grid on;

% --- Imag part ---
ax2 = subplot(2,1,2);
plot(time_baseband*1e6, imag(signal_1_in), 'b', 'LineWidth', 1.2);
 hold on;
plot(time_baseband*1e6, imag(s1_baseband),  'r--', 'LineWidth', 1.2);
xlabel('Time (\mus)');
ylabel('Amplitude (imag)');
```

```
legend('Recovered Signal 1','Original Signal 1');
grid on;

% Paper-style formatting
set([ax1, ax2],'FontSize',12,'LineWidth',1);
```

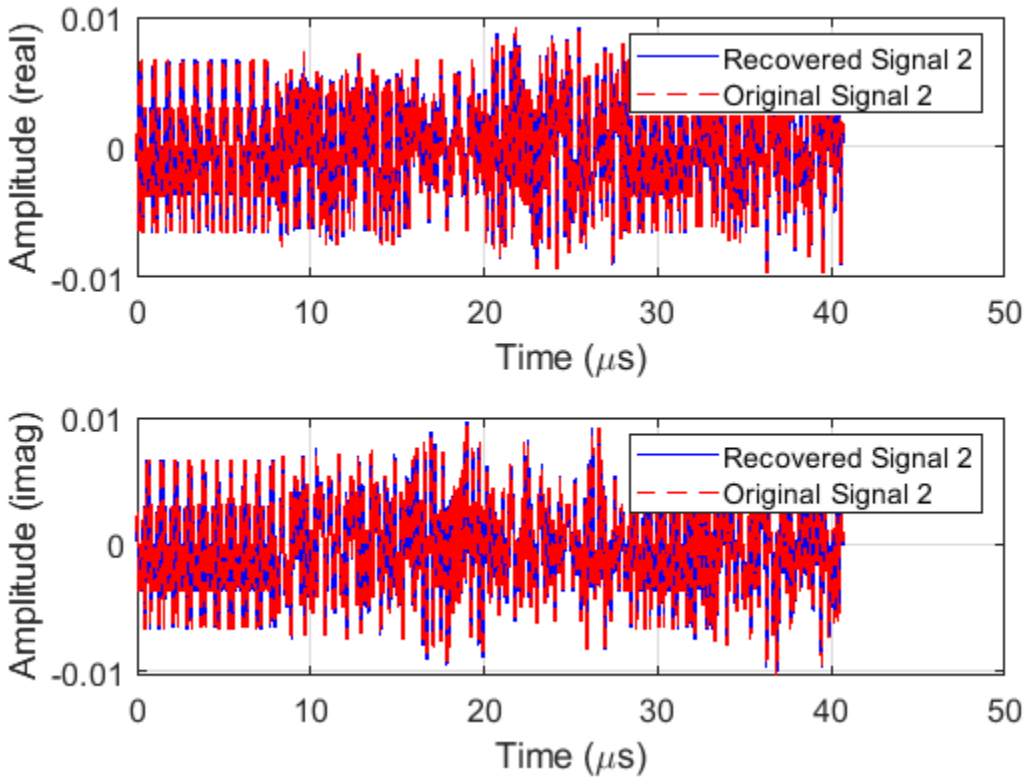


Plot signal 2 (real & imag)

```
figure('Name','Signal 2 Baseband Comparison','Color','w');

% --- Real part ---
ax1 = subplot(2,1,1);
plot(time_baseband*1e6, real(signal_2_in), 'b', 'LineWidth', 1.2);
 hold on;
plot(time_baseband*1e6, real(s2_baseband),  'r--', 'LineWidth', 1.2);
xlabel('Time (\mus)');
ylabel('Amplitude (real)');
legend('Recovered Signal 2','Original Signal 2');
grid on;

% --- Imag part ---
ax2 = subplot(2,1,2);
plot(time_baseband*1e6, imag(signal_2_in), 'b', 'LineWidth', 1.2);
 hold on;
plot(time_baseband*1e6, imag(s2_baseband),  'r--', 'LineWidth', 1.2);
xlabel('Time (\mus)');
```

```
ylabel('Amplitude (imag)');
legend('Recovered Signal 2','Original Signal 2');
grid on;

% Paper-style formatting
set([ax1, ax2],'FontSize',12,'LineWidth',1);

toc
```

```
Elapsed time is 2.157241 seconds.
```



Published with MATLAB® R2019a