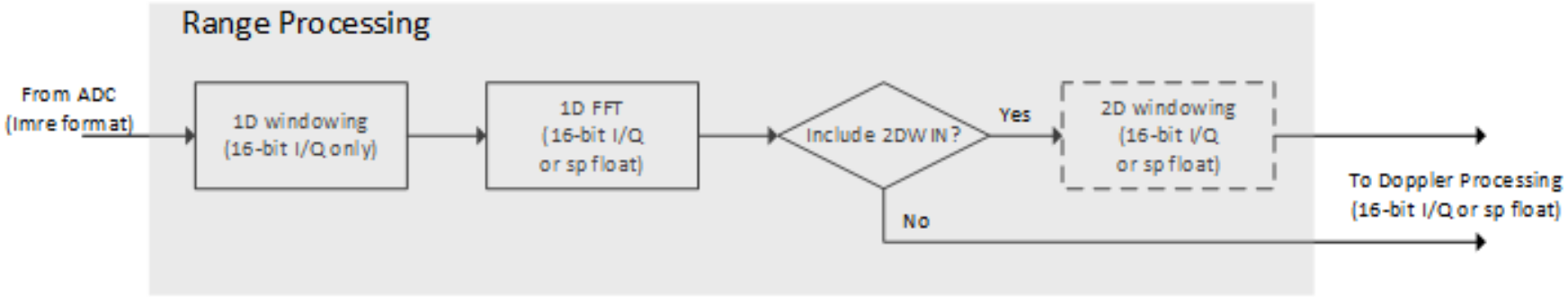
Range processing

Range Processing Block Diagram



- Input is from ADC, assuming data is in 16-bit I/Q format, and stored in memory in imag/real order.
- 1D windowing is 16-bit I/Q in and 16-bit I/Q or SP float out, depending on 1D FFT type. The function also scale the signal depending on number of ADC bits.
- 1D FFT is either fixed-point DSP_fft16x16_imre (note the issue on DC, but does not affect results), or floating-point DSPF_sp_fftSPxSP.
- Option to include 2D windowing inside range processing.
  - If not included, range processing output format must be the same as 1D FFT output format.
  - If included, processing output format can be either 16-bit I/Q fixed-point, or single precision floating point. Format conversion is done by 2D windowing function.
- Memory used
  - nSamplesPerChirp/2 * sizeof(uint16_t) bytes for 1D window function
  - numChirpsPerFrame/2 * sizeof(uint16_t) bytes for 2D window function if 2D windowing is included
  - 2 * fft1DSize * sizeof (int16_t) bytes for DSP_fft16x16_imre twiddle factors, or 2 * fft1DSize * sizeof (float) bytes for DSPF_sp_fftSPxS twiddle factors

Range Processing Benchmarks (C66x)

FFT size	FFT type	2D Win included	Output Format	cycles
64	16x16	no	16x16	585
128	16x16	no	16x16	1177
256	16x16	no	16x16	1612
512	16x16	no	16x16	3890
1024	16x16	no	16x16	6744
2048	16x16	no	16x16	16873
4096	16x16	no	16x16	31806
64	16x16	yes	16x16	735
128	16x16	yes	16x16	1422
256	16x16	yes	16x16	2013
512	16x16	yes	16x16	4913
1024	16x16	yes	16x16	8385
2048	16x16	yes	16x16	19863
4096	16x16	yes	16x16	38691
64	16x16	yes	float	672
128	16x16	yes	float	1082
256	16x16	yes	float	1929
512	16x16	yes	float	4551
1024	16x16	yes	float	7678
2048	16x16	yes	float	18310
4096	16x16	yes	float	35419
64	float	no	float	1192
128	float	no	float	2228
256	float	no	float	4121
512	float	no	float	8715
1024	float	no	float	16364
2048	float	no	float	38140
4096	float	no	float	80308
64	float	yes	float	1354
128	float	yes	float	2518
256	float	yes	float	4659
512	float	yes	float	9728
1024	float	yes	float	18452
2048	float	yes	float	41928
4096	float	yes	float	87604

Range Processing Benchmarks (C674x)

FFT size	FFT type	2D Win included	Output Format	cycles
64	16x16	no	16x16	876
128	16x16	no	16x16	1539
256	16x16	no	16x16	2351
512	16x16	no	16x16	5066
1024	16x16	no	16x16	12882
2048	16x16	no	16x16	31399
4096	16x16	no	16x16	63491
64	16x16	yes	16x16	1130
128	16x16	yes	16x16	1907
256	16x16	yes	16x16	2887
512	16x16	yes	16x16	6102
1024	16x16	yes	16x16	12914
2048	16x16	yes	16x16	29333
4096	16x16	yes	16x16	60383
64	16x16	yes	float	1104
128	16x16	yes	float	1915
256	16x16	yes	float	2871
512	16x16	yes	float	5856
1024	16x16	yes	float	12498
2048	16x16	yes	float	28117
4096	16x16	yes	float	60167
64	float	no	float	1568
128	float	no	float	2996
256	float	no	float	5627
512	float	no	float	12163
1024	float	no	float	24084
2048	float	no	float	60793
4096	float	no	float	130840
64	float	yes	float	1926
128	float	yes	float	3529
256	float	yes	float	6367
512	float	yes	float	13385
1024	float	yes	float	26525
2048	float	yes	float	62534
4096	float	yes	float	131452