Script Generation for Xilinx Board

Used for generating the Xilinx script to perform measurements with the MIMO system. Note that all files are run by GNU Octave. The folder contains the following files:

* 1. Functions – The scripts divided into different functions for script generation. Including look-up-tables for coded waveforms.
  2. Output Scripts – The generated scripts are put here
  3. TCL templates – Contains templates of TCL scripts
  4. *Initialize.m* – Includes additional settings for writing and plotting.
  5. *MIMO\_Xilinx\_Script\_Generation.m* – Master script to generate the wanted Xilinx script. Here six parameters are set:

### Parameter Selection

To generate the specific scripts, six parameters can be adjusted within the script:

1. *pulseLength* – The length of a single pulse in with a maximum of 16
2. *Duty* – Duty-cycle of a MIMO frame in percentage
3. *burstLength* – Burst length (Number of system triggers/MIMO frames pr. burst)
4. *burstRF* – Burst repetition frequency in Hz (cannot exceed 1/burst length)
5. *burstNum* – Number of bursts for a given measurement
6. *waveformMode* – The waveform to generate for transmission from following list:

'TDM\_Alternating' % 1

'TDM\_Staggered' % 2

'TDM\_UpDown' % 3

'DDM' % 4

'Hadamard', % 5

'FDM', % 6

'Gold' % 7

'MultiCAN' % 8

The total recording time is set by the burst-settings. For continuous operation, this can simply be set to a single burst (*burstNum*) with the desired number of pulses (burstLength), limited by the total amount of available memory in DDR-RAM of 4 GB.

After setting the parameters to the specified values, the script can be run in GNU Octave in the control computer. Alternatively, the script can be run on another computer with Matlab.

Waveform comments:

* If choosing DDM or Hadamard codes, the pulse length includes all slow-time codes. With eight transmit channels, the effective pulse length becomes 1/8 of the specified parameter in the script.
* If choosing FT-CDM (*Gold* or *MultiCAN*) the number of bits should also be defined in *nBitLength*. The default is 4096 bit which corresponds to the maximum TX length. A look-up-table is provided instead of generating the codes after each iteration which enables better measurement-to-measurement comparison and shorter waveform generation time.
* Waveforms that have not been included in this script (but can be implemented with ease): ST-FDM, ST-CDM, SIMO and a long list of other CDM waveforms.

### Output after script generation

The *MIMO\_Xilinx\_Script\_Generation.m*-file has four outputs used for operating the MIMO system and system parameter overview:

1. *“iq\_sequence\_<waveformMode>\_<optional>.bin”* contain each of the specified waveforms. The *optional* name either counts the channel number or specifies whether it is an up- or downchirp for TDM\_UpDown.
2. *"tcl\_record\_<waveformMode>.tcl"* contains the TCL script to operate the Xilinx board (set up recording, set time-delays/offsets/TX on/off status, upload waveforms).
3. *"systemSettings\_<waveformMode>.mat "* is a .MAT file containing a struct named “SYS” containing information about the system settings
4. “*Waveform Information\_<waveformMode>.txt*” is a text file with practical information about the setup including the required number of MB to be recorded.