

## RF Demodulator

Medical Imaging DSP Applications Team

### 1 Description

This module removes the carrier signal from the echoes produced by the tissue and vessel walls. In this module, each scan line is processed independently by mixing it with sinusoids to produce in-phase and quadrature components, followed by low-pass filtering using finite impulse response (FIR) filter to prevent aliasing, and then decimating the filtered output by the decimation factor.

Project collateral discussed in this document can be downloaded from the following URL:  
<http://www-s.ti.com/sc/techlit/sprs621.zip>.

### 2 Kernel Complexity ( C64x+™ CPU cycles, based on CPU cycle accurate Simulator)

Even 'S':  $4.1085 * T - 412.4375 * L - 12.779 * \text{ceil}((T-L)/S) + 0.91242 * \text{ceil}((T-L)/S) * L + 227.5672 * \text{ceil}(L/S) + 3.9358 * \text{ceil}(L/S) * L + 11498.2484$

Odd 'S':  $-1.0819 * T + 4.9044 * L + 20.0475 * \text{floor}((T-L)/S) + 0.63939 * (T-L)/S * L - 115.5923 * \text{floor}(L/S) + 2.0936 * \text{floor}(L/S) * L + 1482.1877$

where

S = Decimation factor

K = Number of RF samples

M = Filter length

### 3 Cycles on TMS320C6455 EVM

The performance is given for several example cases on the C6455 EVM in cycles. The test bench for RF Demod can be used to find cycles of interest for any other valid configuration.

T	S	L	Test Case	Cycles Per Scan Line
4672	6	32	10	32425
15200	6	32	23	104676
8304	2	64	42	224730

### 4 Memory

The following table shows the memory consumption of the rfdemod module.

Memory	Size in Bytes
Data	<ul style="list-style-type: none"> <li>State memory to be maintained by caller: [4 x Number of RF samples per call + (4 x Filter Length + 1)]</li> <li>Table: 4096</li> </ul>
Program	2880

## 5 References

- *Application to Sample-Rate Alteration and Filter Banks*, IEEE Transactions on Acoustics, Speech and Signal Processing, Vol. ASSP-24, No. 2, pp, 109-114, April 1976.

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