# Low-Rate Time Delay Estimation GUI Instructions

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## Signal Properties

1. Choose sequences model – three models are supported: Jakes, rounded and normal distribution. These models control the behavior of the reflection coefficient of each path.
2. Set the maximal Doppler – this parameters control the variation rate of the reflection coefficients. Higher Doppler results in faster variation. This parameter is applicable only for Jakes and rounded models.
3. Set the sequence length – this equal to the number of pulses transmitted through the medium.
4. Set the SNR – this parameter controls the amount of noise to be added to the samples.
5. Add propagation paths:
   1. By inserting the delay and energy of each path to the upper table and clicking on insert
   2. Or by setting the number of paths K, and clicking on Randomize. Using this option will create random delays and energies.

## Sampling Scheme

1. Set the number of sampling channels p. This number affects the sampling rate which equals to p/T.
2. Choose the sampling filter type – Sinc and Butterworth low-pass filter are supported.
3. Chose the filter order – applicable only for Butterworth low-pass filter.

Run the simulation by clicking on “Simulate”.

## Graphs

1. Analog Stage – shows the analog signals after the sampling filter, and the samples taken.
2. Delays and Average Energies – shows the original and estimated channel. The graph shows the delays and average energy of each path.
3. Sequence Recovery – shows the recover reflection coefficient of each path. The number of path displayed can be selected.