TinyRad PWM Framework

The PWM framework uses two timers in PWM mode to control the start of the chirp and the sampling of the ADAR. Hence measurements can be started with a desired period.

Configuration with Matlab

In Matlab the class TinyRad is used to configure the board. For the configuration of the chirp sequence the configuration structure Cfg is used.

Field	Description	Unit
fStrt	Start frequency of the chirp	Hz
fStop	Stop frequency of the chirp	Hz
TRampUp	Duration of the upchirp	s
Perd	Period between adjacent ramps (ramp repetition interval)	s
N	Number of samples	
Seq	Array with antenna activation sequence: eg. [1], [2], [1 2], [2 ,1]	
CycSiz	Number of buffers in the DSP to store the data; should be greater than 2 When set to 2 a ping pong scheme is implemented	
FrmSiz	Number of periods (chirps) for one measurement cycle Can be used to adjust the time between two range-Doppler measurements	
FrmSizMeas	Number of chirps where the data is collected	

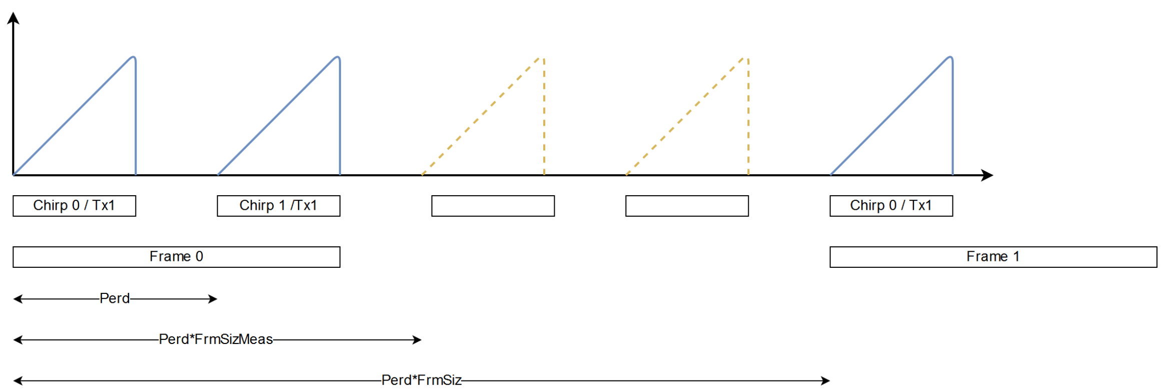
The field **Perd** is used to define the time between two adjacent measurements. The entries frame size (**FrmSiz**) and frame size measurement (**FrmSizMeas**) are used to control the number of collected frames and the time between two range-Doppler measurements in multiples of the PWM period. Hence the time between to measurement frames (FrmSizMeas chirps) can be controlled in multiples of the configured period.

The number of samples collected during one chirp is independent of the chirp duration. In the current framework the sampling rate is fixed to 1 MHz. Hence the sampling period is Ts = 1 us. If N*Ts is smaller than the programmed chirp duration then only the first part of the chirp is sampled. If N*Ts is larger than the chirp duration the downchirp is sampled too. The framework requires that N*Ts + 20 us is smaller than the PWM period.

The array **Seq** is used to configure the desired antenna activation sequence.

Example1: Configuration with TX1 Antenna Activated

In the first example we activate one TX antenna and collect two adjacent chirp as shown in the figure below. After the two chirps for frame0 we do not collect data for two chirps before the next measurement frame starts.



Field	Value	Unit

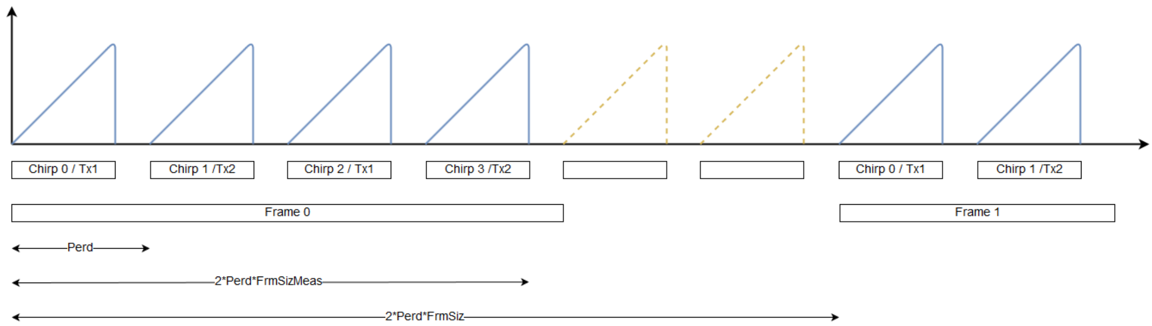
fStrt	24e9	Hz
fStop	24.2e9	Hz
TRampUp	512e-6	s
Perd	1e-3	s
N	512	
Seq	[1]	
CycSiz	2	
FrmSiz	4	
FrmSizMeas	2	

With BrdGetData the IF signals for the first frame (Chirp 0 and Chirp 1) for all four IF channels are returned.

The **FrmSiz** parameter defines the duration between two measurement frames and **FrmSizMeas** defines the number of chirps during which measurement data is collected. **FrmSizMeas** must be lower or equal to **FrmSiz**.

Example2: Configuration with TX1 and Tx2 Antenna Activated

In the first example we activate one TX antenna and collect two adjacent chirp as shown in the figure below. After the two chirps for frame0 we do not collect data for two chirps before the next measurement frame starts.



Field	Value	Unit
fStrt	24e9	Hz
fStop	24.2e9	Hz
TRampUp	256e-6	s
Perd	0.3e-3	s
N	256	
Seq	[1 2]	
CycSiz	2	
FrmSiz	3	
FrmSizMeas	2	

With BrdGetData the IF signals for the first frame (Chirp 0, Chirp 1, Chirp 2, and Chirp 3) for all four IF channels are returned.

The **FrmSiz** parameter defines the duration between two measurement frames and **FrmSizMeas** defines the number of chirps in the measurement sequence during which measurement data is collected. **FrmSizMeas** must be lower or equal to **FrmSiz**.

In the current example the duration between two frames is 2*FrmSiz*Perd, because the measurement sequence consists of two entries. In general the duration between two frames is length(Seq)*FrmSiz*Perd.