



**NAS** Software Limited

*Wynberg House, 1 Prospect Road, Prenton, CH42 8LE. UK*

Tel: +44 151 609 1911

Fax: +44 151 608 2796

# VSIPLUS Performance: PowerPC

14 February 2006

## 1 Introduction

These tables show timings for the NASL VSIPLUS VSIPL library, taken on a 1GHz PowerPC G4 7447 development system. Times are in microseconds unless specified otherwise. They have been measured by averaging over a number of iterated calls to the routine.

Times for the C\_SIPL library are essentially identical to these.

## 2 1-D FFT timings

Complex to complex: In place: `vsip_ccfftip_f`; out of place: `vsip_ccfftop_f`

Real to complex: `vsip_rcfftop_f`; complex to real: `vsip_crfftop_f`

N	rcfftop	crfftop	ccfftop	ccfftip
64	1.0	1.02	0.734	0.782
128	1.25	1.29	1.194	1.195
256	1.98	2.05	2.626	2.63
512	3.99	4.10	5.320	5.36
1K	7.99	8.05	10.8	10.3
2K	17.22	19.037	32.43	30.18
4K	44.670	46.351	73.948	71.044
8K	100.778	103.734	186.758	163.448
16K	229.9	232.0	406.6	404.3
32K	574.9	571.5	1653.3	1027.3
64K	1873.5	1955.2	10,673	2853
128K	11,488	13,212	35,814	32,284
256K	50,690	52,017	70,459	65,410
512K	103,098	106,988,	192,538	182,537

## 3 Complex to complex Multiple FFT timings

In place: `vsip_ccfftmip_f`; out of place: `vsip_ccfftmop_f`

times in seconds; length N, M FFTs

Matrix size	In Place	Out of Place
N x M	(secs).	(secs).
16 x 16	12.34 e-6	81.0 e-6
32 x 32	18.93 e-6	19.05 e-6
64 x 64	46.23 e-6	51.2 e-6
128 x 128	1.63 e-4	183.5 e-6
256 x 256	8.35 e-4	5.96 e-3

## 4 Complex to real and real to complex Multiple FFT timings

Complex to Real: `vsip_crfftmop_f`; real to complex: `vsip_rcfftmop_f`  
times in seconds; length N, N FFTs

CELLS.	Complex to Real	Real to Complex
16**2	36.0 e-6	36.0 e-6
32**2	221 e-6	224 e-6
48**2	716 e-6	720 e-6
64**2	77.8 e-6	81.1 e-6
96**2	5.6 e-3	5.65 e-3
128**2	224 e-6	237.6 e-6
208**2	57.2 e-3	57.4 e-3
256**2	0.845 e-3	0.891 e-3

## 5 2-D FFT

Times in microseconds

N*M	<code>rcfft2dop</code>	<code>crfft2dop</code>	<code>ccfft2dip</code>	<code>ccfft2dop</code>
64*64	96.9	114.5	78.96	89.3
128*128	416.1	479.0	350.3	395.3
256*256	5051	5138	2,179	9,764
512*512	42,303	43,594	47,669	65,379

## 6 Weighting functions (all 1K real): `vsip_vcreate_type_f`

Times in microseconds

TYPE.	Times
Hanning	8.79
Blackman	16.6
Kaiser	51.8
Chebyshev	409

## 7 Elementwise math functions

Data lengths: all 1K real

FUNCTION	Times
<code>asin</code>	6.869
<code>acos</code>	7.1
<code>atan</code>	15.53
<code>atan2</code>	11.2
<code>cos</code>	8.352
<code>sin</code>	9.093
<code>tan</code>	9.206
<code>exp</code>	4.174
<code>log</code>	7.435
<code>sqrt</code>	2.875
<code>sq</code>	1.0

## 8 Vector and matrix multiplication

Operation	SIZE	Times	Operation	SIZE	Times
real vector mult	1K	1.135	vsip_smmul_f	256**2	2.4
cmpl vector mult (inter)	1K	5.753	vsip_svmul_f	1K	1.0
cmpl vector mult (split)	1K	2.359	vsip_svmul_i	1K	2.0
matmul (in cache)	6*6	3.18	vsip_svmul_si	4K	0.5
matmul (out of cache)	6*6	23.6	vsip_vmmul_f	16**3	0.2
vsip_rcmul_f	1K	0		64**3	
vsip_cjmul_f	1K	0		256**3	
vsip_cmul_f	1K	0	vsip_vmul_f	256	
vsip_csmmul_f	256**2	82.8		512	2.0
vsip_csvmul_f	1K	2.9		1K	1.0
vsip_csvmul_f	1280	2.3		2K	1.5
vsip_cvjmul_f	1K	2.9		4K	2.2
vsip_cvjmul_f	1280	3.1	vsip_vmul_i	1K	2.9
vsip_cvmmul_f	256**3	0.3	vsip_vmul_si	1K	1.0
vsip_cvmul_f	1K	2.0	vsip_gemp_f	16**3	1.0
vsip_rcvmul_f	1K	2.0		32**3	0.7
vsip_rscmmul_f	16**2	3.9		64**3	0.6
	32**2	2.0		128**3	0.8
	64**2	3.9		256**3	1.5
	128**2	3.8	vsip_gems_f	32**3	2.0
	160**2	4.1	vsip_gems_f	128**3	1.8
	192**2	27.5	vsip_gems_f	256**3	2.5
	256**2	81.8	vsip_cgemp_f	32**3	
vsip_rscvmul_f	1K	1.0		128**3	4.1
vsip_rvcmmul_f	16**2	3.9		256**3	9.2
	32**2	2.0	vsip_cgems_f	32**3	
	64**2	3.9		128**3	5.8
	128**2	3.8	vsip_cgems_f	256**3	98.0
	176**2	6.1			
	208**2	48.5			
	256**2	86.7			

## 9 Matrix Transpose

N*M	vsip_mtrans_f ip	op	vsip_cmtrans_f ip	op
64**2	3.71	4.80	7.61	17.29
128**2	18.45	34.6	38.84	72.5
256**2	76.2	283.8	345.4	3,900
512**2	7,279	14,735	16,544	29,611

## 10 Vector and matrix addition/subtraction

Only add times shown; subtract should be the same

Operation	SIZE	Times
vsip_cadd_f	1K	0
vsip_csvadd_f	1K	2.0
vsip_cvadd_f	1K	2.0
vsip_madd_f	128**2	2.2
vsip_madd_f	256**2	38.8
vsip_rcadd_f	1K	0
vsip_rcvadd_f	1K	2.0
vsip_rscvadd_f	1K	37.1
vsip_svadd_f	1K	1.0
vsip_svadd_i	1K	1.0
vsip_svadd_si	4K	0.5
vsip_vadd_f	1K	1.0
vsip_vadd_i	1K	1.0
vsip_vadd_si	1K	1.0

## 11 High level linear algebra

Square systems; times in seconds

Operation	SIZE	Times
llsqsol_f	256**3	57.04 e-3
lusol_f (Normal)	256**2	18.9 e-3
lusol_f (unaligned)	256**2	29.4 e-3
lusol_f (stride 5)	256**2	45.3 e-3
vsip_qrd_f (Normal)	256**2	31.9 e-3
(Unaligned)	256**2	35.9 e-3
(stride 5)	256**2	30.2 e-3
qrdprodq_f (Normal)	256**3	25.2 e-3
(Unaligned)	256**3	40.2 e-3
(Stride 5)	256**3	62.1 e-3
qrdsolr_f (Normal)	256**3	11.7 e-3
(Unaligned)	256**3	15.1 e-3
(stride 5)	256**3	35.2 e-3
toepsol_f (Normal)	1024	10.67 e-3
(Unaligned)	1024	10.41 e-3
(Stride 2)	1024	10.25 e-3
ctoepsol_f	1024	22.7 e-3
covsol_f	32**3	127.8 e-6
covsol_f	128**3	3.15 e-3
covsol_f	256**3	35.2 e-3
ccovsol_f	32**3	0.986 e-3
ccovsol_f	128**3	36.1 e-3
ccovsol_f	256**3	260.0 e-3

## 12 FIR Filters

### 12.1 Timings from our standard test suite

`firflt_f` and `cfirflt_f`; filter length data length/2; decimation factor 1  
Times in microseconds

Operation	SIZE	Times
<code>vsip_firflt_f</code>	1024	44.9
<code>vsip_cfirflt_f</code>	1024	91.0

### 12.2 `cfirflt_f`: more detailed timings

times in microseconds

Decimation	Data_length	Filter_length.	Times
1	2048	32	178
4	2048	32	117
8	2048	32	60
16	2048	32	30
16	2048	64	55

## 13 Scatter/gather

Times in microseconds

Operation	SIZE	Times
<code>vsip_vscatter_f</code>	1024	6.96
<code>vsip_vscatter_i</code>	1024	6.96
<code>vsip_vgather_f</code>	1024	9.01
<code>vsip_cvgather_f</code>	1024	10.04
<code>vsip_vgather_i</code>	1024	9.01
<code>vsip_vgather_si</code>	1024	7.99

## 14 Convolution: `vsip_convolve1d_f`

Filter length half data length; decimation factor 1 Times in microseconds

Operation	SIZE	Times
<code>vsip_convolve1d_f</code>	256	12.0
	512	28.0
	768	46.0
	1K	56.0
	1536	92.0
	2K	133.9
	3072	245.1
	4K	317.0