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Performance of Various Computers Using Standard Linear Equations Software

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Abstract

This report compares the performance of different computer systems in solving dense systems of linear equations. The comparison involves approximately a hundred computers, ranging from a Cray Y-MP to scientific workstations such as the Apollo and Sun to IBM PCs.

1 Introduction and Objectives

The timing information presented here should in no way be used to judge the overall performance of a computer system. The results reflect only one problem area: solving dense systems of equations.

This report provides performance information on a wide assortment of computers ranging from the home-used PC up to the most powerful supercomputers. The information has been collected over a period of time and will undergo change as new machines are added and as hardware and software systems improve. The programs used to generate this data can easily be obtained over the Internet. While we make every attempt to verify the results obtained from users and vendors, errors are bound to exist and should be brought to our attention. We encourage users to obtain the programs and run the routines on their machines, reporting any discrepancies with the numbers listed here.

The first table reports three numbers for each machine listed (in some cases the numbers are missing because of lack of data). All performance numbers reflect arithmetic performed in full precision (usually 64-bit), unless noted. On some machines full precision may be single precision, such as the Cray, or double precision, such as the IBM. The first number is for the LINPACK [1] benchmark program for a matrix of order 100 in a Fortran environment. The second number is for solving a system of equations of order 1000, with no restriction on the method or its implementation. The third number is the theoretical peak performance of the machine.

LINPACK programs can be characterized as having a high percentage of floating-point arithmetic operations. The routines involved in this timing study, SGEFA and SGESL, use column-oriented algorithms. That is, the programs usually reference array elements sequentially down a

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column, not across a row. Column orientation is important in increasing efficiency because of the way Fortran stores arrays. Most floating-point operations in LINPACK take place in a set of subprograms, the Basic Linear Algebra Subprograms (BLAS) [3], which are called repeatedly throughout the calculation. These BLAS, referred to now as Level 1 BLAS, reference one-dimensional arrays, rather than two-dimensional arrays.

In the first case, the problem size is relatively small (order 100), and no changes were made to the LINPACK software. Moreover, no attempt was made to use special hardware features or to exploit vector capabilities or multiple processors. (The compilers on some machines may, of course, generate optimized code that itself accesses special features.) Thus, many high-performance machines may not have reached their asymptotic execution rates.

In the second case, the problem size is larger (matrix of order 1000), and modifying or replacing the algorithm and software was permitted to achieve as high an execution rate as possible. Thus, the hardware had more opportunity for reaching near-asymptotic rates. An important constraint, however, was that all optimized programs maintain the same relative accuracy as standard techniques, such as Gaussian elimination used in LINPACK.

Furthermore, the driver program (supplied with the LINPACK benchmark) had to be run to ensure that the same problem is solved. The driver program sets up the matrix, calls the routines to solve the problem, verifies that the answers are correct, and computes the total number of operations to solve the problem (independent of the method) as $2n^3/3 + 2n^2$, where $n = 1000$.

The last column is based not on an actual program run, but on a paper computation to determine the theoretical peak Mflop/s rate for the machine. This is the number manufacturers often cite; it represents an upper bound on performance. That is, the manufacturer guarantees that programs will not exceed this rate—sort of a "speed of light" for a given computer.

The theoretical peak performance is determined by counting the number of floating-point additions and multiplications (in full precision) that can be completed during a period of time, usually the cycle time of the machine. As an example, the Cray Y-MP/8 has a cycle time of 6 ns. During a cycle the results of both an addition and a multiplication can be completed $\frac{2 \text{ operations}}{1 \text{ cycle}} * \frac{1 \text{ cycle}}{6 \text{ ns}} = 333 \text{ Mflop/s}$ on a single processor. On the Cray Y-MP/8 there are 8 processors; thus, the peak performance is 2667 Mflop/s.

The information in this report is presented to users to provide a range of performance for the various computers and to show the effects of typical Fortran programming and the results that can be obtained through careful programming. The maximum rate of execution is given for comparison.

The column labeled "Computer" gives the name of the computer hardware on which the program was run. In some cases we have indicated the number of processors in the configuration and, in some cases, the cycle time of the processor in nanoseconds.

The column labeled "LINPACK Benchmark" gives the operating system and compiler used. The run was based on two routines from LINPACK: SGEFA and SGESL were used for single precision, and DGEFA and DGESL were used for double precision. These routines perform standard LU decomposition with partial pivoting and backsubstitution. The timing was done on a matrix of order 100, where no changes are allowed to the Fortran programs.

The column labeled "TPP" (Toward Peak Performance) gives the results of hand optimization; the problem size was of order 1000.

The final column labeled "Theoretical Peak" gives the maximum rate of execution based on the cycle time of the hardware.

The same matrix was used to solve the system of equations. The results were checked for accuracy by calculating a residual for the problem $||Ax - b||/(||A||||x||)$.

The term Mflop/s, used as a rate of execution, stands for millions of floating-point operations completed per second. For solving a system of n equations, $2/3n^3 + 2n^2$ operations are performed (we count both additions and multiplications).

The information in the tables was compiled over a period of time. Subsequent systems software and hardware changes may alter the timings to some extent.

One further note: The following tables should not be taken too seriously. In multiprogramming environments it is often difficult to reliably measure the execution time of a single program. We trust that anyone actually evaluating machines and operating systems will gather more reliable and more representative data.

2 A Look at Parallel Processing

While collecting the data presented in Table 1, we were able to experiment with parallel processing on a number of computer systems. For these experiments, we used either the standard LINPACK algorithm or an algorithm based on matrix-matrix [2] techniques. In the case of the LINPACK algorithm, the loop around the SAXPY can be performed in parallel. In the matrix-matrix implementation the matrix product can be split into submatrices and performed in parallel. In either case, the parallelism follows a simple fork-and-join model where each processor gets some number of operations to perform.

For a problem of size 1000, we expect a high degree of parallelism. Thus, it is not surprising that we get such high efficiency (see Table 2). The actual percentage of parallelism, of course, depends on the algorithm and on the speed of the uniprocessor on the parallel part relative to the speed of the uniprocessor on the non-parallel part.

3 Highly Parallel Computing

With the arrival of massively parallel computers there is a need to benchmark such machines on problems that make sense. The problem size and rule for the runs reflected in the Tables 1 and 2 do not permit massively parallel computers to demonstrate their potential performance. The basic flaw is the problem size is too small. To provide a forum for comparing such machines the following benchmark was run on a number of massively parallel machines. The benchmark involves solving a system of linear equations (as was done in Tables 1 and 2). However in this case, the problem size is allowed to increase and the performance numbers reflect the largest problem run on the machine.

The ground rules are as follows: Solve systems of linear equations by some method, allow the size of the problem to vary, and measure the execution time for each size problem. In computing the floating-point execution rate, use $2n^3/3 + 2n^2$ operations independent of the actual method used. (If you choose to do Gaussian Elimination, partial pivoting must be used.) Compute and report a residual for the accuracy of solution as $||Ax - b||/(||A||||x||)$.

The columns in Table 3 are defined as follows:

R_{max} the performance in Gflop/s for the largest problem run on a machine.

N_{max} the size of the largest problem run on a machine.

$N_{1/2}$ the size where half the R_{max} execution rate is achieved.

R_{peak} the theoretical peak performance in Gflop/s for the machine.

In addition, the number of processors and the cycle time is listed.

4 Obtaining the Software and Running the Benchmarks

The software used to generate the data for this report can be obtained by sending electronic mail to *netlib@ornl.gov*

4.1 LINPACK Benchmark

The first results listed in Table 1 involved no hand optimization of the LINPACK benchmark.

To receive the single-precision software for this benchmark, in the mail message to *netlib@ornl.gov* type:

send linpacks from benchmark .

To receive the double-precision software for the LINPACK Benchmark, type:

send linpackd from benchmark .

To run the timing programs, one must supply a real function SECOND which returns the time in seconds from some fixed starting time.

There is only one ground rule for running this benchmark:

- No changes are to be made to the Fortran source code, not even changes in the comments.

The compiler and operating system must be generally available. Results from a beta version of a compiler are allowed, however the standard compiler results must also be listed.

4.2 Toward Peak Performance

The second set of results listed in Table 1 reflected user optimization of the software.

To receive the single-precision software for the column labeled "Toward Peak Performance," in the mail message *netlib@ornl.gov* type:

send 1000s from benchmark

To receive the double-precision software, type:

send 1000d from benchmark

The ground rules for running this benchmark are as follows:

- Replacements or modifications are allowed in the routine LU.
- The user is allowed to supply any method for the solution of the system of equations.
- The Mflop/s rate will be computed based on the operation count for LU decomposition.
- In all cases, the main driver routine, with its test matrix generator and residual check, must be used.

This report is updated from time to time. A fax copy of this report can be supplied, for details contact the author. To obtain a Postscript copy of the report send mail to *netlib@ornl.gov* and in the message type:

send performance from benchmark.

To have results verified, please send the output of the runs to

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Table 1: **Performance in Solving a System of Linear Equations**

Computer	"LINPACK Benchmark" n = 100 OS/Compiler	Mflop/s	"TPP" Best Effort n=1000, Mflop/s	"Theoretical Peak" Mflop/s
Cray T932 (32 proc. 2.2 ns)			29360	57600
Cray T928 (28 proc. 2.2 ns)			28340	50400
Cray T924 (24 proc. 2.2 ns)			26170	43200
Cray T916 (16 proc. 2.2 ns)			19980	28800
Cray T916 (8 proc. 2.2 ns)			10880	14400
Cray T94 (4 proc. 2.2 ns)			5735	7200
Cray T94 (3 proc. 2.2 ns)		1097	4387	5400
Cray T94 (2 proc. 2.2 ns)		962	2998	3600
Cray T94 (1 proc. 2.2 ns)	f90 -O3,inline2	705	1603	1800
NEC SX-4/32 (32 proc. 8.0 ns)			31060	64000
NEC SX-4/24 (24 proc. 8.0 ns)			27440	48000
NEC SX-4/16 (16 proc. 8.0 ns)			21470	32000
NEC SX-4/8 (8 proc. 8.0 ns)			12780	16000
NEC SX-4/4 (4 proc. 8.0 ns)			6780	8000
NEC SX-4/2 (2 proc. 8.0 ns)			3570	4000
NEC SX-4/1 (1 proc. 8.0 ns)	137 R6.1 -fopp f=x inline	578	1944	2000
NEC SX-4B/2(2proc.8.8ns)			3246	3636
NEC SX-4B/1(1proc.8.8ns)	R7.1 -fopp f=x inline	524	1767	1818
NEC SX-4/Ce (1 proc.)	R7.1 -fopp f=x inline	500	980	1000
Cray C90 (16 proc. 4.2 ns)	CF77 5.0 -Zp -Wd-e68	479	10780	15238
Cray C90 (8 proc. 4.2 ns)	CF77 5.0 -Zp -Wd-e68	468	6175	7619
NEC SX-4/16A(16proc.8.0ns)			20620	32000
NEC SX-4/8A(8proc.8.0ns)			12490	16000
NEC SX-4/4A(4proc.8.0ns)			6692	8000
NEC SX-4/2A(2proc.8.0ns)			3525	4000
NEC SX-4/1A(1proc.8.0ns)	R7.1 -fopp f=x inline	467	1929	2000
NEC SX-4B/e (1 proc. 8.8ns)	R7.1 -fopp f=x inline	454	890	909
NEC SX-4B/2A (2 proc. 8.8 ns)			3204	3636
NEC SX-4B/1A (1 proc. 8.8 ns)	R7.1 -fopp f=x inline	427	1753	1818
Cray 3-128 (4 proc. 2.11 ns)	CSOS 1.0 level 129	421	2862	3792
Hitachi S-3800/480(4 proc 2 ns)			20640	32000
Hitachi S-3800/380(3 proc 2 ns)			16880	24000
Hitachi S-3800/280(2 proc 2 ns)			12190	16000
Hitachi S-3800/180(1 proc 2 ns)	OSF/1 MJ FORTRAN:V03-00	408	6431	8000
Cray 3-128 (2 proc. 2.11 ns)	CSOS 1.0 level 129	393	1622	1896
Cray C90 (4 proc. 4.2 ns)	CF77 5.0 -Zp -Wd-e68	388	3275	3810
Cray C90 (2 proc. 4.2 ns)	CF77 5.0 -Zp -Wd-e68	387	1703	1905
Cray C90 (1 proc. 4.2 ns)	CF77 5.0 -Zp -Wd-e68	387	902	952
NEC SX-3/44R (4 proc. 2.5 ns)			15120	25600
NEC SX-3/42R (4 proc. 2.5 ns)			8950	12800
NEC SX-3/41R (4 proc. 2.5 ns)			4815	6400
NEC SX-3/34R (3 proc. 2.5 ns)			12730	19200
NEC SX-3/32R (3 proc. 2.5 ns)			6718	9600
NEC SX-3/31R (3 proc. 2.5 ns)			3638	4800

Computer	"LINPACK Benchmark" n = 100 OS/Compiler	Mflop/s	"TPP" Best Effort n=1000, Mflop/s	"Theoretical Peak" Mflop/s
NEC SX-3/24R (2 proc. 2.5 ns)			9454	12800
NEC SX-3/22R (2 proc. 2.5 ns)			5116	6400
NEC SX-3/21R (2 proc. 2.5 ns)			2627	3200
NEC SX-3/14R (1 proc. 2.5 ns)	f77sx 040 R2.2 -pi*:*	368	5199	6400
NEC SX-3/12R (1 proc. 2.5 ns)	f77sx 040 R2.2 -pi*:*	368	2757	3200
Cray 3-128 (1 proc. 2.11 ns)	CSOS 1.0 level 129	327	876	948
IBM RS6000/397(160 MHz ThinNode)	-qarch=pwr2 -qhot -O3 -Pv -Wp,-ea478,-g1	315	532	640
NEC SX-3/44 (4 proc. 2.9 ns)			13420	22000
NEC SX-3/24 (2 proc. 2.9 ns)			8149	11000
NEC SX-3/42 (4 proc. 2.9 ns)			7752	11000
NEC SX-3/22 (2 proc. 2.9 ns)			4404	5500
NEC SX-3/14 (1 proc. 2.9 ns)	f77sx 020 R1.13 -pi*:*	314	4511	5500
NEC SX-3/12 (1 proc. 2.9 ns)	f77sx 020 R1.13 -pi*:*	313	2283	2750
DEC 8400 5/625(8 proc,612 MHz)			3608	9792
DEC 8400 5/625(4 proc,612 MHz)			2377	4896
DEC 8400 5/625(2 proc,612 MHz)			1375	2448
DEC 8400 5/625(1 proc,612 MHz)	f77 -O5 -fast	287	764	1224
Cray Y-MP/832 (8 proc. 6 ns)	CF77 4.0 -Zp -Wd-e68	275	2144	2667
DEC 8200 5/625(8 proc,612 MHz)			2696	9792
DEC 8200 5/625(4 proc,612 MHz)			2313	4896
DEC 8200 5/625(2 proc,612 MHz)			1366	2448
DEC 8200 5/625(1 proc,612 MHz)	f77 -O5 -fast	268	750	1224
IBM RS6000/595(135 MHz WideNode)	-qarch=pwr2 -qhot -O3 -Pv -Wp,-ea478,-g1	265	440	540
Fujitsu VP2600/10 (3.2 ns)	FORTRAN77 EX/VP V11L10	249	4009	5000
DEC 500/500 (1 proc, 500 MHz)	kf77 -inline=daxpy -ur=3 -fast -O5 -tune ev5	235	590	1000
IBM P2SC (120 MHz Thin Node)	-qarch=pwr2 -qhot -O3 -Pv -Wp,-ea478,-g1	233	406	480
DEC PersonalWorkstation 600	-O5 -fast -tune ev56 -inline all -speculate all	227		1200
Cray Y-MP/832 (4 proc. 6 ns)	CF77 4.0 -Zp -Wd-e68	226	1159	1333
Fujitsu VPP500/1(1 proc. 10 ns)	FORTRAN77EX/VP V12L20	206	1490	1600
DEC 8400 5/440(8 proc, 440 MHz)	kf77 -inline=daxpy -ur=3 -fast -O5 -tune ev5		3112	7040
DEC 8100 5/440(4 proc, 440 MHz)	kf77 -inline=daxpy -ur=3 -fast -O5 -tune ev5		1945	3520
DEC 8100 5/440(2 proc, 440 MHz)	kf77 -inline=daxpy -ur=3 -fast -O5 -tune ev5		1090	1760
DEC 8100 5/440(1 proc, 440 MHz)	kf77 -inline=daxpy -ur=3 -fast -O5 -tune ev5	205	588	880
Cray Y-MP M98 (8 proc. 6 ns)	CF77 5.0 -Zp -Wd-e68	204	1733	2666
Fujitsu VX/1 (1 proc. 7 ns)	Fortran90/VP V10L10	203	1936	2200
Fujitsu VPP300/1 (1 proc. 7 ns)	Fortran90/VP V10L10	203	1936	2200
Fujitsu VPP700/1 (1 proc. 7 ns)	Fortran90/VP V10L10	203	1936	2200

Computer	"LINPACK Benchmark" n = 100 OS/Compiler	Mflop/s	"TPP" Best Effort n=1000, Mflop/s	"Theoretical Peak" Mflop/s
Fujitsu VP2200/10 (3.2 ns)	FORTRAN77 EX/VP V12L10	203	1048	1250
HP Exemplar V-Class(16 proc.240 MHz)	+O3 +Oinline=daxpy		5935	15360
HP Exemplar V-Class(14 proc.240 MHz)	+O3 +Oinline=daxpy		5394	13440
HP Exemplar V-Class(12 proc.240 MHz)	+O3 +Oinline=daxpy		5202	11520
HP Exemplar V-Class(10 proc.240 MHz)	+O3 +Oinline=daxpy		4585	9600
HP Exemplar V-Class(8 proc.240 MHz)	+O3 +Oinline=daxpy		4125	7680
HP Exemplar V-Class(6 proc.240 MHz)	+O3 +Oinline=daxpy		3350	4760
HP Exemplar V-Class(4 proc.240 MHz)	+O3 +Oinline=daxpy		2414	3840
HP Exemplar V-Class(2 proc.240 MHz)	+O3 +Oinline=daxpy		1260	1920
HP Exemplar V-Class(1 proc.240 MHz)	HP-UX 11.0			
	+O3 +Oinline=daxpy	203	743	960
Cray 2S/4-128 (4 proc. 4.1 ns)	CSOS 1.0 level 129	202	1406	1951
NEC SX-3/11R (1 proc. 2.5 ns)	f77sx 040 R2.2 -pi*:*	202	1418	1600
NEC SX-3/1LR (1 proc. 2.5 ns)	f77sx 040 R2.2 -pi*:*	201	767	800
Hewlett-Packard C240 236 MHz	+O3 +Oinline=daxpy	197	667	944
DEC 500/400 (1 proc, 400 MHz)	kf77 -inline=daxpy -ur=3			
	-fast -O5 -tune ev5	189	449	800
DEC 4100 5/400(4 proc, 400 MHz)	kf77 -inline=daxpy -ur=3			
	-fast -O5 -tune ev5		1821	3200
DEC 4100 5/400(2 proc, 400 MHz)	kf77 -inline=daxpy -ur=3			
	-fast -O5 -tune ev5		1001	1600
DEC 4100 5/400(1 proc, 400 MHz)	kf77 -inline=daxpy -ur=3			
	-fast -O5 -tune ev5	189	531	800
DEC 1000A 5/400(1 proc, 400 MHz)	kf77 -inline=daxpy -ur=3			
	-fast -O5 -tune ev5	187	440	800
Cray Y-MP/832 (2 proc. 6 ns)	CF77 5.0 -Zp -Wd-e68	181	604	667
Cray X-MP/416 (4 proc. 8.5 ns)	CF77 4.0 -Zp -Wd-e68	178	822	940
Cray Y-MP M98 (4 proc. 6 ns)	CF77 5.0 -Zp -Wd-e68	177	1114	1333
NEC SX-3/11 (1 proc. 2.9 ns)	f77sx 020 R1.13 -pi*:*	173	1223	1370
NEC SX-3/1L (1 proc. 2.9 ns)	f77sx 020 R1.13 -pi*:*	171	661	680
Fujitsu VP2400/10 (4 ns)	FORTRAN77 EX/VP V11L10	170	1688	2000
HP Exemplar V-Class(16 proc.200 MHz)	HP-UX 11.0		4832	12800
HP Exemplar V-Class(14 proc.200 MHz)	HP-UX 11.0		4442	11200
HP Exemplar V-Class(12 proc.200 MHz)	HP-UX 11.0		4109	8400
HP Exemplar V-Class(10 proc.200 MHz)	HP-UX 11.0		3506	8000
HP Exemplar V-Class(8 proc.200 MHz)	HP-UX 11.0		3206	6400
HP Exemplar V-Class(6 proc.200 MHz)	HP-UX 11.0		2608	4200
HP Exemplar V-Class(4 proc.200 MHz)	HP-UX 11.0		1912	3200
HP Exemplar V-Class(2 proc.200 MHz)	HP-UX 11.0		1082	1600
HP Exemplar V-Class(1 proc.200 MHz)	HP-UX 11.0			
	+O3 +Oinline=daxpy	169	613	800
Cray 2S/4-128 (2 proc. 4.1 ns)	CSOS 1.0 level 129	167	741	976
Hewlett-Packard C200 200 MHz	+O3 +Oinline=daxpy	166	550	800
DEC 8400 5/350 (1 proc 350 MHz)	kf77 -fkapargs='-inline=daxpy			
	-ur3=100' -tune ev5 -O5			
	-assume nounderscore	164	510	700

Computer	"LINPACK Benchmark" n = 100 OS/Compiler	Mflop/s	"TPP" Best Effort n=1000, Mflop/s	"Theoretical Peak" Mflop/s
DEC 8400 5/300 (8 proc 300 MHz)			2282	4800
DEC 8400 5/300 (6 proc 300 MHz)			1902	3600
DEC 8400 5/300 (4 proc 300 MHz)			1351	2400
DEC 8400 5/300 (2 proc 300 MHz)			757	1200
Cray Y-MP/832 (1 proc. 6 ns)	CF77 5.0 -Zp -Wd-e68	161	324	333
Convex C4/XA-4(4 proc)	fc9.0.0.5 -tm c4 -O3 -ds			
(7.41 ns)	-ep 4 -is .	160	2531	3240
Hewlett-Packard K460-EG 180 MHz	+Oall +Oinline=daxpy	158	510	720
Hewlett-Packard C180-XP 180 MHz	+Oall +Oinline=daxpy	158	480	720
HP Exemplar S-Class (16 proc)	SPP-UX 5.2		4609	11520
HP Exemplar S-Class (14 proc)	SPP-UX 5.2		4217	10080
HP Exemplar S-Class (12 proc)	SPP-UX 5.2		4019	8640
HP Exemplar S-Class (10 proc)	SPP-UX 5.2		3389	7200
HP Exemplar S-Class (8 proc)	SPP-UX 5.2		2979	5760
HP Exemplar S-Class (6 proc)	SPP-UX 5.2		2305	4320
HP Exemplar S-Class (4 proc)	SPP-UX 5.2		1629	2880
HP Exemplar S-Class (2 proc)	SPP-UX 5.2		967	1440
HP Exemplar S-Class(1 proc)	SPP-UX 5.2+Oall +Oinline=daxpy	156	545	720
Sun UltraSPARC II(30 proc)336MHz			5187	20160
Sun UltraSPARC II(24 proc)336MHz			4755	16128
Sun UltraSPARC II(16 proc)336MHz			3981	10752
Sun UltraSPARC II(14 proc)336MHz			3721	9408
Sun UltraSPARC II(8 proc)336MHz			2481	5376
Sun UltraSPARC II(6 proc)336MHz			1990	4032
Sun UltraSPARC II(4 proc)336MHz			1438	2688
Sun UltraSPARC II(2 proc)336MHz			843	1344
Sun UltraSPARC II(1 proc)336MHz	-fast -xO5 -xarch=v8plusa			
	-xchip=ultra -o	154	461	672
Cray Y-MP M98 (2 proc. 6 ns)	CF77 5.0 -Zp -Wd-e68	154	596	666
DEC AlphaStation 600 5/333 MHz	-fkapargs='-inline=daxpy			
	-ur3=100' -tune ev5 -O5	153		666
Convex C4/XA-3(3 proc)	fc9.0.0.5 -tm c4 -O3 -ds			
(7.41 ns)	-ep 3 -is .	151	1933	2430
Cray Y-MP M98 (1 proc. 6 ns)	CF77 5.0 -Zp -Wd-e68	150	307	333
Cray Y-MP M92 (2 proc. 6 ns)	CF77 5.0 -Zp -Wd-e68	145	550	666
Cray Y-MP M92 (1 proc. 6 ns)	CF77 5.0 -Zp -Wd-e68	145	332	333
Cray X-MP/416 (2 proc. 8.5 ns)	CF77 5.0 -Zp -Wd-e68	143	426	470
IBM RS/6000-R24 (71.5 MHz)	v3.1.1 xlf -Pv -Wp,-me,-ew			
	-O3 -qarch=pwrx -qtune=pwrx			
	-qhot-qhsflt -qnosave	142	246	284
DEC Alphastations 433 MHz	f90 -O	141		866
Hewlett-Packard C160 160 MHz	+Oall +Oinline=daxpy	140	421	640
IBM POWER2-990(71.5 MHz)	-O-Pv-Wp-ea478-g1-qarch=pwrx	140	254	286
DEC 4100 5/300(4 proc, 300 MHz)	kf77 -inline=daxpy -ur=3			
	-fast -O5 -tune ev5		1287	2400
DEC 4100 5/300(2 proc, 300 MHz)	kf77 -inline=daxpy -ur=3			

Computer	"LINPACK Benchmark" n = 100 OS/Compiler	Mflop/s	"TPP" Best Effort n=1000, Mflop/s	"Theoretical Peak" Mflop/s
	-fast -O5 -tune ev5		734	1200
DEC 4100 5/300(1 proc, 300 MHz)	kf77 -inline=daxpy -ur=3			
	-fast -O5 -tune ev5	140	420	600
DEC 8400 5/350 (8 proc 350 MHz)			2853	5600
DEC 8400 5/350 (6 proc 350 MHz)			2313	4200
DEC 8400 5/350 (4 proc 350 MHz)			1678	2800
DEC 8400 5/350 (2 proc 350 MHz)			938	1400
DEC 8400 5/300 (1 proc 300 MHz)	-inline=daxpy -ur=3 -fast			
	-O5 -tune ev5	140	411	600
DEC 8200 5/300 (6 proc 300 MHz)			1821	3600
DEC 8200 5/300 (4 proc 300 MHz)			1317	2400
DEC 8200 5/300 (2 proc 300 MHz)			752	1200
DEC 8200 5/300 (1 proc 300 MHz)	-inline=daxpy -ur=3 -fast			
	-O5 -tune ev5	140	411	600
IBM RS/6000-59H (66 MHz)	v3.1.1 xlf -Pv -Wp,-me,-ew			
	-O3 -qarch=pwrx -qtune=pwrx			
	-qhot-qhsflt -qnosave	132	230	264
IBM POWER2 model 590(66 MHz)	-O-Pv-Wp,-ea478,-g1-qarch=pwrx	130	236	264
Convex C4/XA-2(2 proc)	fc9.0.0.5 -tm c4 -O3 -ds			
(7.41 ns)	-ep 2 -is .	129	1335	1620
Cray J916 (16 proc. 10 ns)	CF77 6.0 -Zp -Wd-e68		2471	3200
Cray J916 (12 proc. 10 ns)	CF77 6.0 -Zp -Wd-e68		2046	2400
Cray J916 (8 proc. 10 ns)	CF77 6.0 -Zp -Wd-e68		1439	1600
Cray J916 (7 proc. 10 ns)	CF77 6.0 -Zp -Wd-e68	129	1254	1400
Fujitsu VP2200/10 (4 ns)	FORTRAN77 EX/VP V11L10	127	842	1000
Cray J932 (32 proc. 10 ns)	cf77 (6.0) -Zp -Wd-68		4486	6400
Cray J932 (28 proc. 10 ns)	cf77 (6.0) -Zp -Wd-68		4235	5600
Cray J932 (24 proc. 10 ns)	cf77 (6.0) -Zp -Wd-68		3775	4800
Cray J932 (20 proc. 10 ns)	cf77 (6.0) -Zp -Wd-68		3238	4000
Cray J932 (16 proc. 10 ns)	cf77 (6.0) -Zp -Wd-68		2709	3200
Cray J932 (12 proc. 10 ns)	cf77 (6.0) -Zp -Wd-68		2029	2400
Cray J932 (8 proc. 10 ns)	cf77 (6.0) -Zp -Wd-68		1425	1600
Cray J932 (7 proc. 10 ns)	cf77 (6.0) -Zp -Wd-68	126	1221	1400
SGI POWER CHALLENGE				
(90 MHz,16 proc)			3240	5760
SGI POWER CHALLENGE				
(90 MHz,8 proc)			2045	2880
SGI POWER CHALLENGE				
(90 MHz,4 proc)			1124	1440
SGI POWER CHALLENGE				
(90 MHz,2 proc)			569	720
SGI POWER CHALLENGE	-non_shared -OPT:			
(90 MHz,1 proc)	IEEE_arithmetic=3:roundoff=3			
	-TENV:X=4 -col120 -WK,-ur=12,			
	-ur2=200 -WK,-so=3,-ro=3,-o=5			
	-WK,-inline=daxpy:dscal:idamax			

Computer	"LINPACK Benchmark" n = 100 OS/Compiler	Mflop/s	"TPP" Best Effort n=1000, Mflop/s	"Theoretical Peak" Mflop/s
	-SWP:max_pair_candidates=2			
	-SWP:strict_ivdep=false	126	308	360
Cray J916 (4 proc. 10 ns)	CF77 6.0 -Zp -Wd-e68	121	743	800
Cray X-MP/416 (1 proc. 8.5 ns)	CF77 5.0 -Zp -Wd-e68	121	218	235
Cray 2S/4-128 (1 proc. 4.1 ns)	CSOS 1.0 level 129	120	384	488
DEC 2100 5/250 (4 proc 250 MHz)			1022	2000
DEC 2100 5/250 (2 proc 250 MHz)			578	1000
DEC 2100 5/250 (1 proc 250 MHz)	-inline=daxpy -ur=3 -fast			
	-O5 -tune ev5	119	317	500
Cray J932 (4 proc. 10 ns)	cf77 (6.0) -Zp -Wd-68	117	730	800
SGI Origin 2000				
(195 MHz, 16 proc)			3146	6240
SGI Origin 2000				
(195 MHz, 8 proc)			2182	3120
SGI Origin 2000				
(195 MHz, 4 proc)			1292	1560
SGI Origin 2000				
(195 MHz, 2 proc)			667	780
SGI Origin 2000	-n32 -mips4 -Ofast=ip27 -TENV:X=4			
(195MHz,1proc)	-LNO:blocking=off:ou_max=6:pf2=0	114	344	390
IBM RS/6000 F50 (332 MHz,4 proc)			967	2656
IBM RS/6000 F50 (332 MHz,3 proc)			760	1992
IBM RS/6000 F50 (332 MHz,2 proc)			517	1328
IBM RS/6000 F50 (332 MHz,1 proc)	-O -qhot -qarch=ppc			
	-qfloat=hsflt -Pv -Wp,-ea478,			
	-g1 -bnso -bI:/lib/syscalls.exp			
	-bnodelcsect	116	277	664
Fujitsu VP2100/10 (4 ns)	FORTRAN77 EX/VP V11L10	112	445	500
Cray J916 (2 proc. 10 ns)	CF77 6.0 -Zp -Wd-e68	111	380	400
SUN Ultra HPC 6000(250 MHz,30 p)			4755	15000
SUN Ultra HPC 6000(250 MHz,24 p)			4389	12000
SUN Ultra HPC 6000(250 MHz,16 p)			3493	8000
SUN Ultra HPC 6000(250 MHz,14 p)			3112	7000
SUN Ultra HPC 6000(250 MHz, 8 p)			2038	4000
SUN Ultra HPC 6000(250 MHz, 6 p)			1607	3000
SUN Ultra HPC 6000(250 MHz, 4 p)			1126	2000
SUN Ultra HPC 6000	-fast -native -xarch=v8plusa			
(250 MHz,1MB L2)	-xsafe=mem -dalign -libmil -xO5			
	-fsimple=2 -stackvar -xarch=v8plusa			
	-xcache=16/32/1:512/64/1 -xchip=ultra			
	-xdepend -xlibmil -xlibmopt -xsafe=mem			
	-Qoption cg -Qms_pipe+float_loop_ld=16			
	-xcrossfile	110		500
Cray J932 (2 proc. 10 ns)	cf77 (6.0) -Zp -Wd-68	109	376	400
Hitachi S-820/80 (4 ns)	FORT77/HAP V23-0C	107		3000
Cray J916 (1 proc. 10 ns)	CF77 6.0 -Zp -Wd-e68	106	203	200

Computer	"LINPACK Benchmark" n = 100 OS/Compiler	Mflop/s	"TPP" Best Effort n=1000, Mflop/s	"Theoretical Peak" Mflop/s
Cray J932 (1 proc. 10 ns)	cf77 (6.0) -Zp -Wd-68	104	202	200
Cray 2S/8-128 (8 proc. 4.1 ns)	CF77 4.0 -Zp -Wd-e68	102	2171	3902
IBM POWER2 model 58H(55 MHz)	-O-Pv-Wp-ea478-g1-qarch=pwrx	101	197	220
SGI POWER CHALLENGE (75 MHz,18 proc)			3227	5400
SGI POWER CHALLENGE (75 MHz,16 proc)			3033	4800
SGI POWER CHALLENGE (75 MHz,14 proc)			2775	4200
SGI POWER CHALLENGE (75 MHz,12 proc)			2499	3600
SGI POWER CHALLENGE (75 MHz,10 proc)			2167	3000
SGI POWER CHALLENGE (75 MHz,8 proc)			1818	2400
SGI POWER CHALLENGE (75 MHz,6 proc)			1421	1800
SGI POWER CHALLENGE (75 MHz,4 proc)			993	1200
SGI POWER CHALLENGE (75 MHz,2 proc)			505	600
SGI POWER CHALLENGE (75 MHz,1 proc)	-non_shared -OPT: IEEE_arithmetic=3:roundoff=3 -TENV:X=4 -col120 -WK,-ur=12, -ur2=200 -WK,-so=3,-ro=3,-o=5 -WK,-inline=daxpy:dscal:idamax -SWP:max_pair_candidates=2 -SWP:strict_ivdep=false	104	261	300
Convex C4/XA-1(1 proc.)(7.41 ns)	fc9.0.0.5 -tm c4 -O2 -is .	99	705	810
ETA 10-G (1 proc. 7 ns)	ETAV/FTN200	93	496	571
Convex C-3880 (8 proc.) (16.7 ns)	fc7.0 -tm c38 -O3 -ep 8 -ds -is .	86	795	960
IBM ES/9000-982 VF(8 proc 7.1ns)	VAST-2/VS Fortran V2R5		2278	4507
IBM ES/9000-972 VF(7 proc 7.1ns)	VAST-2/VS Fortran V2R5		2072	3944
IBM ES/9000-962 VF(6 proc 7.1ns)	VAST-2/VS Fortran V2R5		1923	3380
IBM ES/9000-952 VF(5 proc 7.1ns)	VAST-2/VS Fortran V2R5		1681	2817
IBM ES/9000-942 VF(4 proc 7.1ns)	VAST-2/VS Fortran V2R5		1377	2254
IBM ES/9000-831 VF(3 proc 7.1ns)	VAST-2/VS Fortran V2R5		1082	1690
IBM ES/9000-821 VF(2 proc 7.1ns)	VAST-2/VS Fortran V2R5		767	1127
IBM ES/9000-711 VF(1 proc 7.1ns)	VAST-2/VS Fortran V2R5	86	422	563
HALstation 300 model 350(118MHz)	-Kfast -Keval -KGREG -Kgs -KV8PLUS -X7 -Kpreex -Kpreload -Kfuse -x FLDFLAGS = -dn	85	177	236
SUN-Ultra 1 mod. 170	f77 v4.0 -fast -O4	76		
Convex C-3840 (4 proc.) (16.7 ns)	fc7.0 -tm c38 -O3 -ep 4 -ds -is .	75	425	480
HALstation 300 model 330(101MHz)	-Kfast -Keval -KGREG -Kgs -KV8PLUS -X7 -Kpreex			

Computer	"LINPACK Benchmark" n = 100 OS/Compiler	Mflop/s	"TPP" Best Effort n=1000, Mflop/s	"Theoretical Peak" Mflop/s
	-Kpreload -Kfuse -x FLDFLAGS = -dn	72	153	202
SGI CHALLENGE/Onyx				
(6.6ns, 36 proc)			557	2700
SGI CHALLENGE/Onyx				
(6.6ns, 32 proc)			539	2400
SGI CHALLENGE/Onyx				
(6.6ns, 28 proc)			531	2100
SGI CHALLENGE/Onyx				
(6.6ns, 24 proc)			499	1800
SGI CHALLENGE/Onyx				
(6.6ns, 20 proc)			474	1500
SGI CHALLENGE/Onyx				
(6.6ns, 18 proc)			458	1350
SGI CHALLENGE/Onyx				
(6.6ns, 16 proc)			431	1200
SGI CHALLENGE/Onyx				
(6.6ns, 14 proc)			393	1050
SGI CHALLENGE/Onyx				
(6.6ns, 12 proc)			374	900
SGI CHALLENGE/Onyx				
(6.6ns, 10 proc)			338	750
SGI CHALLENGE/Onyx	IRIX 5.2,f77,-O2-mips2-Wo,			
(6.6ns, 8 proc)	-loopunroll,8-Olimit2000-Wf			
	-dchacheopt-jmpopt-non_shared			
	-pfa keep-WK, -WK,			
	-ipa=daxpy:saxpy,-ur=1,-mc=100	73	311	600
Convex C-3830 (3 proc.) (16.7 ns)				
	fc7.0 -tm c38 -O3 -ep 3 -ds -is .	71	327	360
Sun UltraSPARC 1(24 proc)167MHz			3566	8000
Sun UltraSPARC 1(20 proc)167MHz			3170	6667
Sun UltraSPARC 1(16 proc)167MHz			2761	5333
Sun UltraSPARC 1(12 proc)167MHz			2238	4000
Sun UltraSPARC 1(8 proc)167MHz			1607	2667
Sun UltraSPARC 1(4 proc)167MHz			871	1333
Sun UltraSPARC 1(2 proc)167MHz			456	667
Sun UltraSPARC 1(1 proc)167MHz	-V -fast -native -dalign			
	-libmil -xO4 -xsafe=3Dmem			
	-Qoption cg=20			
	-Qms_pipe+float_loop_ld=3D16			
	-onetrip -xcrossfile	70	237	333
SGI CHALLENGE/Onyx	IRIX 5.2,f77,-O2-mips2-Wo,			
(6.6ns, 6 proc)	-loopunroll,8-Olimit2000-Wf			
	-dchacheopt-jmpopt-non_shared			
	-pfa keep-WK, -WK,			
	-ipa=daxpy:saxpy,-ur=1,-mc=100	69		450
Convex SPP-1600(8 proc) 120 MHz			934	1920

Computer	"LINPACK Benchmark" n = 100 OS/Compiler	Mflop/s	"TPP" Best Effort n=1000, Mflop/s	"Theoretical Peak" Mflop/s
Convex SPP-1200(8 proc) 120 MHz			656	1920
Convex SPP-1600(7 proc) 120 MHz			860	1680
Convex SPP-1600(6 proc) 120 MHz			722	1440
Convex SPP-1200(6 proc) 120 MHz			530	1440
Convex SPP-1600(5 proc) 120 MHz			633	1200
Convex SPP-1600(4 proc) 120 MHz			518	960
Convex SPP-1200(4 proc) 120 MHz			383	960
Convex SPP-1600(3 proc) 120 MHz			415	720
Convex SPP-1600(2 proc) 120 MHz			290	480
Convex SPP-1200(2 proc) 120 MHz			213	480
Convex SPP-1600(1 proc) 120 MHz	fc9.2.1 fc -is	65	195	240
Convex SPP-1200(1 proc) 120 MHz	fc9.2.1 fc -is	65	123	240
SUN-Ultra 1 mod. 140	f77 v4.0 -fast -O4	63		
Convex C-3820 (2 proc.) (16.7 ns)				
	fc7.0 -tm c38 -O3 -ep 2 -ds -is .	62	222	240
Cray-2/4-256 (4 proc. 4.1 ns)	cf77 3.0	62	1226	1951
ETA 10-E (1 proc. 10.5 ns)	ETAV/FTN200	62	334	381
Gateway 2000 G6-200 PentiumPro	MS Fortran NT /G5 /Oxb2	62		200
IBM ES/9000-900 VF(6 proc. 9 ns)	VAST-2/VS Fortran V2R4		1457	2664
IBM ES/9000-860 VF(5 proc. 9 ns)	VAST-2/VS Fortran V2R4		1210	2220
IBM ES/9000-820 VF(4 proc. 9 ns)	VAST-2/VS Fortran V2R4		1003	1776
IBM ES/9000-740 VF(3 proc. 9 ns)	VAST-2/VS Fortran V2R4		775	1332
IBM ES/9000-640 VF(2 proc. 9 ns)	VAST-2/VS Fortran V2R4		539	888
IBM ES/9000-660 VF(2 proc. 9 ns)	VAST-2/VS Fortran V2R4		535	888
IBM ES/9000-520 VF(1 proc. 9 ns)	VAST-2/VS Fortran V2R4	60	338	444
SGI CHALLENGE/Onyx	IRIX 5.2,f77,-O2-mips2-Wo,			
(6.6ns, 4 proc)	-loopunroll,8-Olimit2000-Wf			
	-dchacheopt-jmpopt-non_shared			
	-pfa keep-WK, -WK,			
	-ipa=daxpy:saxpy,-ur=1,-mc=100	58	178	300
Cray X-MP/14se (10 ns)	cf77 3.0	53	184	210
DEC 7000-760 (6 proc) 3.64 ns			962	1650
DEC 7000-740 (4 proc) 3.64 ns			693	1100
DEC 7000-720 (2 proc) 3.64 ns			361	550
DEC 7000-710 (1 proc) 3.64 ns	3.6 -O5 -fast	53	208	275
IBM RS/6000-390 (66.5 MHz)	v3.1.1 xlf -Pv -Wp,-fz,-me,-ew			
	-O3 -Q -qstrict -qarch=pwr-qtune			
	=pwrx -qhot -qhsflt -qnosave	53	181	266
DEC 2100 4/275 A500MP(4 proc)			625	1100
DEC 2100 4/275 A500MP(2 proc)			348	550
DEC 2100 4/275 A500MP(1 proc)	3.6 -O5 -fast	52	208	275
DEC 3000-900 (1 proc) 3.64 ns	3.6 -O5 -fast	52	193	275
Convex SPP-1000(15 procs)100MHz			965	3000
Convex SPP-1000(12 procs)100MHz			916	2400
Convex SPP-1000(8 procs)100 MHz			751	1600
Convex SPP-1000(4 procs)100 MHz			442	800

Computer	"LINPACK Benchmark" n = 100 OS/Compiler	Mflop/s	"TPP" Best Effort n=1000, Mflop/s	"Theoretical Peak" Mflop/s
Convex SPP-1000(2 procs)100 MHz			255	400
Convex SPP-1000(1 proc) 100 MHz	fc9.2.1 fc -is	48	123	200
Cray-2/4-256 (2 proc. 4.1 ns)	cf77 3.0	48	709	976
IBM ES/9000-711 (1 proc 7.1ns)	VAST-2/VS Fortran V2R5	48		
DEC 3000-700 (1 proc) 4.44 ns	3.6 -O5 -fast	45	164	225
DEC 400 4/233 (1 proc) 4.3 ns	3.6 -O5 -fast	45	138	233
Convex C-3810 (1 proc.) (16.7 ns)	fc7.0 -tm c38 -O2 -is .	44	113	120
DEC 7000-660 (6 procs) 5.0 ns			755	1200
DEC 7000-650 (5 procs) 5.0 ns			641	1000
DEC 7000-640 (4 procs) 5.0 ns			538	800
DEC 7000-630 (3 procs) 5.0 ns			413	600
DEC 7000-620 (2 procs) 5.0 ns			279	400
DEC 7000-610 (1 proc) 5.0 ns	1.3 -O5 -fast	44	156	200
DEC 3000-800 Alpha AXP 5.0 ns	1.3 -O5 -fast	44	145	200
DEC 2100-A500MP(4 procs)5.25 ns	1.3 -O5 -fast		358	760
DEC 2100-A500MP(3 procs)5.25 ns	1.3 -O5 -fast		293	570
DEC 2100-A500MP(2 procs)5.25 ns	1.3 -O5 -fast		209	380
DEC 2100-A500MP(1 proc) 5.25 ns	1.3 -O5 -fast	43	129	190
DEC 10000-660 Alpha AXP(6 proc)			751	1200
DEC 10000-650 Alpha AXP(5 proc)			639	1000
DEC 10000-640 Alpha AXP(4 proc)			523	800
DEC 10000-630 Alpha AXP(3 proc)			403	600
DEC 10000-620 Alpha AXP(2 proc)			273	400
DEC 10000-610 Alpha AXP 200 MHz	3.2 inl=daxpy,ur=4,ur2=240	43	155	200
NEC SX-2 (6 ns)	FORTRAN 77/SX	43	885	1300
Cray Y-MP EL (4 proc. 30 ns)	CF77 5.0 -Zp -Wd-e68	41	345	532
HP 9000/735 (99 MHz)	+OP3 -Wl,-aarchive -WP,-nv -w, ConvexMLIB 1.2	41	120	198
Compaq Proliant 5000 200 MHz	MS Power Stat. 4.0 Full Opt	40		200
Cray Y-MP EL98 (8 proc. 30 ns)	CF77 5.0 -Zp -Wd-e68	40	567	1068
Cray Y-MP EL98 (4 proc. 30 ns)	CF77 5.0 -Zp -Wd-e68	40	357	534
Cray Y-MP EL94 (4 proc. 30 ns)	CF77 5.0 -Zp -Wd-e68	40	331	532
Cray S-MP/11v2 (1 proc. 30 ns)	uf77 5.1.2 vec=collapse pi+	39	206	267
Cray Y-MP EL94 (2 proc. 30 ns)	CF77 5.0 -Zp -Wd-e68	39	190	266
Cray Y-MP EL (2 proc. 30 ns)	CF77 5.0 -Zp -Wd-e68	39	191	266
DEC 4000-720 (2 procs) 5.25 ns			235	380
DEC 4000-710 (1 procs) 5.25 ns	1.3 -O5 -fast	39	143	190
DEC 1000 4/200 (5 ns)	3.6 -O5 -fast	39	147	200
Cray-2/4-256 (1 proc. 4.1 ns)	cf77 3.0	38	360	488
IBM RISC Sys/6000-580 (62.5MHz)	v2.3 xlf -O -P -Wp,-ea478	38	104	125
IBM RISC Sys/6000-980 (62.5MHz)	v2.3 xlf -O -P -Wp,-ea478	38	104	125
IBM ES/9000-520 (1 proc. 9 ns)	VAST-2/VS Fortran V2R4	38		
IBM ES/9000-820 (1 proc. 9 ns)	VAST-2/VS Fortran V2R4	38		
SGI CHALLENGE/Onyx (6.6ns, 2 proc)	IRIX 5.2,f77,-O2-mips2-Wo, -loopunroll,8-Olimit2000-Wf -dchacheopt-jmpopt-non_shared			

Computer	"LINPACK Benchmark" n = 100 OS/Compiler	Mflop/s	"TPP" Best Effort n=1000, Mflop/s	"Theoretical Peak" Mflop/s
	-pfa keep-WK, -WK,			
	-ipa=daxpy:saxpy,-ur=1,-mc=100	38	93.5	150
DEC 4000-610 Alpha AXP(160 MHz)	3.2 inl=daxpy,ur=4,ur2=240	36	114	160
Pentium Pro 200 Mhz	Solaris 2.5 GNU F77 v0.5.5	38		200
NEC SX-1	FORTRAN 77/SX	36	422	650
Cray Y-MP EL98 (2 proc. 30 ns)	CF77 5.0 -Zp -Wd-e68	35	192	267
Apple Macintosh 9500/233	MF -O4 -Asched=2,targ=604	34		
Apple Macintosh 6500/275	MF -O4 -Asched=2,targ=604	20		
Convex C-3440 (4 proc.)	fc7.0 fc -O3 -ep 4 -ds -is .	34	172	200
Cray Y-MP EL98 (1 proc. 30 ns)	CF77 5.0 -Zp -Wd-e68	34	107	133
ETA 10-Q (1 proc. 19 ns)	ETAV/FTN200	34	185	210
Cray Y-MP EL94 (1 proc. 30 ns)	CF77 5.0 -Zp -Wd-e68	34	107	133
Cray Y-MP EL (1 proc. 30 ns)	CF77 5.0 -Zp -Wd-e68	34	107	133
DEC 3000-600 Alpha AXP 5.7 ns	1.3 -O5 -fast	34	129	180
Cray S-MP/MCP784(84 proc. 25 ns)			742	3360
Cray S-MP/MCP756(56 proc. 25 ns)			678	2240
Cray S-MP/MCP728(28 proc. 25 ns)			508	1120
Cray S-MP/MCP707 (7 proc. 25 ns)	MCP Release 2.2	33	194	280
DEC 200 4/166 (1 proc) 6 ns	3.6 -O5 -fast	33	100	167
FPS 510S MCP784 (84 proc. 25 ns)			548	3360
FPS 510S MCP756 (56 proc. 25 ns)			513	2240
FPS 510S MCP728 (28 proc. 25 ns)			414	1120
FPS 510S MCP707 (7 proc. 25 ns)	pgf77 -O4 -Minline	33	184	280
CDC Cyber 2000V	Fortran V2	32		
Convex C-3430 (3 proc.)	fc7.0 fc -O3 -ep 3 -ds -is .	32	132	150
Macintosh 7300/200MHz	4.4, Absoft Corp.-c -O -o	32		200
NEC SX-1E	FORTRAN 77/SX	32	221	325
SGI Indigo2 (R4400/200MHz)	-mips2 -Olimit 3000 -Wo,			
	-loopunroll,8 -Wf,-dcacheopt			
	-Wf,-dcacheoptx -O3 -non_shared	32		
Alliant FX/2800-200 (14 proc)	fortran 1.1.27 -O -inline	31	325	560
IBM RISC Sys/6000-970 (50 MHz)	v2.2.1 xlf -O -P -Wp,-ea478	31	84	100
IBM RS/6000 Cluster(8 proc 62.5 MHz)			269	1000
IBM RS/6000 Cluster(4 proc 62.5 MHz)			206	500
IBM RS/6000 Cluster(2 proc 62.5 MHz)			144	250
IBM RS/6000 Cluster(8 proc 50 MHz)			194	800
IBM RS/6000 Cluster(6 proc 50 MHz)			174	600
IBM RS/6000 Cluster(4 proc 50 MHz)			152	400
IBM RS/6000 Cluster(2 proc 50 MHz)			111	200
IBM RISC Sys/6000-560 (50 MHz)	v2.2.1 xlf -O -P -Wp,-ea478	31	84	100
IBM ES/9000-742 VF(4 proc 11ns)	VAST-2/VS Fortran V2R5		441	752
IBM ES/9000-732 VF(3 proc 11ns)	VAST-2/VS Fortran V2R5		352	545
IBM ES/9000-622 VF(2 proc 11ns)	VAST-2/VS Fortran V2R5		244	364
IBM ES/9000-621 VF(2 proc 11ns)	VAST-2/VS Fortran V2R5		244	364
IBM ES/9000-521 VF(2 proc 11ns)	VAST-2/VS Fortran V2R5		185	364
IBM ES/9000-511 VF(1 proc 11ns)	VAST-2/VS Fortran V2R5	30	130	182

Computer	"LINPACK Benchmark" n = 100 OS/Compiler	Mflop/s	"TPP" Best Effort n=1000, Mflop/s	"Theoretical Peak" Mflop/s
DEC 3000-500 Alpha AXP(150 MHz)	3.2 inl=daxpy,ur=4,ur2=240	30	107	150
Hitachi SR2201(1 proc 150 MHz)	f90 PVEC,OPT(0(S),FOLD(2))	30	248	300
SGI CHALLENGES 200Mhz R4400SC	IRIX 5.3 f77 -O4 -mips2	30		
Alliant FX/2800-200 (12 proc)	fortran 1.1.27 -O -inline	29	290	480
HP 9000/715 (75 MHz)	HP-UX f77 +OP4	29		
IBM 9672-R12	VAST-2/VS Fortran 2.5	29		83
Sun Sparc 20 90 MHz, (1 proc)	SUN 5.3 -fast -unroll=4 -O4	29		
Alliant FX/2800 210 (1 proc)	fortran 1.3.02 -Ovg -inline	25	34	50
Alliant FX/2800-200 (10 proc)	fortran 1.1.27 -O -inline	27	250	400
ETA 10-P (1 proc. 24 ns)	ETAV/FTN200	27	146	167
Convex C-3420 (2 proc.)	fc7.0 fc -O3 -ep 2 -ds -is .	27	90	100
Cray-1S (12.5 ns)	cf77 2.1	27	110	160
Convex C-3240 (4 proc.)	fc -O3 -ep 2 -uo -pp=fcpp1 -is .	26	171	200
Convex C-240 (4 proc.)	6.1 -O3 -ep2 -uo -pp=fcpp1 -is .	26	166	200
Convex C-3230 (3 proc.)	fc -O3 -ep 2 -uo -pp=fcpp1 -is .	26	132	150
Convex C-230 (3 proc.)	6.1 -O3 -ep2 -uo -pp=fcpp1 -is .	26	128	150
DEC 2000-300 Alpha AXP 6.7 ns	1.3 -O5 -fast	26	88	150
DEC 3000-400 Alpha AXP(133 MHz)	3.2 inl=daxpy,ur=4,ur2=240	26	90	133
IBM RISC Sys/6000-950 (42 MHz)	v2.2.1 xlf -O -P -Wp,-ea478	26	70	84
IBM RISC Sys/6000-550 (42 MHz)	v2.2.1 xlf -O -P -Wp,-ea478	26	70	84
IBM RISC Sys/6000-375(62.5 MHz)	v2.3.0 xlf -O -P -Wp,-ea478	26	90	125
IBM RISC Sys/6000-370(62.5 MHz)	v2.3.0 xlf -O -P -Wp,-ea478	26	90	125
SGI CHALLENGE/Onyx (6.6ns, 1 proc)	IRIX 5.2,f77,-O2-mips2-Wo, -loopunroll,8-Olimit2000-Wf -dchacheopt-jmpopt-non_shared -pfa keep-WK, -WK, -ipa=daxpy:saxpy,-ur=1,-mc=100	26	48.4	75
Alliant FX/2800-200 (8 proc)	fortran 1.1.27 -O -inline	25	207	320
NAS AS/EX 100 VPF (4 proc)			320	484
NAS AS/EX 90 VPF (3 proc)			251	363
NAS AS/EX 80 VPF (2 proc)			173	242
NAS AS/EX 60 VPF	VAST-2/VS 2.3.0 opt=3	25	94	121
HP 9000/750 (66 MHz)	+OP3 -Wl,-aarchive -WP,-nv -w	24	47	66
HP 9000/730 (66 MHz)	+OP3 -Wl,-aarchive -WP,-nv -w	24	49	66
IBM ES/9000 Model 480 VF	VAST-2/VS Fortran V2R4		180	266
IBM ES/9000-340 VF (14.5 ns)	VAST-2/VS Fortran V2R4	23		138
IBM ES/9000-411 VF(1 proc 11ns)	VAST-2/VS Fortran V2R5	23	99	182
Meiko CS2 (64 proc)			652	11520
Meiko CS2 (32 proc)			649	5760
Meiko CS2 (16 proc)			530	2880
Meiko CS2 (8 proc)			420	1440
Meiko CS2 (4 proc)			289	720
Meiko CS2 (2 proc)			169	360
Meiko CS2 (1 proc)	-dalign -O5 -XT=ss10h,unroll=1	24	97	180
Fujitsu M1800/20	EX V10L20 frt -Of -Ne	23		
Sun Sparc 10-52 (1 proc)	SUN 3.0 -fast -O4			

Computer	"LINPACK Benchmark" n = 100 OS/Compiler	Mflop/s	"TPP" Best Effort n=1000, Mflop/s	"Theoretical Peak" Mflop/s
	-unroll=4 -Bstatic	23		
DEC VAX 9000 420VP(2 proc 16 ns)	HPO V1.3-163V, DXML		155	250
DEC VAX 9000 410VP(1 proc 16 ns)	HPO V1.3-163V, DXML	22	89	125
IBM ES/9000-610 VF (4 proc 15 ns)	VAST-2/VS Fortran V2R4		335	532
IBM ES/9000-570 VF (3 proc 15 ns)	VAST-2/VS Fortran V2R4		252	399
Apple Macintosh 9500/132	MF77 -O4 -Ashed=2,target=604	22		
IBM ES/9000-490 VF (2 proc 15 ns)	VAST-2/VS Fortran V2R4		171	266
IBM ES/9000-320 VF (1 proc 15 ns)	VAST-2/VS Fortran V2R4	22	91	133
IBM RISC Sys/6000-570 (50 MHz)	v2.3.0 xlf -O -P -Wp,-ea478	22	73	100
IBM RISC Sys/6000-365 (50 MHz)	v2.3.0 xlf -O -P -Wp,-ea478	22	73	100
IBM RISC Sys/6000-360 (50 MHz)	v2.3.0 xlf -O -P -Wp,-ea478	22	73	100
Multiflow TRACE 28/300	Fortran 2.2.1	22	69	123
Convex C-3220 (2 proc.)	fc -O3 -ep 2 -uo -pp=fcpp1 -is .	22	89	100
Convex C-220 (2 proc.)	6.1 -O3 -ep2 -uo -pp=fcpp1 -is .	22	87	100
Alliant FX/2800-200 (6 proc)	fortran 1.1.27 -O -inline	21	148	240
Siemens VP400-EX (7 ns)	Fortran 77/VP V10L30	21	794	1714
IBM ES/9221-211 (16 ns)	VAST-2/VS Fortran 2.5	21		
Apple Macintosh 6500/275	MF -O4 -Asched=2,targ=604	20		
Apple Power Mac 8500/120	Absoft Power PC v4.1 -O -U	20		
FPS Model 522	F77 4.2	20	105	133
Fujitsu VP-400	Fortran 77 V10L30	20		1142
IBM RISC Sys/6000-530H(33 MHz)	v2.2.1 xlf -O -P -Wp,-ea478	20	55	66
IBM RS/6000-C10(601 - 80 MHz)	v3.1.1 xlf -Pv -Wp,-fz,-me, -ew -O3 -qarch=ppc -qhot -qhsflt -qnosave -qnofold	20	63	80
IBM ES/9672-R11 (16 ns)	VAST-2/VS Fortran 2.5	20		
Siemens VP200-EX (7 ns)	Fortran 77 V10L30	20	472	857
Amdahl 1400	77/VP V10L20	19	521	1142
Amdahl 1200	77/VP V10L20	19	424	571
Apple Power Mac 9500/132	Absoft Power PC v4.1 -O -U	19		
Convex C-3410 (1 proc.)	fc7.0 fc -O2 -is .	19	47	50
Gateway 2000 P5-133	MS PS 32 NT /G5 /Oxb2	19		
IBM ES/9000 Model 260 VF (15 ns)	VAST-2/VS Fortran V2R4	19	78	133
IBM RISC Sys/6000-550L(42 MHz)	v2.3.0 xlf -O -P -Wp,-ea478	19	61	82
IBM RISC Sys/6000-540 (30 MHz)	v2.2.1 xlf -O -P -Wp,-ea478	19	50	60
IBM RISC Sys/6000-355 (42 MHz)	v2.3.0 xlf -O -P -Wp,-ea478	19	61	84
IBM RISC Sys/6000-350 (42 MHz)	v2.2.1 xlf -O -P -Wp,-ea478	19	61	84
IBM RISC Sys/6000-34H (42 MHz)	v2.3.0 xlf -O -P -Wp,-ea478	19	61	84
IBM ES/9000-311 VF(1 proc 11ns)	VAST-2/VS Fortran V2R5	19	82	182
Cray S-MP/11 (1 proc. 30 ns)	uf77 5.1.2 -Oc a2	18	60	67
Compaq Deskpro 4000 166 MHz	MS Power Stat. 4.0 Full Opt	18		166
Fujitsu VP-200	Fortran 77	18	422	533
HP 9000/720 (50 MHz)	HP-UX 8.05 f77 +OP4 +O3	18	36	50
IBM ES/9221-201 (16 ns)	VAST-2/VS Fortran 2.5	18		
NAS AS/EX 50 VPF	VAST-2/VS 2.3.0	18	82	121
SGI 4D/480(8 proc) 40MHz	f77 -O2 -mp	18	71	128

Computer	"LINPACK Benchmark" n = 100 OS/Compiler	Mflop/s	"TPP" Best Effort n=1000, Mflop/s	"Theoretical Peak" Mflop/s
Siemens VP100-EX (7 ns)	Fortran 77/VP V10L30	18	254	428
Sun 670MP Ross Hypersparc(55Mhz)	-cg89 -dalign -libmil -O4	18		
Apple PowerMacintosh 8100/100	Motorola MF77 -O4	17		
Apple Power Mac 6500/275	Absoft f77 v4.4 -O	17		
Alliant FX/2800-200 (4 proc)	fortran 1.1.27 -O -inline	17	94	160
Amdahl 1100	77/VP V10L20	17	248	285
CDC CYBER 205 (4-pipe)	FTN	17	195	400
CDC CYBER 205 (2-pipe)	FTN	17	113	200
Convex C-3210 (1 proc.)	fc -O2 -uo -pp=fcpp1 -is .	17	44	50
Convex C-210 (1 proc.)	6.1 -O2 -uo -pp=fcpp1 -is .	17	44	50
Cray XMS (55 ns)	cf77 5.0 -Zp -Wd-e68	17	34	36
Hitachi S-810/20	FORT77/HAP	17		840
IBM ES/9000 Model 210 VF (15 ns)	VAST-2/VS Fortran V2R4	17	72	133
Siemens VP50-EX (7 ns)	Fortran 77/VP V10L30	17	238	285
Multiflow TRACE 14/300	Fortran 2.2.1	17	42	63
Amdahl 500	77/VP V10L20	16	133	142
Fujitsu VP-100	Fortran 77	16		267
Hitachi M680H/vector	Fort 77 E2 V04-0I	16		
Hitachi S-810/10	HAP V21.00	16		315
IBM 3090/600J VF (6 proc, 14.5 ns)			540	828
IBM 3090/500J VF (5 proc, 14.5 ns)			458	690
IBM 3090/400J VF (4 proc, 14.5 ns)			370	552
IBM 3090/380J VF (3 proc, 14.5 ns)			282	414
IBM 3090/300J VF (3 proc, 14.5 ns)			284	414
IBM 3090/280J VF (2 proc, 14.5 ns)			191	276
IBM 3090/200J VF (2 proc, 14.5 ns)			192	276
IBM 3090/180J VF (1 proc, 14.5 ns)	VS Fortran V2R3	16	97	138
PowerPC 601/100 MHz	LS Fortran 1.5 prerelease	16		
SGI Crimson(1 proc 50 MHz R4000)	-O2 -mips2 -G 8192	16	32	50
SGI 4D/380(8 proc) 33MHz	f77 -O2 -mp	16	60	106
SGI Indigo2 Extreme(R4000/100MHz)	-O2 -mips2 -G 8192	15		
FPS Model 511	F77 4.2	15	56	67
Hitachi M680H	Fort 77 E2 V04-0I	15		
IBM RISC Sys/6000-930 (25 MHz)	v2.2.1 xlf -O -P -Wp,-ea478	15	42	50
IBM RISC Sys/6000-530 (25 MHz)	v2.2.1 xlf -O -P -Wp,-ea478	15	42	50
IBM RISC Sys/6000-340 (33 MHz)	v2.2.1 xlf -O -P -Wp,-ea478	15	49	66
IBM ES/9000-511 (1 proc 11ns)	VAST-2/VS Fortran V2R5	15		
Kendall Square (32 proc)			513	1280
Kendall Square (16 proc)			307	640
Kendall Square (8 proc)			146	320
Kendall Square (4 proc)			47	160
Kendall Square (1 proc)	ksrf77 -O2 -r8 -inline_auto	15	31	40
NAS AS/EX 60	Fortran	15		40
SGI 4D/440(4 proc) 40MHz	f77 -O2 -mp	15	42	64
Siemens H120F	Fortran 77	15		
Apple Power Mac 5500/250	Absoft f77 v4.4 -O	14		

Computer	"LINPACK Benchmark" n = 100 OS/Compiler	Mflop/s	"TPP" Best Effort n=1000, Mflop/s	"Theoretical Peak" Mflop/s
Power Computing 100/601/100	Absoft f77 Power PC v4.1	14		
Cydrome CYDRA 5	Fortran 77 Rel 2.4.1	14		25
Fujitsu VP-50	Fortran 77	14		133
IBM ES/9000 Model 190 VF(15 ns)	VAST-2/VS Fortran V2R4	14	60	133
IBM ES/9221-191 (16 ns)	VAST-2/VS Fortran 2.5	14		
Apple Power Mac 7100/80	Absoft f77 Power PC v4.1	13		
DELL XMT5133 Pentium 133MHz	PS 32 NT V 1.0 /G5 /Oxb2	14		
IBM POWERPC 250 (66 MHz)	-O-Pv-Wp-ea478-g1-qarch=pwrx	13		66
IBM 3090/180E VF	VS 2.1.1 opt=3	13	71	116
SGI 4D/340(4 proc) 33MHz	f77 -O2 -mp	13	36	53
Apple Power Mac 7500/100	Absoft f77 Power PC v4.1	12		
Apple Power Mac 8100/80	Absoft f77 Power PC v4.1	12		
CDC CYBER 990E	FTN V2 VL=HIGH	12		
Cray-1S (12.5 ns, 1983 run)	CFT 1.12	12	110	160
Gateway 2000 P5-100XL	MS PS 32 /G5 /Ox /D "NDEBUG"	12		
IBM 3090/180 VF	VS Fortran V2	12	65	108
IBM RISC Sys/6000-520H(25 MHz)	v2.2.1 xlf -O -P -Wp,-ea478	12	37	50
IBM RISC Sys/6000-320H(25 MHz)	v2.2.1 xlf -O -P -Wp,-ea478	12	37	50
SGI Indigo 4000 50MHz	-O2 -mips2 -G 8192 -sopt	12		
Stardent 3040	3.0 -inline -nmax=300	12	77	128
Stardent 3030	3.0 -inline -nmax=300	12	63	96
Stardent 2040 (Stellar GS2000)	f77 -O3 -is R2.1	12		40
Stardent 1040 (Stellar GS1000)	f77 -O3 -is -re R2.0	12		40
CDC 4680InfoServer (60 MHz)	f77 2.20 -O3 -mips2 -Wb,-r6000	11		
Cray S-MP/MCP101 (1 proc. 25 ns)	MCP Release 2.2	11	31	40
FPS 510S MCP101 (1 proc. 25 ns)	pgf77 -O4	11	30	40
IBM ES/9000 Model 340	VAST-2/VS Fortran V2R4	11		
IBM ES/9000-411 (1 proc 11ns)	VAST-2/VS Fortran V2R5	11		
Meiko Comp. Surface (32 proc)			210	1280
Meiko Comp. Surface (16 proc)			187	640
Meiko Comp. Surface (8 proc)			147	320
Meiko Comp. Surface (4 proc)			98	160
Meiko Comp. Surface (2 proc)	-O4 -Mvect=smallvect		58	80
Meiko Comp. Surface (1 proc)	-Minline=daxpy	11	31	40
Gateway 2000 P5-90(90 MHz Pentium)	Windows NT /G5 /Oxb2	11		
SGI Power Series 50MHz R4000	-O2 -mips2 -G 8192 -sopt	11		
Stardent 3020	3.0 -inline -nmax=300	11	46	64
Sperry 1100/90 ext w/ISP	UCS level 2	11		
Multiflow TRACE 7/300	Fortran 2.2.1	11	22	31
Alliant FX/2800-200 (2 proc)	fortran 1.1.27 -O -inline	10	53	80
Alliant FX/80 (8 proc.)	-O -DAS -inline	10	69	188
IBM 3090/180J	VS Fortran V2R3	10		
Intel Paragon (1 proc)	-O4 -Mvect=smallvect -Minline=daxpy -Knoieee	10	34	50
MIPS RC6280 (60.0MHz)	f77 2.20 -O	10	16	24
MIPS RC6260 (60.0MHz)	f77 2.20 -O	10	16	24

Computer	"LINPACK Benchmark" n = 100 OS/Compiler	Mflop/s	"TPP" Best Effort n=1000, Mflop/s	"Theoretical Peak" Mflop/s
Multiflow TRACE 14/200	Fortran 1.7	10		31
Stardent 3010	3.0 -inline -nmax=300	10	25	32
Stardent 1540 (Ardent Titan-4)			47	64
Stardent 1530 (Ardent Titan-3)			37	48
Stardent 1520 (Ardent Titan-2)	f77 1.0 -O3 -inline	10	25	32
SUN Sparc2000(50 MHz)(16 proc)			333	800
SUN Sparc2000(50 MHz)(12 proc)			295	600
SUN Sparc2000(50 MHz)(8 proc)			223	400
SUN Sparc2000(50 MHz)(1 proc)			28	50
SUN Sparc1000(50 MHz)(8 proc)			198	400
SUN Sparc1000(50 MHz)(4 proc)			107	200
SUN Sparc1000(50 MHz)(2 proc)			53	100
SUN Sparc1000(50 MHz)(1 proc)			25	50
SUN Sparc10/514(50 MHz)(4 proc)			98	200
SUN Sparc10/512(50 MHz)(2 proc)			57	100
SUN Sparc10/51(50 MHz)(1 proc)			27	50
SUN Sparc10/402(40 MHz)(2 proc)			41	81
SUN Sparc10/40(40 MHz)(1 proc)	-fast -O4 -unroll=4 -Bstatic	10	23	40
Intel iPSC/Delta (512 proc)			446	20480
Intel iPSC/Delta (256 proc)			418	10240
Intel iPSC/Delta (128 proc)			393	5120
Intel iPSC/Delta (64 proc)			352	2560
Intel iPSC/Delta (32 proc)			304	1280
Intel iPSC/Delta (16 proc)			231	640
Intel iPSC/Delta (8 proc)			163	320
Intel iPSC/Delta (4 proc)			100	160
Intel iPSC/Delta (2 proc)	if77 -O4 -Mvect=smallvect		58	80
Intel iPSC/Delta (1 proc)	-Minline=daxpy -Knoieee	9.8	34	40
Intel iPSC/860 d7 (128 proc)			219	5120
Intel iPSC/860 d6 (64 proc)			208	2560
Intel iPSC/860 d5 (32 proc)			167	1280
Intel iPSC/860 d4 (16 proc)			131	640
Intel iPSC/860 d3 (8 proc)			103	320
Intel iPSC/860 d2 (4 proc)			75	160
Intel iPSC/860 d1 (2 proc)	if77 -O4 -Mvect=smallvect		52	80
Intel iPSC/860 d0 (1 proc)	-Minline=daxpy -Knoieee	9.8	34	40
SGI 4D/240(4 proc) 25MHz	f77 -O2 -mp	9.8	28	40
Apple Power Mac 6100/66	Absoft f77 Power PC v4.1	9.7		
Apple Power Macintosh 6100/60	Absoft v4.0 F77 -O	9.6		
IBM 3090/180S	VS Fortran 2.3.0	9.6	92	133
Alliant FX/80 (7 proc.)	-O -DAS -inline	9.5	63	165
CDC CYBER 4680	f77 2.11.2 o2	9.4		
IBM Power Vis. Sys. (32 proc.)			310	1280
IBM Power Vis. Sys. (1 proc.)	-O4 -Minline=daxpy	9.3		
NAS AS/EX 50	Fortran	9.3		28
Sun SPARCsystem 10/30 36MHz	f77 -O4 -cg89 -libmil -native	9.3		

Computer	"LINPACK Benchmark" n = 100 OS/Compiler	Mflop/s	"TPP" Best Effort n=1000, Mflop/s	"Theoretical Peak" Mflop/s
SGI 4D/420(2 proc) 40MHz	f77 -O2 -mp	9.3	23	32
IBM RISC Sys/6000-520 (20 MHz)	v2.2.1 xlf -O -P -Wp,-ea478	9.0	29	40
IBM RISC Sys/6000-320 (20 MHz)	v2.2.1 xlf -O -P -Wp,-ea478	9.0	29	40
IBM ES/9000-180 VF(15 ns)	VAST-2/VS Fortran V2R4	8.9	48	133
Solbourne 6/904 (Viking sparc)	f77 -O3 -cg89 -dalign	8.9		
IBM RISC Sys/6000-230 (45 MHz)	v2.3.0 xlf -O -P -Wp,-ea478	8.8	19	90
DEC VAXvector 6000/520 (2 proc)	Fortran HPO V1.2	8.8	51	90
Comparex 8/92 (Fujitsu M382)	VS/FORTRAN 2.4.0	8.7		
DEC VAXstation 4000-90	V 5.2	8.7		
Apple Power Macintosh 7100/66	Absoft v4.0 F77 -O	8.6		
IBM ES/9000-311 (1 proc 11ns)	VAST-2/VS Fortran V2R5	8.6		
IBM ES/9000 Model 320	VAST-2/VS Fortran V2R4	8.5		
NAS AS/9160	VAST/VS 1.4.1 opt=3	8.3		
Alliant FX/80 (5 proc.)	-O -DAS -inline	8.1	49	118
IBM ES/9000 Model 260	VAST-2/VS Fortran V2R4	8.0		
SCS-40	CFT 1.13	8.0	17	45
SGI 4D/320(2 proc) 33MHz	f77 -O2 -mp	8.0	20	26
IBM ES/9000 Model 210	VAST-2/VS Fortran V2R4	7.7		
IBM ES/9000 Model 320	VS/FORTRAN V2R4	7.6		
IBM 3090/120E VF	VS 2.1.1 opt=3	7.5	54	108
IBM 3090/180E	VS 2.1.1 opt=3	7.4	71	116
Siemens 7890F	Fortran 77 V10.3	7.2		
Convex C-130	Fortran 4.0	7.2	31	36
Alliant FX/80 (4 proc.)	-O -DAS -inline	7.2	33	94
DEC VAXvector 6000/510 (1 proc)	Fortran HPO V1.2	7.0	28	45
CECpx XL 560 Pentium 60 MHz	10.5 wfc386 /l=dos4g /ox	7.2		
Sun SPARCsystem 10/41 40MHz	f77 -native -fast -O4 -Bstatic	7.0		
Stardent 1510 (Ardent Titan-1)	f77 1.0 -O2 -inline	6.9	13	16
IBM 3090/180	VS opt=3	6.8	65	108
Alliant FX/40 (4 proc.)	-O -DAS -inline	6.7	33	94
IBM RS/6000-N40(PowerPC601 50MHz)	xlf -O -P -Wp,-ea478	6.7		50
IBM RISC Sys/6000-M20 (33 MHz)	v2.3.0 xlf -O -P -Wp,-ea478	6.6	14	66
IBM RISC Sys/6000-M2A (33 MHz)	v2.3.0 xlf -O -P -Wp,-ea478	6.6	14	66
IBM ES/9000 Model 190	VAST-2/VS Fortran V2R4	6.6		133
Convex C-120	fc 5.1	6.5	17	20
IBM RISC Sys/6000-220 (33 MHz)	v2.2.1 xlf -O -P -Wp,ea478	6.5	14	66
Alliant FX/4 (4 proc.)	-O -DAS -inline	6.4	21	47
Alliant FX/2800-200 (1 proc)	fortran 1.1.27 -O -inline	6.4	28	40
Apple PowerBook PB1400cs(133 MHz)	MF -O4 -Asched=2,targ=604	6.3		
Fujitsu M-380	Fortran 77, opt=3	6.3		
DEC VAX 6620	V5.5	6.2		
Multiflow TRACE 7/200	Fortran 1.4	6.0		15
SGI 4D/420(1 proc) 40MHz	f77 -O2	6.0	12	16
Apple Performa 6230CD/603/75	Absoft f77 Power PC v4.1	5.9		
Siemens 7890G	Fortran 77 V10.3 opt=4	5.9		
IBM 3090/150E	VS 2.1.1 opt=3	5.9	64	112

Computer	"LINPACK Benchmark" n = 100 OS/Compiler	Mflop/s	"TPP" Best Effort n=1000, Mflop/s	"Theoretical Peak" Mflop/s
FPS-264 (M64/60)	F02 APFTN64 OPT=4	5.9	34	38
Alliant FX/80 (3 proc.)	-O -DAS -inline	5.9	32	71
SGI 4D/220(2 proc) 25MHz	f77 -O2 -mp	5.9	15	20
Apollo DN10000	f77,10.7	5.8		
Alliant FX/40 (3 proc.)	-O -DAS -inline	5.6	27	71
Gateway P5-60 (60 MHz Pentium)	F77L-EM32 5.01 /4 /Z1	5.4		
DEC 5900 RISC	Ultrix 4.1	5.3		
DEC 5000/240	Ultrix	5.3		
Gateway P5-60 (60 MHz Pentium)	77/32/mf/d1/warn/5/fp5/ot	5.3		
Alliant FX/4 (3 proc.)	-O -DAS -inline	5.1	17	35
CDC 4330-300 (33 MHz)	f77 2.20 -O3	5.1		
Number-Smasher 860 40MHz	NDP -vast-inline-on-OLM-fdiv	5.1		
VAXstation 4000-90	DEC FORTRAN V5.2	5.1		
DEC VAX 6000/610 (1 proc)	VMS V5.2	5.0		
Intel iPSC/2 d4/VX (16 proc)			39	
Intel iPSC/2 d5/VX (32 proc)			52	
SGI 4D/310(1 proc) 33MHz	f77 -O2	5.0	10	13
Honeywell DPS90	ES F77V 1.0	5.0		
Siemens 7890D	Fortran 77 V10.3	5.0		
IBM ES/9000 Model 180 (15 ns)	VAST-2/VS Fortran V2R4	4.9		
CDC CYBER 875	FTN 5 opt=3	4.8		
Number Smasher i860 40MHz	-on -OLM -fdiv -inline	4.7		40
CDC CYBER 176	FTN 5.1 opt=2	4.6		
MIPS RC3360 (33.3MHz)	f77 2.20 -O	4.5	11	13
Alliant FX/80 (2 proc.)	-O -DAS -inline	4.4	22	47
AMD 486DX5-133	f2c and gcc2.7.0	4.4		
Alliant FX/40 (2 proc.)	-O -DAS -inline	4.3	19	47
NAS AS/EX 30	VS 1.4.1 opt=3	4.3		
SGI 4D/35	f77 -O3	4.3		
SUN 4/600 MP	f77 1.4 -O3 -cg89 -dalign	4.3		
IBM ES/9221-170 (16 ns)	VAST-2/VS Fortran 2.5	4.1		
SUN SPARCstation IPX	f77 1.4 -O3 -cg89 -dalign	4.1		
SUN 4/50 IPX	f77 1.4 -O3 -cg89 -dalign	4.1		
CDC CYBER 4360	f77 2.11.2 o2	4.0		
SUN SPARCstation 2	f77 1.4 -O3 -cg89 -dalign	4.0		
SGI Indigo 33MHz R3000	-O2 -G 8192 -sopt	4.0		
Amdahl 5860 HSFPF	H enhanced opt=3	3.9		
MIPS M/2000 (25.0MHz)	f77 2.20 -O	3.9	7.9	10
MIPS RC3260 (25.0MHz)	f77 2.20 -O	3.9	7.9	10
Alliant FX/4 (2 proc.)	-O -DAS -inline	3.8	12	24
SGI 4D/210(1 proc) 25MHz	f77 -O2	3.9	7.8	10
Amdahl 5860 HSFPF	VS opt=3	3.8		
CDC 4320	f77 2.20 opt=02	3.7		
DEC station 5000/200 (25 Mhz)	MIPS f77 2.0	3.7		
MIPS RS3230 (25.0MHz)	f77 2.20 -O	3.7	7.8	10
DEC VAXvector 6000/420 (2 proc)	Fortran HPO V1.0		43	90

Computer	"LINPACK Benchmark" n = 100 OS/Compiler	Mflop/s	"TPP" Best Effort n=1000, Mflop/s	"Theoretical Peak" Mflop/s
DEC VAXvector 6000/410 (1 proc)	Fortran HPO V1.0	3.6	24	45
SUN 4/490	4.1.1 f77 -O3	3.6		
CDC 4330	f77 2.20 opt=02	3.5		
Apple Power Macintosh 6100/60	Absoft F77 SDK	3.4		
NAS 8093 w/HSA	VS 1.4.0 opt=3	3.5		
CDC 7600	FTN	3.3		
SUN Sparc ELC	-dalign -xcg89 -fsimple -O4	3.3		
CDC CYBER 960-31	NOS/VE 1.3.1 FTN 1.6	3.1		
Gould NP1	Fortran	3.1		
IBM 3090/120E	VS 2.1.1 opt=3	3.1	54	108
MIPS RC3240 (25.0MHz)	f77 2.20 -O	3.1	7.1	10
Tadpole SPARCbook 2	f77 -O	3.1		
CDC CYBER 4340	f77 2.11.2 o2	3.0		
Convex C-1/XP	Fortran 2.0	3.0		20
DEC VAX 6540	VMS 5.4-2	3.0		
FPS-264/20 (M64/50)	F02 APFTN64 OPT=4	3.0	17	
Harris Nighthawk 4802 (88100)	f77	3.0		
Convex C-1/XL	Fortran 1.6	2.9		20
IBM ES/9000 Model 150	VS Fortran V2R4	2.9		
NAS AS/EX 25	VS 1.4.1 opt=3	2.9		
Solbourne 5/602	f77 (Sun) 1.2 -O3 -dalign	2.9		
SUN 4/330	f77 1.4 -O3 -dalign	2.7		
SUN 4/370	f77 1.3.1 -O3 -cg89 -dalign	2.7		
CDC CYBER 760	FTN 5, opt=3	2.6		
CyberPlus	CPFTN 1.1-07	2.6		
IBM 370/195	H enhanced opt=3	2.5		
SUN 4/330 SparcServer	f77 1.2, -O3 -dalign	2.5		
Alliant FX/80 (1 proc.)	-O -DAS -inline	2.4	12	24
Alliant FX/40 (1 proc.)	-O -DAS -inline	2.4	10	24
Gateway 2000 66 MHz 80486-DX2	F77L-EM32 5.01 /4 /Z1	2.4		
Apple Mac Quadra 840AV	Absoft -w -v -O -f -s -N40	2.3		
HP-APOLLO 9000/425e (68040)	f77 -O4 rev 10.3.5	2.3		
NAS AS/EX 20	VS 1.4.1 opt=3	2.2		
Fujitsu AP1000 (512 proc.)			610	2844
Fujitsu AP1000 (256 proc.)			333	1422
Fujitsu AP1000 (128 proc.)			193	711
Fujitsu AP1000 (64 proc.)			100	356
Fujitsu AP1000 (1 proc.)	SUN f77 1.3.1 -O3 -dalign	2.2	1.7	5.6
HP-APOLLO 9000/425t (68040)	f77 -O4 rev 10.3.4	2.2		
Alliant FX/4 (1 proc.)	-O -DAS -inline	2.1	6.3	12
CDC CYBER 175	FTN 5 opt=2	2.1		
CDC CYBER 180-860	NOS/VE OPT=HIGH	2.1		
FPS-M64/30	APFTN464 OPT=4	2.1	10	
IBM ES/9000 Model 130	VS Fortran V2R4	2.1		
IBM 3081 K (1 proc.)	H enhanced opt=3	2.1		
MIPS M120-5	UMIPS v.3 3.0 f771.31 -O	2.1	3.6	8.3

Computer	"LINPACK Benchmark" n = 100 OS/Compiler	Mflop/s	"TPP" Best Effort n=1000, Mflop/s	"Theoretical Peak" Mflop/s
MIPS M/120 (16.7MHz)	f77 2.20 -O	2.1	4.8	6.7
Prism" 486-50 (50 MHz)	Salford v2.69 /optimise	2.1		
Tadpole SPARCbook (25 MHz)	f77 -O	2.1		
Apple Macintosh QUADRA 950	Absoft -w -v -O -f -s -N40	2.0		
CDC 7600	Local	2.0		
IBM 3081 K (1 proc.)	VS opt=3	2.0		
Culler PSC	CSD Fortran 3.21	2.0		5
FPS M64/35	APFTN464	2.0		
Micronics 486-50MHz EISA2	NDP Fortran 486: -on	2.0		
HP 425T (68040)		1.9		
CDC CYBER 175	FTN 5 opt=1	1.8		
HP 9000 Series 835	2.1 fc -O	1.8		
Sperry 1100/90	FTN opt=ZEO	1.8		
SUN SPARCstation 1+	f77 1.4 -O3 -cg89 -dalign	1.8		
ELXSI 6420 (5 proc.)			6.4	
ELXSI 6420 (3 proc.)			4.0	
ELXSI 6420 (2 proc.)			2.7	
ELXSI 6420 (1 proc.)	EMBOS 6.3 +opt+inline+vector	1.7	1.4	
FPS-164/364 (M64/40)	F02 APFTN64 OPT=4	1.7	9	
Honeywell DPS 8/88	FR7X	1.7		
IBM 3033	H enhanced opt=3	1.7		
IBM 3033	VS opt=3	1.7		
IBM 3081 D	VS opt=3	1.7		
MIPS RS2030 (16.7MHz)	f77 2.20 -O	1.7	4.7	6.7
Sperry 1100/90 ext	UFTN	1.7		
HP 9000 Series 850 w/fp	2.0 fc -O	1.6		
Amdahl 470 V/8	H enhanced opt=3	1.6		
CDC CYBER 170-750	FTN 5.1, opt=3	1.6		
CDC CYBER 180-850	NOS/VE OPT=HIGH	1.6		
DECstation 3100	V3.0/V1.31 -O	1.6		
DEC 5400	f77 -O3	1.6		
Amdahl 470 V/8	VS opt=3	1.5		
DEC VAXstation 4000-60	V 5.2	1.5		
MIPS M/1000 (15.0MHz)	f77 2.20 -O	1.5	3.7	6
NAS 8093	VS 1.4.0 opt=3	1.5		
Siemens 7570-P	For1 1.6A	1.5		
ALR 486/33 m-board, 256K cache	Lahey F77L3, v5.0 /Z1	1.4		
Apple Mac Quadra 700	Absoft -w -v -O -f -s -N40	1.4		
Compaq Deskpro 486/33l-120 w/487	Microway NDPF487 -O -OL -on	1.4		
NeXTCube	2.0 gcc 1.36 -O	1.4		
SUN SPARCstation 1	f77 1.3.1 -O3 -cg89 -dalign	1.4		
IBM 4381-23	VS Fortran 2.1.1 opt=3	1.3		
Compaq Deskpro 486/33l-120 w/487	Salford FTN77/ optimized	1.3		
Compaq Deskpro 486/33l-120 w/487	Watcom WFC386P /OL /OT	1.3		
ALR 486/33 m-board, 256K cache	Lahey F77L3, v5.0 /nZ1	1.2		
CDC 7600	CHAT, No opt	1.2		

Computer	"LINPACK Benchmark" n = 100 OS/Compiler	Mflop/s	"TPP" Best Effort n=1000, Mflop/s	"Theoretical Peak" Mflop/s
CSPI MAP-6430	Fortran 1.5.35	1.2		
DEC VAX 6000/460 (6 proc)			8.4	15
DEC VAX 6000/450 (5 proc)			7.1	13
DEC VAX 6000/440 (4 proc)			5.8	10
DEC VAX 6000/430 (3 proc)			4.4	7.6
DEC VAX 6000/420 (2 proc)			3.0	5.1
DEC VAX 6000/410 (1 proc)	VMS V5.2	1.2	1.5	2.6
ELXSI 6420	Fortran 5.14 opt=10	1.2	1.4	
Gateway 2000/Micronics 486DX/33	f2c emx/gcc -O2 -m486	1.2		
Gateway Pentium (66HHz)	Lahey F77, 4.00	1.2		
IBM ES/9000 Model 120	VS Fortran V2R4	1.2		
IBM 370/168 Fast Mult	H Ext	1.2		
IBM 4381 90E	VS Fortran 2.1.1 opt=3	1.2		
IBM 4381-13	VS 1.4.0 opt=3	1.2		
MIPS M/800 (12.5MHz)	f77 1.31 -O	1.2		5
Prime P6350	f77 rev 20.2.b2 -opt	1.2		
Siemans 7580-E	BS2000	1.2		
Amdahl 470 V/6	H opt=2	1.1		
Compaq Deskpro 486/33l-120 w/487	Lahey F77L3 /Z1	1.1		
SUN 4/260	f77 -O sys4-beta2	1.1	1.1	3.3
ES1066 (1 proc. 80 ns Russian)	f77(like IBM VS1.4.1 OPT=3)	1.0		
CDC CYBER 180-840	NOS/VE OPT=HIGH	.99		
DEC VAX 8800 (4 proc)			4.9	
DEC VAX 8800 (3 proc)			3.7	
DEC VAX 8800 (2 proc)			2.5	
DEC VAX 8550/8700/8800	VMS v4.5	.99	1.3	
Solbourne	f77 -O	.98		
IBM 4381-22	VS Fortran 2.1.1 opt=3	.97		
IBM 4381 MG2	VS Fortran opt=3	.96		
IBM 4381-12	VS Fortran 1.4.0 opt=3	.95		
ICL 3980 w/FPU	FORTRAN77 PLUS V10.02	.93		
IBM-486 33MHz	Microsoft 5.1	.94		
Siemens 7860E	Fortran 77 V10.3	.92		
Concurrent 3280XP	Fortran VII,Z 8.1	.87		
MIPS M800 w/R2010 FP	f77 1.10	.87		
Gould PN 9005	VTX/32 2.0 Fortran 77	.87		
VAXstation 3100-76	DEC FORTRAN V5.2	.85		
IBM 9370-90	VS Fortran 1.3.0 opt=3	.78		
nCUBE 2, 1024 proc			258	2409
nCUBE 2, 512 proc			204	1205
nCUBE 2, 256 proc			165	602
nCUBE 2, 128 proc			116	301
nCUBE 2, 64 proc			76.9	151
nCUBE 2, 32 proc			46.0	75
nCUBE 2, 16 proc			26.1	38
nCUBE 2, 8 proc			14.2	19

Computer	"LINPACK Benchmark" n = 100 OS/Compiler	Mflop/s	"TPP" Best Effort n=1000, Mflop/s	"Theoretical Peak" Mflop/s
nCUBE 2, 4 proc			7.50	9.4
nCUBE 2, 2 proc			3.91	4.7
nCUBE 2, 1 proc	Fort77/ncc -O3	.78	2.02	2.35
IBM 370/165 Fast Mult	H Ext	.77		
Prime P9955II	f77 rev 20.2.b2 -opt	.72		
DEC VAX 8530	VMS v4.6	.73		
HP 9000 Series 850	2.0 fc -O	.71		
DEC VAX 8650	VMS v4.5	.70		
DEC VAX 8500	VMS v4.5	.65		
HP/Apollo DN4500 (68030 + FPA)		.60		
Mentor Graphics Computer	fortran	.60		
MIPS M/500 (8.3HHz)	f77 1.21 -O	.60		3.3
Data General MV/20000	f77	.59		
IBM 9377-80	VS Fortran 2.1.1 opt=3	.58		
Sperry 1100/80 w/SAM	FTN opt=ZEO	.58		
CDC CYBER 930-31	NOS/VE 1.2.2	.58		
Russian PS-2100	FORTRAN-PS	.57	1.6	
Gateway 486DX-2 (66HHz)	Lahey F77, 4.00	.56		
Harris H1200	VOS 4.1 opt g	.56		
HP/Apollo DN4500 (68030)		.55		
HP 9000 Series 825	2.0 fc -O	.53		
HP-APOLLO 9000/400t (68030)	f77 -O4 rev 10.8(190)	.51		
Harris HCX-9	hf77 -O3	.50		
Pyramid 9810	OSx 4.0	.50		
HP 9000 Series 840	2.0 fc -O	.49		
DEC VAX 8600	VMS v4.5	.48		
Harris HCX-7 w/fpp	f77 1.0	.48		
CDC 6600	FTN 4.6 opt=2	.48		
CDC CYBER 170-835	FTN 5 opt=2	.47		
CCI Power 6/32 w/fpa	UNIX 4.2 bsd f77	.47		
IBM 4381-21	VS Fortran 2.1.1 opt=3	.47		
Sperry 7000	4.2	.47		
Gould PN9000	UNIX	.47		
SUN-3/260 + FPA	3.2 f77 -O -ffpa	.46		
IBM 4381 MG1	VS Fortran opt=3	.46		
DEC VAX 6210 (1 proc.)	VMS v5.0	.46		
CDC CYBER 170-835	FTN 5 opt=1	.44		
HP 9000 Series 840	HP-UX 14.3	.43		
IBM RT 135	AIX-2.2	.42		
Harris H1000	VOS 3.3 opt g	.41		
microVAX 3200/3500/3600	VMS v4.6	.41		
Apple Macintosh IIfx	A/UX 2.0 f77	.41		
Apollo DN5xxT FPX	DOMAIN/IX SR9.7 opt 4	.40		
microVAX 3200/3500/3600	ULTRIX 2.2/VFU	.40		
IBM 9370-60	VS Fortran 1.4.0 opt=3	.40		
Sun-3/160 + FPA	3.2 f77 -O -ffpa	.40		

Computer	"LINPACK Benchmark" n = 100 OS/Compiler	Mflop/s	"TPP" Best Effort n=1000, Mflop/s	"Theoretical Peak" Mflop/s
Prime P9755	f77 rev 20.2.b2 -opt	.40		
Ridge 3200 Model 90	ROS/rf	.39		
IBM 4381-11	VS Fortran 1.4.0 opt=3	.39		
Gould 32/9705 mult acc	fort77+ 4.3	.39		
NORSK DATA ND-570/2	Fortran-500-E	.38		
Sperry 1100/80	FTN opt=ZEO	.38		
Apple Mac IIfx	Absoft -w -v -O -f -s	.37		
CDC CYBER 930-11	NOS/VE OPT=High	.37		
CSA w/T800C-20	Fortran 3L	.37		
Inmos T800 (20 MHz)	Fortran 3L -:o0	.37		
Sequent Symmetry (386 w/fpa)	Fortran -fpa -O3	.37		
CONCEPT 32/8750	UTX/32	.36		
Celerity C1230	UNIX 4.2 bsd f77	.36		
IBM RT PC 6150/115 fpa2	f77	.36		
IBM 9373-30	VS Fortran 2.1.1 opt=3	.36		
CDC 6600	RUN	.36		
Gould PN9080	UTX/32	.35		
Prime 9950	F77 19.4.2	.34		
Opus Series 300pm 30 MHz	UNIX Greenhills	.33		
Masscomp MC5600 w/fpa	f77 v1.2 -O3 rtv v3.1	.33		
Data General MV/10000	f77 opt level 2	.30		
IBM 4361 MG5	VS Fortran opt=3	.30		
DATEK 80386-33 /w 64KB Cache	MS Fortran 5.0 -Ox -AH -G2	.27		
Inmos T800 (20 MHz)	Fortran 3L -:o1	.26		
Apollo DN3500	FTN -CPU 3000 -opt 4	.25		
IRIS 2400 Turbo/FPA	f77	.24		
CDC CYBER 180-830	NOS/VE OPT=HIGH	.24		
Apple Macintosh PowerBook 170	Absoft -w -v -O -f -s	.23		
Gould PN 6005	VTX/32 2.0 Fortran 77	.23		
Harris 800	Fortran 77	.23		
IBM 370/158	H opt=3	.23		
IBM 370/158	VS Fortran opt=3	.22		
NORSK DATA ND-560	Fortran-500	.22		
Celerity C1200	UNIX 4.2 bsd f77	.21		
Honeywell DPS 8/70	FR7X	.21		
Denelcor HEP	f77 UPX	.21		
VAX 11/785 FPA	VMS v4.5	.20		
CDC CYBER 170-720	FTN 5, opt=2	.20		
Apple Macintosh IIsi	Absoft -w -v -O -f -s	.19		
Itel AS/5 mod 3	H	.19		
NORSK DATA ND-500	Fortran-500-E	.19		
KONTRON KSM/386	UNIX SVS F77 2.8	.19		
Sun 386i/250 25 MHz	SunOS 4.0; Sun 1.1 -O	.19		
CDC CYBER 170-825	FTN 5, opt=2	.19		
IBM 4341 MG10	VS Fortran opt=3	.19		
Apollo DN2500		.18		

Computer	"LINPACK Benchmark" n = 100 OS/Compiler	Mflop/s	"TPP" Best Effort n=1000, Mflop/s	"Theoretical Peak" Mflop/s
Pyramid 98xe	OSx 4.0	.18		
IBM 9370-40	VS Fortran 1.4.0 opt=3	.18		
VAX 11/785 FPA	UNIX 4.2 bsd f77	.18		
DEC VAX 8250/8350 (UP)	VMS v4.6	.18		
CDC CYBER 170-825	FTN 5, opt=1	.18		
Ridge Server/RT EFP	ROS/rf	.18		
CDC CYBER 170-720	FTN 5, opt=1	.17		
Ridge 32/130	OS 3.3/RISC	.17		
PC Craft 2400/25MHz w/80387	PLI Fortran 2.09	.17		
Concurrent 3252	OS 6.2.4 fortran z	.17		
Tandy 5000 MC 20 MHz	LPI Fortran 3.0	.17		
Tektronix 4315 w/68882	UTEK f77	.17		
CDC CYBER 180-810	NOS/VE OPT=HIGH	.17		
Prime P2755	f77 rev 20.2.b2 -opt	.17		
Apple Macintosh IIx	A/UX 2.0 f77	.16		
Concurrent 3242	OS 32 v7.2 f77	.16		
Compaq 386/20 w/387	Microsoft Fortran 4.1	.16		
Apple Macintosh IIcx	Absoft -w -v -O -f -s	.15		
Apple Macintosh IIx	Absoft -w -v -O -f -s	.15		
DEC VAX 8200/8300	VMS v4.5	.15		
IBM PS/2-70 (20 MHz)	AIX 1.2	.15		
Apple Macintosh SE 30	Absoft -w -v -O -f -s	.14		
Apollo DN4000	DOMAIN/IX SR9.7 opt 4	.14		
ICL 2988	f77 OPT=2	.14		
IBM 9370-20	VS Fortran 1.4.0 opt=3	.14		
HP Vectra RS/20C 20 MHz	LPI Fortran 3.0	.14		
VAX 11/780 FPA	VMS v4.5	.14		
Compaq 386/20 w/387	RM/Forrtan 2.43	.13		
microVAX II	VMS v4.5	.13		
Prime P2450	f77 rev 20.2.b2 -opt	.13		
Apple Macintosh IIsi	Fortran	.12		
Apple Mac II/16 Mhz/25 Mhz 68882	Absoft 2.4 -w -v -O -f -s	.12		
CDC 6500	FUN	.12		
CONCEPT 32/6750	UTX/32	.12		
IBM PS/2-70 (16 MHz)	AIX 1.2	.12		
IBM RT w/68881	f77	.12		
VAX 11/750 FPA	VMS v4.1	.12		
micro VAX II	ULTRIX 2.2/VFU	.12		
Concurrent 3230	OS 6.2.2 fortran 5.2	.11		
Definicon DSI-780	SVS Fortran (MSDOS)	.11		
ENCORE Multimax NS32332	f77	.11		
HP 9000 Series 350	HP-UX, f77 5.2	.11		
Northgate 386/387 (25MHz)	Lahey F77, 4.00	.11		
Prime 750	Primos f77 v19.1	.11		
Sun 3/260, 20 MHz 68881	3.2 f77 -O -f68881	.11		
Tektronix 4315 w/68881	UTEK f77	.11		

Computer	"LINPACK Benchmark" n = 100 OS/Compiler	Mflop/s	"TPP" Best Effort n=1000, Mflop/s	"Theoretical Peak" Mflop/s
VAX 11/780 FPA	UNIX 4.3 BSD f77 -O	.11		
Sun 3/160, 16.7 MHz 68881	3.2 f77 -O -f68881	.10		
NCUBE (1 proc. 8 MHz)	Fortran	.10		
Apple Mac SE/30	ABSOFT 2.4	.10		
Apollo DN590	DOMAIN/IX SR9.7 opt 4	.099		
Masscomp MC5600 68881	f77 v1.2 -O3 rtv v3.1	.099		
VAX 11/750 FPA	UNIX 4.2 bsd f77	.096		
Prime 850	Primos	.095		
Sperry 1100/60	FTN opt=ZEO	.093		
Pyramid 90X FPA	UNIX 4.2 bsd f77	.088		
Apple Mac II/16 Mhz/25 Mhz 68882	Absoft 2.4	.087		
SUN-3/50, 16.7 MHz 68881	3.2 f77 -O -f68881	.087		
HP 9000 Series 330	HP-UX, f77 5.2	.087		
Apple Macintosh II	Absoft -w -v -O -f -s	.083		
microVAX II	f77 Ultrix 1.1	.082		
Apple Mac SE + 20 MHz 68881	ABSOFT 2.4	.082		
Ridge 32/110	ROS 3.3/RISC	.081		
Data General MV/8000	f77 opt level 2	.078		
Apple MAC II w/882		.078		
Prime P2350	f77 rev 20.2.b2 -opt	.077		
Apple Mac/Levco Prodigy 4	ABSOFT MacFort 020	.076		
Apple Mac II w/68020	FORTRAN	.074		
HP 9000 Series 320	HP-UX, f77 5.2	.073		
Apollo DN3000	DOMAIN/IX SR9.7 opt 4	.071		
Apollo DN460/660	AEGIS 8.0 FTN	.069		
Masscomp MC500 w/FPP	3.1 Fortran	.061		
Harris HS-20 w/FPP	Fortran 77 3.1	.061		
Sequent Balance 8000	DYNIX Fortran 2.4.4	.059		
Definicon DSI-32/10	Greenhills f77 (MSDOS)	.057		
VAX 11/750	VMS v4.1	.057		
Encore Multimax	f77	.055		
HP 9000 Series 500	Fortran 1.7	.043		
Opus 32.32	UNIX, f77 4.2 bsd	.043		
ATT 3B20 FP	UNIX V 2.0/4	.040		
Acorn Cambridge	fortran	.039		
IBM 4331 MG2	H opt=3	.038		
Burroughs B6800	Fortran 77 ver 34	.037		
VAX 11/725 FPA	VMS v4.1	.037		
Masscomp MCS-541 w/FPB	Fortran 3.1	.037		
IBM RT PC Model 20	f77	.036		
VAX 11/730 FPA	VMS	.036		
Prime 2250	Fortran 77	.034		
IBM PC-AT/370	VS Fortran opt=3	.033		
IBM PC-XT/370	H opt=3	.031		
VAX 11/750	UNIX 4.2 bsd f77	.029		
Apollo DN320	AEGIS 8.0 FTN	.028		

Computer	"LINPACK Benchmark" n = 100 OS/Compiler	Mflop/s	"TPP" Best Effort n=1000, Mflop/s	"Theoretical Peak" Mflop/s
Sun 2/50 + SKY FFP	f77 -O -fsky 3.0	.027		
Ametek S14/32 (1 node)	RM Fortran 2.11	.026		
Apollo DN550 FPA	AEGIS 8.0 FTN	.025		
AMSTRAC 1512 8086/8087 9.54 MHz	MS-Fortran 4.0 -Ox -AH	.022		
microVAX I	VMS	.023		
Canaan	VS	.021		
Chas. River Data 6835+SKY	SVS Fortran 77	.018		
Apollo DN 420 PEB	AEGIS 7+ FTN	.017		
IBM AT w/80287	PROFORT 1.0	.012		
IBM PC w/8087	PROFORT 1.0	.012		
Cadtrak DS1/8087	Intel Fortran 77	.011		
Apple Mac Classic II/16 MHz68030	Absoft 2.4	.011		
IBM PC/AT w/80287	Microsoft 3.2	.0091		
Chas. River Data 6835	SVS Fortran 77	.0088		
Apollo DN300	AEGIS 8.0 FTN	.0071		
Masscomp MC500	3.1 Fortran	.0070		
IBM PC w/8087	Microsoft 3.2	.0069		
Apple Mac II	ABSOFT 2.4	.0064		
HP 9000 Series 200	HP-UX	.0062		
Sun 2/50	f77 -O -fsoft 3.0	.0055		
Atari ST	ABSOFT AC/Fortran v2.2	.0051		
Apple Macintosh	ABSOFT 2.0b	.0038		
HP 48GX		.00081		

Table 2: **A Look at Parallel Processing**

Computer	1000 x 1000 Problem with Parallel Processing				
	Time uniprocessor	no. of processors	Time multiprocessors	Speedup	Efficiency
Hitachi S-3800/480	0.104	4	.0324	3.21	.80
Hitachi S-3800/380	0.104	3	.0396	2.63	.88
Hitachi S-3800/280	0.104	2	.0549	1.89	.95
NEC SX-3/*4R	0.128	4	.0442	2.91	.73
NEC SX-3/*4R	0.128	2	.0707	1.82	.91
NEC SX-3/*4	0.148	4	.0498	2.98	.74
NEC SX-3/*4	0.148	2	.0821	1.81	.90
NEC SX-3/*2R	0.243	4	.0747	3.25	.81
NEC SX-3/*2R	0.243	2	.1307	1.86	.93
NEC SX-3/*2	0.293	4	.0863	3.40	.85
NEC SX-3/*2	0.293	2	.1518	1.93	.96
Cray C90	0.740	16	.0618	11.95	.75
Cray C90	0.740	8	.108	6.85	.86
Cray C90	0.740	4	.204	3.63	.91
Cray C90	0.740	2	.392	1.89	.94
NEC SX-3	0.149	2	.0820	1.82	.91
NEC SX-3/*1R	0.472	4	.139	3.40	.85
NEC SX-3/*1R	0.472	2	.255	1.85	.93
Convex C4/XA	0.949	4	.264	3.59	.90
Convex C4/XA	0.949	3	.346	2.74	.91
Convex C4/XA	0.949	2	.501	1.89	.95
IBM ES/9000 (7.1 ns)	1.58	8	.293	5.34	.67
IBM ES/9000 (7.1 ns)	1.58	7	.322	4.91	.70
IBM ES/9000 (7.1 ns)	1.58	6	.347	4.56	.76
IBM ES/9000 (7.1 ns)	1.58	5	.397	3.98	.80
IBM ES/9000 (7.1 ns)	1.58	4	.485	3.26	.82
IBM ES/9000 (7.1 ns)	1.58	3	.617	2.56	.85
IBM ES/9000 (7.1 ns)	1.58	2	.871	1.82	.91
Cray Y-MP/8	2.17	8	.312	6.96	.87
Cray Y-MP/8	2.17	4	.577	3.76	.94
Cray Y-MP/8	2.17	3	.754	2.88	.96
Cray Y-MP/8	2.17	2	1.11	1.96	.98
Cray Y-MP/98	2.17	8	.386	5.65	.71
Cray Y-MP/98	2.17	4	.600	3.63	.91
Cray Y-MP/98	2.17	2	1.12	1.94	.97
IBM ES/9000 (9 ns)	1.98	6	.458	4.31	.72
IBM ES/9000 (9 ns)	1.98	5	.552	3.58	.72
IBM ES/9000 (9 ns)	1.98	4	.666	2.97	.74
IBM ES/9000 (9 ns)	1.98	3	.862	2.29	.76
IBM ES/9000 (9 ns)	1.98	2	1.24	1.59	.80
Cray 2S	1.76	4	.476	3.66	.91
Cray 2S	1.76	3	.617	2.82	.94
Cray 2S	1.76	2	.902	1.93	.96
Cray X-MP/4	3.10	4	.813	3.78	.94

Computer	1000 x 1000 Problem with Parallel Processing				
	Time uniprocessor	no. of processors	Time multiprocessors	Speedup	Efficiency
Cray X-MP/4	3.10	3	1.07	2.87	.96
Cray X-MP/4	3.10	2	1.57	1.96	.98
Convex C3880	5.90	8	.841	7.02	.88
Convex C3840	5.90	4	1.58	3.74	.94
Convex C3830	5.90	3	2.05	2.88	.96
Convex C3820	5.90	2	3.01	1.96	.98
DEC 10000 Alpha	4.31	6	.889	4.85	.81
DEC 10000 Alpha	4.31	5	1.04	4.12	.82
DEC 10000 Alpha	4.31	4	1.28	3.37	.84
DEC 10000 Alpha	4.31	3	1.66	2.60	.87
DEC 10000 Alpha	4.31	2	2.44	1.76	.88
Convex SPP-1000	i 5.45	8	0.8905	6.120	.77
Convex SPP-1000	i 5.45	4	1.513	3.602	.90
Convex SPP-1000	i 5.45	2	2.628	2.073	1.03
Cray S-MP/MCP784	21.4	84	.902	23.7	.28
Cray S-MP/MCP756	21.4	56	.986	21.7	.39
Cray S-MP/MCP728	21.4	28	1.32	16.2	.58
Cray S-MP/MCP707	21.4	7	3.46	6.19	.88
DEC 7000 Alpha	4.74	6	.978	4.84	.81
DEC 7000 Alpha	4.74	5	1.14	4.16	.83
DEC 7000 Alpha	4.74	4	1.38	3.43	.86
DEC 7000 Alpha	4.74	3	1.81	2.62	.87
DEC 7000 Alpha	4.74	2	2.67	1.77	.89
Meiko CS2	6.89	64	1.03	6.69	.10
Meiko CS2	6.89	32	1.03	6.69	.21
Meiko CS2	6.89	16	1.26	5.47	.34
Meiko CS2	6.89	8	1.59	4.33	.54
Meiko CS2	6.89	4	2.32	2.97	.74
Meiko CS2	6.89	2	3.96	1.74	.87
Fujitsu AP1000	160	512	1.10	147	.29
Fujitsu AP1000	160	256	1.50	108	.42
Fujitsu AP1000	160	128	2.42	66.5	.52
Fujitsu AP1000	160	64	3.51	46.0	.72
Fujitsu AP1000	160	32	6.71	24.0	.75
Fujitsu AP1000	160	16	11.5	13.9	.87
Fujitsu AP1000	160	8	22.6	7.12	.89
Fujitsu AP1000	160	4	41.3	3.90	.97
Fujitsu AP1000	160	2	81.4	1.96	.98
IBM 3090/J (14.5 ns)	6.8832	6	1.24	5.57	.93
IBM 3090/J (14.5 ns)	6.8832	5	1.46	4.72	.94
IBM 3090/J (14.5 ns)	6.8832	4	1.80	3.81	.95
IBM 3090/J (14.5 ns)	6.8832	3	2.35	2.93	.98
IBM 3090/J (14.5 ns)	6.8832	2	3.48	1.98	.99
IBM 3090/600S VF	7.27	6	1.29	5.64	.94
IBM 3090/500S VF	7.27	5	1.52	4.78	.96
IBM 3090/400S VF	7.27	4	1.89	3.85	.96

Computer	1000 x 1000 Problem with Parallel Processing				
	Time uniprocessor	no. of processors	Time multiprocessors	Speedup	Efficiency
IBM 3090/300S VF	7.27	3	2.46	2.96	.99
IBM 3090/280S VF	7.27	2	3.65	1.99	.99
IBM 3090/200S VF	7.27	2	3.64	1.99	.99
Kendall Square Research	21.5	32	1.30	16.5	.52
Kendall Square Research	21.5	16	2.17	9.90	.62
Kendall Square Research	21.5	8	4.57	4.71	.59
Kendall Square Research	21.5	4	14.2	1.52	.38
IBM ES/9000 (11 ns)	5.14	4	1.51	3.39	.85
IBM ES/9000 (11 ns)	5.14	3	1.90	2.71	.90
IBM ES/9000 (11 ns)	5.14	2	2.74	1.88	.94
Intel Delta	22	512	1.5	14.7	.03
Intel Delta	22	256	1.6	13.8	.05
Intel Delta	22	128	1.7	12.9	.10
Intel Delta	22	64	1.9	11.5	.18
Intel Delta	22	32	2.2	10.0	.31
Intel Delta	22	16	2.9	7.59	.47
Intel Delta	22	8	4.1	5.37	.67
Intel Delta	22	4	6.7	3.28	.82
Intel Delta	22	2	11.6	1.90	.95
IBM 3090/600E VF	9.36	6	1.73	5.41	.90
IBM 3090/500E VF	9.36	5	2.02	4.63	.93
IBM 3090/400E VF	9.36	4	2.48	3.77	.94
IBM 3090/300E VF	9.36	3	3.21	2.92	.97
IBM 3090/200E VF	9.36	2	4.73	1.98	.99
SUN Sparc2000(50 MHz)	23.85	16	2.01	11.89	.74
SUN Sparc2000(50 MHz)	23.85	12	2.26	10.54	.88
SUN Sparc2000(50 MHz)	23.85	8	2.99	7.96	.99
Alliant FX/2800-200	22.9	14	2.06	11.1	.79
Alliant FX/2800-200	22.9	12	2.30	10.0	.83
Alliant FX/2800-200	22.9	10	2.68	8.54	.85
Alliant FX/2800-200	22.9	8	3.24	7.07	.88
Alliant FX/2800-200	22.9	4	6.07	3.77	.94
Alliant FX/2800-200	22.9	2	11.8	1.94	.97
IBM PVS	20.4	32	2.17	9.35	.29
IBM PVS	20.4	16	2.35	8.64	.54
IBM PVS	20.4	8	3.41	5.95	.74
IBM PVS	20.4	4	5.71	3.56	.89
IBM PVS	20.4	2	10.6	1.92	.96
IBM RS/6000 Cluster (62.5 ns)	7.42	8	2.48	2.99	.37
IBM RS/6000 Cluster (62.5 ns)	7.42	4	3.24	2.29	.57
IBM RS/6000 Cluster (62.5 ns)	7.42	2	4.64	1.60	.80
nCUBE 2	331	1024	2.59	128	.12
nCUBE 2	331	512	3.29	101	.20
nCUBE 2	331	256	4.05	81.7	.32
nCUBE 2	331	128	5.74	57.7	.45
nCUBE 2	331	64	8.70	38.0	.59

Computer	1000 x 1000 Problem with Parallel Processing Time uniprocessor	no. of processors	Time multiprocessors	Speedup	Efficiency
nCUBE 2	331	32	14.5	22.8	.71
nCUBE 2	331	16	25.6	12.9	.81
nCUBE 2	331	8	46.9	7.04	.88
nCUBE 2	331	4	89.1	3.71	.93
nCUBE 2	331	2	171.	1.93	.97
Intel iPSC/860	22	128	2.8	7.68	.06
Intel iPSC/860	22	64	3.2	6.72	.11
Intel iPSC/860	22	32	4.0	5.38	.17
Intel iPSC/860	22	16	5.1	4.22	.26
Intel iPSC/860	22	8	6.5	3.31	.41
Intel iPSC/860	22	4	8.9	2.42	.60
Intel iPSC/860	22	2	12.8	1.68	.84
Meiko Computing Surface (i860)	21.9	32	3.19	6.85	.21
Meiko Computing Surface (i860)	21.9	24	3.30	6.62	.28
Meiko Computing Surface (i860)	21.9	16	3.57	6.12	.38
Meiko Computing Surface (i860)	21.9	8	4.56	4.79	.60
Meiko Computing Surface (i860)	21.9	4	6.83	3.20	.80
Meiko Computing Surface (i860)	21.9	2	11.6	1.88	.94
IBM RS/6000 Cluster (50 ns)	7.95	8	3.44	2.31	.29
IBM RS/6000 Cluster (50 ns)	7.95	6	3.84	2.07	.35
IBM RS/6000 Cluster (50 ns)	7.95	4	4.39	1.81	.45
IBM RS/6000 Cluster (50 ns)	7.95	2	6.02	1.32	.66
SUN Sparc2000(50 MHz)	26.71	8	3.37	7.92	.99
SUN Sparc2000(50 MHz)	26.71	4	6.24	4.28	1.07
SUN Sparc2000(50 MHz)	26.71	2	12.60	2.12	1.06
Convex C3240	14.9	4	3.92	3.81	.95
Convex C3230	14.9	3	5.06	2.95	.98
Convex C3220	14.9	2	7.50	1.99	.99
Convex C-240	15	4	4.03	3.76	.94
Convex C-230	15	3	5.20	2.91	.97
Convex C-220	15	2	7.65	1.98	.99
Parsytec FT-400	1075	400	4.90	219.	.55
Parsytec FT-400	1075	256	6.59	163.	.64
Parsytec FT-400	1075	100	13.2	81.4	.81
Parsytec FT-400	1075	64	19.1	56.3	.88
Parsytec FT-400	1075	16	69.2	15.5	.97
SUN Sparc10/514(50 MHz)	24.73	4	6.81	3.63	.91
SUN Sparc10/514(50 MHz)	24.73	2	11.71	2.11	1.06
FPS Model 522	12	2	6.36	1.89	.95
Suprenum S1C1	51	16	6.4	8.0	.50
Suprenum S1C1	51	14	7.1	7.2	.51
Suprenum S1C1	51	12	7.9	6.5	.54
Suprenum S1C1	51	10	8.9	5.8	.58
Suprenum S1C1	51	8	10.4	4.9	.61
Suprenum S1C1	51	6	13.1	3.9	.65
Suprenum S1C1	51	4	18.1	2.8	.70

Computer	1000 x 1000 Problem with Parallel Processing				
	Time uniprocessor	no. of processors	Time multiprocessors	Speedup	Efficiency
Suprenum S1C1	51	2	33.4	1.5	.75
Alliant FX/800-200	24.2	4	7.09	3.41	.85
Alliant FX/800-200	24.2	2	12.7	1.91	.95
Alliant FX/80	57.7	8	9.64	5.99	.75
Alliant FX/80	57.7	7	10.6	5.44	.78
Alliant FX/80	57.7	6	11.8	4.89	.82
Alliant FX/80	57.7	5	13.6	4.24	.85
Alliant FX/80	57.7	4	16.2	3.56	.89
Alliant FX/80	57.7	3	20.7	2.79	.93
Alliant FX/80	57.7	2	29.8	1.94	.97
Stardent 1540 (Ardent Titan-4)	51.2	4	14.3	3.57	.89
Stardent 1530 (Ardent Titan-3)	51.2	3	18.3	2.80	.93
Stardent 1520 (Ardent Titan-2)	51.2	2	26.3	1.95	.97
SGI 4D/480 40 MHz	54.0	8	9.48	5.70	.71
SGI 4D/440 40 MHz	54.0	4	15.91	3.39	.85
SGI 4D/420 40 MHz	54.0	2	28.80	1.88	.94
SGI 4D/380 33 MHz	65.0	8	11.13	5.84	.73
SGI 4D/340 33 MHz	65.0	4	18.62	3.49	.87
SGI 4D/320 33 MHz	65.0	2	34.17	1.90	.95
SUN Sparc10/402(40 MHz)	29.03	2	16.28	1.78	.89
Alliant FX/40	66.1	4	20.5	3.22	.81
Alliant FX/40	66.1	3	24.9	2.65	.88
Alliant FX/40	66.1	2	34.8	1.90	.95
SGI 4D/240 25 MHz	85.2	4	23.89	3.57	.89
SGI 4D/220 25 MHz	85.2	2	44.89	1.90	.95
Alliant FX/4	106	4	32.3	3.28	.82
Alliant FX/4	106	3	38.7	2.74	.91
Alliant FX/4	106	2	55.8	1.90	.95
DEC VAX 6000-460	439	6	80	5.5	.92
DEC VAX 6000-450	439	5	94	4.7	.94
DEC VAX 6000-440	439	4	114	3.8	.96
DEC VAX 6000-430	439	3	152	2.9	.96
DEC VAX 6000-420	439	2	222	1.9	.99
ELXSI 6420	475	5	104	4.57	.91
ELXSI 6420	475	3	167	2.84	.95
ELXSI 6420	475	2	245	1.94	.97
DEC VAX 6240	1295	4	332	3.90	.98
DEC VAX 6230	1295	3	439	2.95	.98
DEC VAX 6220	1295	2	654	1.98	.99
Sequent Balance 21000	11111	30	445	25.0	.83

Table 3: **Highly Parallel Computing**

Computer (Full Precision)	Number of Processors	R_{max} Gflop/s	N_{max} order	$N_{1/2}$ order	R_{peak} Gflop/s
Intel ASCI Option Red (200 MHz Pentium Pro)	9152	1338.	235000	63000	1830
Intel ASCI Option Red (200 MHz Pentium Pro)	7264	1068.	215000	53400	1453
CRAY T3E-900 (450 MHz)	1320	670.	128832	23184	1188
Cray T3E 900 (450 MHz)	1024	523.2	113920	20992	922
CP-PACS* (150 MHz PA-RISC based CPU)	2048	368.2	103680	30720	614
CRAY T3E-900 (450 MHz)	512	321.1	122880	15360	461
Intel Paragon XP/S MP (50 MHz OS=SUNMOS)	6768	281.1	128600	25700	338
Intel Paragon XP/S MP (50 MHz OS=SUNMOS)	6144	256.2	122500	24300	307
CRAY T3E (300 MHz)	540	234.9	86400	14400	324
HITACHI SR2201/1024(150MHz)	1024	232.3	155520	34560	307
Numerical Wind Tunnel* (9.5 ns)	167	229.7	66132	18018	281
Intel Paragon XP/S MP (50 MHz OS=SUNMOS)	5376	223.6	114500	22900	269
CRAY T3E (300 MHz)	512	222.3	84480	12480	307
Fujitsu VPP700/116(7nsec)	116	213.0	111360	18560	255
CRAY T3E-1200 (600 MHz)	256	209.4	122880	12288	307
Fujitsu VPP500/153(10nsec)	153	200.6	62730	17000	245
Numerical Wind Tunnel* (9.5 ns)	140	195.0	60480	15730	236
Intel Paragon XP/S MP (50 MHz OS=SUNMOS)	4608	191.5	106000	21000	230
Numerical Wind Tunnel* (9.5 ns)	128	179.2	56832	14800	216
Fujitsu VPP500/128(10nsec)	128	170.2	56832	14804	205
CRAY T3E-900 (450 MHz)	256	161.6	84480	10080	230
IBM SP/472 (120 MHz)	460	151.8	61000	22600	221
Intel Paragon XP/S MP (50 MHz OS=SUNMOS)	3648	151.7	95000	18100	182
Intel Paragon XPS-140 (50 MHz OS=SUNMOS)	3680	143.4	55700	20500	184
Fujitsu VPP500/100(10nsec)	100	135.3	51000	12816	160
Fujitsu VPP700/64 (7nsec)	64	129.5	115200	12800	141
Fujitsu VPP500/96 (10nsec)	96	129.5	49728	12430	154
Paragon XP/S MP(1024 Nodes, OS=SUNMOS S1.6)	3072	127.1	86000	17800	154
NEC SX-4/64M2 (8.0 ns)	64	122.2	30080	4352	128
CRAY T3E-900 (450 MHz)	192	116.0	51840	8448	171
CRAY T3E (300 MHz)	256	112.8	59904	8832	154
Fujitsu VPP700/56 (7nsec)	56	110.3	109200	10752	123
Fujitsu VPP500/80 (10nsec)	80	109.8	46400	11030	128
CRAY T3E-1200 (600 MHz)	128	103.5	84480	8448	154
Cray T3D 1024 (150 MHz)	1024	100.5	81920	10224	152
Sun Ultra HPC10000 Cluster/4(250 MHz,4MB L2)	256	100.4	80640	22528	128
Fujitsu VPP700/46 (7nsec)	46	94.3	100280	8280	101
NEC SX-4/48M2 (8.0 ns)	48	92.63	30080	2688 96	
Sun Ultra HPC10000 Cluster/4(250 MHz,4MB L2)	244	92.6	80640	21504	122
Fujitsu VPP500/64 (10nsec)	64	89.3	41472	9820	102
IBM SP2-T2 (66 MHz)	512	88.4	73500	20150	136
Sun Ultra HPC10000 Cluster/4(250 MHz,4MB L2)	224	87.94	80640	19200	112
CRAY T3E (300 MHz)	192	83.07	51840	7680	115
Hitachi S-3000 cluster/412 (3x4) (2 ns)	12	78.2	31120	4880	96
CRAY T3E-900 (450 MHz)	128	77.52	42240	6432	115

Computer (Full Precision)	Number of Processors	R_{max} Gflop/s	N_{max} order	$N_{1/2}$ order	R_{peak} Gflop/s
Sun Ultra HPC10000 Cluster/3(250 MHz,4MB L2)	192	75.65	65520	19200	96
Sun Ultra HPC10000 Cluster/4(250 MHz,4MB L2)	192	75.58	80640	16320	96
Intel Paragon XPS-140 (50 MHz)	1872	72.9	55000	17500	94
Fujitsu VPP700/32 (7nsec)	32	67.3	83200	5760	70
NEC SX-4/32 (8.0 ns) ***	32	66.53	15360	1792	64
Paragon XP/S MP(512 Nodes, OS=SUNMOS S1.6)	1516	64.0	61000	12200	77
Cray T932 (2.2 ns) ***	32	61.8	16384	1280	58
NEC SX-4/32 (8.0 ns)	32	61.77	20480	1688	64
NEC SX-4/32M2 (8.0 ns)	32	61.32	20480	2432 64	
Thinking Machines CM-5	1024	59.7	52224	24064	131
Hitachi S-3000 cluster/309 (3x3) (2 ns)	9	59.0	26940	3180	72
HITACHI SR2201/256(150MHz)	256	58.68	77760	13440	78
Fujitsu VPP700/26E (6.5nsec)	26	58.0	74880	5200	62
IBM SP2 (160 MHz)	128	57.24	39000	9180	82
Sun Ultra HPC10000 Cluster/3(250 MHz,4MB L2)	144	56.97	65520	14400	72
CRAY T3E (300 MHz)	128	55.72	42240	5952	76.8
Hitachi S-3000 cluster/408 (2x4) (2 ns)	8	54.1	31200	3760	64
CRAY T3E-1200 (600 MHz)	64	52.64	61440	5376	77
Cray T932 (2.2 ns) ***	24	51.1	16384	1000	43
Sun Ultra HPC10000 Cluster/2(250 MHz,4MB L2)	128	51.08	44352	12096	64
Cray T3D 512 (150 MHz)	512	50.8	57856	7136	76
Sun Ultra HPC10000 Cluster/4(250 MHz,4MB L2)	128	48.85	80640	10368	64
Sun Ultra HPC6000 Cluster/4(250 MHz,4MB L2)	120	46.56	53760	24192	60
Fujitsu VPP500/32 (10nsec)	32	46.1	29760	5350	51
IBM SP2-T2 (66 MHz)	256	44.2	53000	13500	68
Hitachi S-3000 cluster/306 (2x3) (2 ns)	6	40.9	27000	2400	48
Hitachi S-3000 cluster/206 (3x2) (2 ns)	6	40.6	21600	2160	48
SGI Origin 2000 (195 MHz)	128	40.25	60000	6000	49.9
CRAY T3E-900 (450 MHz)	64	39.36	29952	4416	58
Sun Ultra HPC6000 Cluster/4(250 MHz,4MB L2)	96	38.44	53760	19968	48
Sun Ultra HPC10000 Cluster/2(250 MHz,4MB L2)	96	37.79	50400	6528	48
Sun Ultra HPC10000 Cluster/3(250 MHz,4MB L2)	96	36.91	65520	8640	48
Cray T932 (2.2 ns) ***	16	36.6	16384	1000	29
Fujitsu VPP700/16E (6.5nsec)	16	36.4	57600	3520	38
Fujitsu VPP300/16E (6.5nsec)	16	36.4	57600	3520	38
NEC SX-4/16 (8.0 ns) ***	16	34.42	14336	960	32
Sun HPC 10000(333MHz 4MB L2 Cache)	64	34.17	20352	3648	42.6
Fujitsu VPP700/16 (7nsec)	16	34.1	59200	3520	35
Fujitsu VPP300/16 (7nsec)	16	34.1	59200	3520	35
IBM RS/6000 F50 (332 MHz)	128	34.05	80000	10000	85
Sun HPC 10000(333MHz 4MB L2 Cache)	60	32.27	20352	3456	40.0
Paragon XP/S MP(256 Nodes, OS=SUNMOS S1.6)	768	31.7	43500	8400	38
NEC SX-4/16 (8.0 ns)	16	31.10	20480	960	32
NEC SX-4/16M2 (8.0 ns)	16	31.09	20480	2048 32	
DEC AlphaServer 8400 5/612 (625 MHz)	64	30.90	30704	8360	80
NEC SX-4/16A (8.0 ns)	16	30.83	20480	960	32
Thinking Machines CM-5	512	30.4	36864	16384	66

Computer (Full Precision)	Number of Processors	R_{max} Gflop/s	N_{max} order	$N_{1/2}$ order	R_{peak} Gflop/s
Sun HPC 10000(333MHz 4MB L2 Cache)	56	30.27	20352	3264	37.3
Hitachi SR2201/128(150MHz)	128	29.46	51840	7680	38.4
IBM SP2 (160 MHz)	64	29.45	27500	5700	41
IBM SP2-T2 (66 MHz)	160	28.7	42200	10300	42
Hitachi S-3800/480 (2 ns)	4	28.4	15500	830	32
Sun HPC 10000(333MHz 4MB L2 Cache)	52	28.32	20352	3072	34.6
CRAY T3E (300 MHz)	64	28.31	29952	4032	38.4
Hitachi S-3000 cluster/204 (2x2) (2 ns)	4	27.9	21600	1640	32
HP Exemplar X-Class SPP-UX 5.2	64	27.56	29956	4584	46
Hitachi S-3000 cluster/404 (1x4) (2 ns)	4	27.2	31200	2680	32
SGI POWER CHALLENGE (90 MHz)	128	26.7	53000	20000	46
Sun Ultra HPC 10000(250 MHz 4MB L2 Cache)	64	26.45	19968	3072	32
Sun HPC 10000(333MHz 4MB L2 Cache)	48	26.38	20352	2880	32.0
CRAY T3E-1200 (600 MHz)	32	25.98	42240	3456	38
DEC AlphaServer 8400 5/612 (625 MHz)	56	25.39	26864	8360	70
Cray T3D 256 (150 MHz)	256	25.3	40960	4918	38
SGI Origin 2000 (250 MHz)	64	25.30	43200	4320	32
Sun Ultra HPC 10000(250 MHz 4MB L2 Cache)	60	24.83	19968	2800	30
DEC 8400 5/440 (440 MHz)	64	24.7	30712	4584	56.3
Sun HPC 10000(333MHz 4MB L2 Cache)	44	24.36	20352	2688	29.3
Fujitsu VPP500/16 (10nsec)	16	23.6	21120	3360	26
IBM SP2 thin-node2,SP-sw,256MB/node(66 MHz)	128	23.45	56000	9200	33.6
Sun Ultra HPC 10000(250 MHz 4MB L2 Cache)	56	23.38	19968	2880	28
NEC SX-3/44R (2.5 ns)	4	23.2	6400	830	26
IBM SP2-T2 (66 MHz)	128	22.9	37000	9200	34
IBM POWER2 Super Chip RS/6000 SP(120 MHz)	64	22.55	27400	6500	31
Sun HPC 10000(333MHz 4MB L2 Cache)	40	22.27	20352	2496	26.6
DEC 8400 5/440 (440 MHz)	56	21.8	26856	4072	49.3
Sun Ultra HPC 10000(250 MHz 4MB L2 Cache)	52	21.68	19968	2496	26
Hitachi S-3800/380 (2 ns)	3	21.6	15680	760	24
Hitachi S-3000 cluster/303 (1x3) (2 ns)	3	21.5	27000	1560	24
SUN Ultra HPC 10000(250 MHz 1MB L2 Cache)	64	21.37	15000	4200	32.0
SUN Ultra HPC 10000(250 MHz 1MB L2 Cache)	63	21.14	15000	4200	31.5
Sun Ultra HPC 10000(250 MHz 4MB L2 Cache)	50	21.05	19968	2496	25
Cray C90 (240 MHz)***	16	20.65	13312	700	15
DEC AlphaServer 8400 5/612 (625 MHz)	40	20.54	24552	8960	50
SUN Ultra HPC 10000(250 MHz 1MB L2 Cache)	60	20.31	15000	3600	30.0
Sun Ultra HPC 10000(250 MHz 4MB L2 Cache)	48	20.30	19968	2496	24
Sun HPC 10000(333MHz 4MB L2 Cache)	36	20.11	20352	2304	24.0
SGI Origin 2000 (195 MHz)	64	20.1	40000	4000	25.0
NEC SX-3/44 (2.9 ns)	4	20.0	6144	832	22
LANL Avalon Cluster:Alpha 533 Mhz+100Mb/s sw	68	19.33	30464	14376	72.5
DEC 8400 5/440 (440 MHz)	48	19.2	23032	4048	42.2
SUN Ultra HPC 10000(250 MHz 1MB L2 Cache)	56	19.14	15000	3600	28.0
CRAY T3E-900 (450 MHz)	32	19.57	21120	3048	29
Sun Ultra HPC 10000(250 MHz 4MB L2 Cache)	44	18.67	19968	2496	22
Fujitsu VPP700/8E (6.5nsec)	8	18.6	41600	2400	19

Computer (Full Precision)	Number of Processors	R_{max} Gflop/s	N_{max} order	$N_{1/2}$ order	R_{peak} Gflop/s
Fujitsu VPP300/8E (6.5nsec)	8	18.6	41600	2400	19
SGI POWER CHALLENGE (75 MHz)	96	18.5	53000	20000	29
DEC AlphaServer 8400 5/612 (625 MHz)	32	17.96	25624	4088	40
Sun HPC 10000(333MHz 4MB L2 Cache)	32	17.91	20352	2112	21.3
Sun HPC 6000(336MHz 4MB L2 Cache)	30	17.89	20352	2112	20.2
NEC SX-3/34R (2.5 ns)	3	17.4	6144	691	19
Sun Ultra HPC 10000(250 MHz 4MB L2 Cache)	40	17.12	19968	2496	20
Fujitsu VPP700/8 (7nsec)	8	17.1	41600	2080	18
Fujitsu VPP300/8 (7nsec)	8	17.1	41600	2080	18
IBM RS/6000 F50 (332 MHz)	64	16.97	56000	6000	42
DEC 8400 5/440 (440 MHz)	40	16.7	20456	3200	35.2
Sun HPC 6000(336MHz 4MB L2 Cache)	28	16.74	20352	2112	18.8
SUN Ultra HPC 10000(250 MHz 1MB L2 Cache)	48	16.66	15000	3600	24.0
Paragon XP/S MP(128 Nodes, OS=SUNMOS S1.6)	384	16.0	30700	5700	19
Cray C90 (240 MHz)***	12	15.97	13312	600	12
Sun HPC 10000(333MHz 4MB L2 Cache)	28	15.66	20352	1728	18.6
SGI POWER CHALLENGE (90 MHz)	64	15.6	37000	8500	23
Sun HPC 6000(336MHz 4MB L2 Cache)	26	15.59	20352	1920	17.5
NEC SX-4/8M2 (8.0 ns)	8	15.44	9984	1920 16	
NEC SX-4/8 (8.0 ns)	8	15.43	9984	860	16
Sun Ultra HPC 10000(250 MHz 4MB L2 Cache)	36	15.42	19968	2112	18
NEC SX-4/8A (8.0 ns)	8	15.31	9984	860	16
Intel Paragon XPS-35 (50 MHz, OS=R1.1)	512	15.2	23000	9000	26
Thinking Machines CM-5	256	15.1	26112	12032	33
HP Exemplar X-Class SPP-UX 5.2	32	15.01	26848	1840	23
IBM SP2 (160 MHz)	32	14.93	20000	3840	20
HITACHI SR2201/64(150MHz)	64	14.89	38880	6720	19
Hitachi S-3800/280 (2 ns)	2	14.6	15680	570	16
Sun HPC 10000(333MHz 4MB L2 Cache)	26	14.53	20352	1728	17.3
IBM SP2 (77 MHz, switch of 4/96)	64	14.5	27000	5100	20
Hitachi S-3000 cluster/202 (1x2) (2 ns)	2	14.5	21600	1100	16
Sun HPC 6000(336MHz 4MB L2 Cache)	24	14.49	20352	1728	16.1
SUN Ultra HPC 10000(250 MHz 1MB L2 Cache)	40	14.06	15000	3000	20.0
CRAY T3E (300 MHz)	32	14.03	21120	2832	19.2
Intel Delta (40 MHz)	512	13.9	25000	7500	20
DEC AlphaServer 8400 5/612 (625 MHz)	24	13.79	25624	3072	30
Sun Ultra HPC 10000(250 MHz 4MB L2 Cache)	32	13.77	19968	1920	16
Cray Y-MP C90 (240 MHz 4.2 ns)	16	13.7	10000	650	15
DEC 8400 5/440 (440 MHz)	32	13.7	19176	4584	28.2
Sun Ultra HPC 6000(250 MHz 4MB L2 Cache)	30	13.39	19968	1920	15
Sun HPC 10000(333MHz 4MB L2 Cache)	24	13.39	20352	1728	16.0
Sun HPC 6000(336MHz 4MB L2 Cache)	22	13.33	20352	1728	14.8
CRAY T3E-1200 (600 MHz)	16	13.24	30720	2304	19
HITACHI SR2201/56(150MHz)	56	12.98	33600	4480	17
Cray T3D 128 (150 MHz)	128	12.8	20736	3408	19
Sun Ultra HPC 6000(250 MHz 4MB L2 Cache)	28	12.53	19968	1728	14
IBM SP2 thin-node2,SP-sw,256MB/node(66 MHz)	64	12.50	39000	7000	16.8

Computer (Full Precision)	Number of Processors	R_{max} Gflop/s	N_{max} order	$N_{1/2}$ order	R_{peak} Gflop/s
Intel Paragon XPS-35 (50 MHz)	296	12.5	29400	5000	15
SUN Ultra HPC 6000 250 MHz (1MB L2 Cache)	30	12.42	15700	4000	15.0
DEC 4100 5/400 (400 MHz)	32	12.37	15340	6120	25.6
Sun HPC 10000(333MHz 4MB L2 Cache)	22	12.32	20352	1536	14.7
Sun HPC 6000(336MHz 4MB L2 Cache)	20	12.13	20352	1536	13.4
Sun Ultra HPC 10000(250 MHz 4MB L2 Cache)	28	12.05	19968	1728	14
Fujitsu VPP500/8 (10nsec)	8	12.0	14960	2216	13
Sun Ultra HPC 6000(250 MHz 4MB L2 Cache)	26	11.66	19968	1728	13
NEC SX-3/42R (2.5 ns)	4	11.6	4352	516	13
NEC SX-3/24R (2.5 ns)	2	11.6	4352	492	13
IBM SP2-T2 (66 MHz)	64	11.4	26500	6250	16
IBM POWER2 Super Chip RS/6000 SP(120 MHz)	32	11.38	19500	4100	15
SUN Ultra HPC 10000(250 MHz 1MB L2 Cache)	32	11.34	15000	2400	16.0
Sun HPC 10000(333MHz 4MB L2 Cache)	20	11.24	20352	1536	13.3
Sun Ultra HPC 10000(250 MHz 4MB L2 Cache)	26	11.20	19968	1728	13
Sun HPC 6000(336MHz 4MB L2 Cache)	18	10.94	20352	1344	12.1
Cray C90 (240 MHz)***	8	10.93	13312	490	7.7
SGI Origin 2000 (195 MHz, 4MB L2 Cache)	32	10.9	32000	6400	12.5
DEC 8400 5/440 (440 MHz)	24	10.9	15340	4088	21.1
Sun Ultra HPC 6000(250 MHz 4MB L2 Cache)	24	10.78	19968	1728	12
HP Exemplar V-Class (240 MHz)	16	10.65	14944	896	15
Sun Ultra HPC 10000(250 MHz 4MB L2 Cache)	24	10.35	19968	1728	12
Intel Delta (40 MHz)	384	10.2	20000	6000	15
Berkeley NOW:UltraSPARC-1(167-Mhz)+Myricom	100	10.14	32768	8192	33.4
NEC SX-3/24 (2.9 ns)	2	10.0	4352	500	11
NEC SX-3/42 (2.9 ns)	4	10.0	4608	640	11
SUN Ultra HPC 6000 250 MHz (1MB L2 Cache)	24	9.992	15700	1632	12.0
CRAY T3E-900 (450 MHz)	16	9.946	14976	1968	14
Sun Ultra HPC 6000(250 MHz 4MB L2 Cache)	22	9.887	19968	1728	11
Thinking Machines CM-200 (10 MHz)	2048	9.8	29696	11264	20
Sun HPC 6000(336MHz 4MB L2 Cache)	16	9.715	20352	1344	10.8
DEC AlphaServer 8400 5/612 (625 MHz)	16	9.592	25624	3072	20
Sun Ultra HPC 10000(250 MHz 4MB L2 Cache)	22	9.513	19968	1728	11
DEC 4100 5/400 (400 MHz)	24	9.48	15344	3600	19.2
Cray T94 (2.2 ns) ***	4	9.414	8192	420	7.2
SGI POWER CHALLENGE (90 MHz)	40	9.4	27000	6775	14
Fujitsu VPP700/4E (6.5nsec)	4	9.33	28800	1280	9.6
Fujitsu VPP300/4E (6.5nsec)	4	9.33	28800	1280	9.6
Fujitsu VX/4E (6.5nsec)	4	9.33	28800	1280	9.6
HP Exemplar V-Class (200 MHz)	16	9.203	14944	868	12.8
Sun HPC 10000(333MHz 4MB L2 Cache)	16	9.107	20352	1344	10.7
Sun Ultra HPC 6000(250 MHz 4MB L2 Cache)	20	8.997	19968	1344	10
NEC SX-3/32R (2.5 ns)	3	8.7	6144	717	9.6
Sun Ultra HPC 10000(250 MHz 4MB L2 Cache)	20	8.679	19968	1344	10
Fujitsu VPP700/4 (7nsec)	4	8.6	28800	1280	8.8
Fujitsu VPP300/4 (7nsec)	4	8.6	28800	1280	8.8
Fujitsu VX/4 (7nsec)	4	8.6	28800	1280	8.8

Computer (Full Precision)	Number of Processors	R_{max} Gflop/s	N_{max} order	$N_{1/2}$ order	R_{peak} Gflop/s
Sun HPC 6000(336MHz 4MB L2 Cache)	14	8.527	20352	1344	9.4
IBM RS/6000 F50 (332 MHz)	32	8.46	40000	4000	21
Cray C90 (240 MHz)***	6	8.29	13312	450	5.8
SGI POWER CHALLENGE (195 MHz, 2MB cache)	32	8.233	16000	4000	12
HP Exemplar V-Class (240 MHz)	12	8.228	14944	736	11.5
Sun Ultra HPC 6000(250 MHz 4MB L2 Cache)	18	8.113	19968	1344	9
Parsytec GC/Power Plus (80 MHz)	192	8.0	27192	9500	15
SGI Origin 2000 (195 MHz, 4MB cache)	24	7.928	19000	3500	9.4
SUN Ultra HPC 6000 167 MHz (1MB L2 Cache)	30	7.806	14000	1000	10.0
SGI POWER CHALLENGE (75 MHz)	40	7.8	27000	6775	12
HP Exemplar S-Class SPP-UX 5.2	16	7.783	13320	1044	11.5
DEC 8400 5/440 (440 MHz)	16	7.7	15340	3270	14.1
Thinking Machines CM-5	128	7.7	18432	8192	16
Cray J932 (10 ns) ***	32	7.622	19456	800	6.4
SGI POWER CHALLENGE (195 MHz, 2MB cache)	28	7.635	15000	4000	11
Intel Paragon XPS-35 (50 MHz, OS=R1.1)	256	7.6	16000	4000	13
IBM SP2 (160 MHz)	16	7.57	13500	2280	10
SGI POWER CHALLENGE (90 MHz)	32	7.5	22000	5600	16
Cray J928 (10 ns) ***	28	7.413	19456	750	5.6
Hitachi S-3800/180 (2 ns)	1	7.4	15680	470	8
IBM SP2 (77 MHz, switch of 4/96)	32	7.3	19500	3500	10
Sun Ultra HPC 6000(250 MHz 4MB L2 Cache)	16	7.219	19968	1344	8
CRAY T3E (300 MHz)	16	7.133	14976	1728	9.6
DEC 8400 5/625 (612 MHz)	12	7.283	9548	1800	14.7
Cray T94 (2.2 ns) ***	3	7.112	8192	370	5.4
HP Exemplar V-Class (200 MHz)	12	7.094	14944	696	9.6
Sun Ultra HPC 10000(250 MHz 4MB L2 Cache)	16	7.023	19968	1344	8
Intel Delta (40 MHz)	256	7.0	18000	5000	10
SGI POWER CHALLENGE (195 MHz, 2MB cache)	24	6.819	15000	3500	9.4
DEC 4100 5/400 (400 MHz)	16	6.89	15344	2760	12.8
SUN Ultra HPC 6000 250 MHz (1MB L2 Cache)	16	6.688	15700	1088	8.0
DEC Alphaserver 8400 5/440(440MHz, 4MB cache)	12	6.678	9548	1028	10.6
Cray J924 (10 ns) ***	24	6.645	19456	700	4.8
CRAY T3E-1200 (600 MHz)	8	6.615	22080	1536	9.6
IBM SP2 thin-node2,SP-sw,256MB/node(66 MHz)	32	6.569	28000	5200	8.4
Cray T3D 64 (150 MHz)	64	6.4	20736	2368	9.6
SUN Ultra HPC 6000 167 MHz (1MB L2 Cache)	24	6.350	14000	800	8.0
SUN Ultra HPC 6000 250 MHz (4MB L2 Cache)	14	6.251	15552	1152	7.0
Convex SPP-1000(64 procs)100 MHz	64	6.192	41000	11400	12.8
SGI POWER CHALLENGE (195 MHz, 1 MB cache)	24	6.118	15000	3100	9.3
Fujitsu VPP500/4 (10nsec)	4	6.1	10560	1390	6.4
HP Exemplar S-Class SPP-UX 5.2	12	6.005	13320	800	8.6
Cray J920 (10 ns) ***	20	5.917	19456	675	4.0
DEC 8400 5/350 (12 proc 350 MHz)	12	5.904	9548	3010	8.4
SGI POWER CHALLENGE (195 MHz, 2MB cache)	20	5.872	15000	3000	7.8
SUN Ultra HPC 6000 250 MHz (1MB L2 Cache)	14	5.856	15700	960	7.0
DEC Alphaserver 8400 5/440(440MHz, 4MB cache)	10	5.845	9548	1124	8.8

Computer (Full Precision)	Number of Processors	R_{max} Gflop/s	N_{max} order	$N_{1/2}$ order	R_{peak} Gflop/s
SGI POWER CHALLENGE (195 MHz, 1 MB cache)	22	5.812	15000	2900	8.6
IBM SP2-T2 (66 MHz)	32	5.8	18000	4500	8.4
NEC SX-3/41R (2.5 ns)	4	5.8	3584	414	6.4
NEC SX-3/22R (2.5 ns)	2	5.8	3072	370	6.4
NEC SX-3/14R (2.5 ns)	1	5.8	2816	282	6.4
IBM POWER2 Super Chip RS/6000 SP(120 MHz)	16	5.767	13500	2600	7.7
Cray C90 (240 MHz)***	4	5.75	13312	420	3.8
HP Exemplar V-Class (240 MHz)	8	5.657	14944	560	7.68
Convex SPP-1600(32 procs)120 MHz	32	5.452	27000	4500	7.7
SGI POWER CHALLENGE (195 MHz, 1 MB cache)	20	5.430	15000	2600	7.8
SGI Origin 2000 (195 MHz, 4MB cache)	16	5.300	16000	1000	6.2
Intel Delta (40 MHz)	192	5.2	15000	4500	7.7
Parsytec GC/Power Plus (80 MHz)	128	5.2	22000	7800	10
Thinking Machines CM-2 (7 MHz)	2048	5.2	26624	11000	14
DEC AlphaServer 8400 5/300	12	5.0	9548	1148	7.2
Meiko CS2	64	5.0	18688	6144	11.5
NEC SX-3/22 (2.9 ns)	2	5.0	3072	384	5.5
NEC SX-3/14 (2.9 ns)	1	5.0	3072	384	5.5
Thinking Machines CM-200 (10 MHz)	1024	5.0	21504	8192	10
SGI POWER CHALLENGE (195 MHz, 2MB cache)	18	4.992	15000	2350	7.0
CRAY T3E-900 (450 MHz)	8	4.944	10560	1360	7.2
Cray J916 (10 ns) ***	16	4.911	19456	640	3.2
SGI POWER CHALLENGE (75 MHz)	24	4.9	18000	3500	7.2
Cray T94 (2.2 ns) ***	2	4.886	8192	350	3.6
Sun HPC 6000(336MHz 4MB L2 Cache)	8	4.886	20352	960	5.4
SGI POWER CHALLENGE (195 MHz, 2MB cache)	16	4.862	15000	2500	6.2
HP Exemplar V-Class (200 MHz)	8	4.860	14944	552	6.4
Alliant CAMPUS/800 (40 MHz)	192	4.8	17024	5768	7.7
IBM SP-1	64	4.8	26000	6000	8
DEC Alphaserver 8400 5/440(440MHz, 4MB cache)	8	4.754	7644	1500	7.0
SGI POWER CHALLENGE (90 MHz)	18	4.620	2500	540	6.5
SGI POWER CHALLENGE (195 MHz, 1 MB cache)	16	4.527	15000	2200	6.2
NEC SX-3/31R (2.5 ns)	3	4.4	6144	414	5.4
SGI POWER CHALLENGE (90 MHz)	16	4.323	2500	540	5.8
Cray C90 (240 MHz)***	3	4.31	13312	380	2.9
SUN Ultra HPC 6000 167 MHz (1MB L2 Cache)	16	4.305	14000	700	5.3
IBM RS/6000 F50 (332 MHz)	16	4.30	28500	2100	11
SGI POWER CHALLENGE (75 MHz)	18	4.142	2604	570	5.4
HP Exemplar S-Class SPP-UX 5.2	8	4.103	13320	520	5.8
Alliant CAMPUS/800 (40 MHz)	168	4.1	16016	5516	6.7
SGI POWER CHALLENGE (195 MHz, 1 MB cache)	14	4.041	15000	2000	5.5
SGI Origin 2000 (195 MHz, 4MB cache)	12	4.038	15000	1000	4.7
DEC 8400 5/625 (612 MHz)	6	4.003	9156	1100	7.34
Intel Paragon XPS-35 (50 MHz, OS=R1.1)	128	4.0	12000	3000	6.4
Convex SPP-1200(32 procs)120 MHz	32	3.962	27700	4500	7.7
DEC AlphaServer 8400 5/300	10	3.9	9540	812	6.0
Parsytec GC/Power Plus (80 MHz)	96	3.9	19000	6599	7.7

Computer (Full Precision)	Number of Processors	R_{max} Gflop/s	N_{max} order	$N_{1/2}$ order	R_{peak} Gflop/s
IBM SP2 (160 MHz)	8	3.83	10000	1320	5.1
Thinking Machines CM-5	64	3.8	13056	6016	8
Cray J912 (10 ns) ***	12	3.768	19456	690	2.4
SGI POWER CHALLENGE (90 MHz)	14	3.767	2000	470	5.0
HITACHI SR2201/16(150MHz)	16	3.74	19440	2880	4.8
IBM SP2 (77 MHz, switch of 4/96)	16	3.7	13500	2200	5
SGI POWER CHALLENGE (75 MHz)	16	3.7	2500	540	4.8
Sun HPC 6000(336MHz 4MB L2 Cache)	6	3.672	20352	960	4.0
SGI POWER CHALLENGE (195 MHz, 2MB cache)	12	3.604	10000	2000	4.7
SUN Ultra HPC 6000 250 MHz (4MB L2 Cache)	8	3.589	15552	768	4.0
DEC 4100 5/400 (400 MHz)	8	3.57	8964	1340	6.4
CRAY T3E (300 MHz)	8	3.542	10560	1152	4.8
Intel Delta (40 MHz)	128	3.5	12500	3500	5
Alliant CAMPUS/800 (40 MHz)	144	3.5	15484	4956	5.8
SGI POWER CHALLENGE (195 MHz, 1 MB cache)	12	3.496	15000	1650	4.7
IBM SP2 thin-node2,SP-sw,256MB/node(66 MHz)	16	3.414	19000	3400	4.2
SGI POWER CHALLENGE (90 MHz)	12	3.398	2000	450	4.3
CRAY T3E-1200 (600 MHz)	4	3.333	15360	1000	4.8
SUN Ultra HPC 6000 250 MHz (1MB L2 Cache)	8	3.328	15700	700	4.0
Convex SPP-1000(32 procs)100 MHz	32	3.306	25800	4700	6.4
Cray T3D 32 (150 MHz)	32	3.2	14592	1616	3.6
DEC AlphaServer 8400 5/300	8	3.2	7668	540	4.8
SGI POWER CHALLENGE (75 MHz)	14	3.203	2000	470	4.2
IBM SP2-T2 (66 MHz)	16	3.0	13000	2600	4.2
Cray C90 (240 MHz)***	2	2.92	13312	350	1.9
HP Exemplar V-Class (240 MHz)	4	2.910	14944	400	3.84
Alliant CAMPUS/800 (40 MHz)	120	2.9	14000	4620	4.8
NEC SX-3/21R (2.5 ns)	2	2.9	2560	257	3.2
NEC SX-3/12R (2.5 ns)	1	2.9	2048	174	3.2
IBM POWER2 Super Chip RS/6000 SP(120 MHz)	8	2.876	9500	1500	3.8
SGI POWER CHALLENGE (75 MHz)	12	2.874	2000	450	3.6
Convex SPP-1600(16 procs)120 MHz	16	2.840	18000	2400	3.8
SGI POWER CHALLENGE (90 MHz)	10	2.830	2000	400	3.6
Meiko CS2	32	2.8	13824	3488	5.8
Parsytec GC/Power Plus (80 MHz)	64	2.8	16000	4500	5.1
Convex SPP-1200(24 procs)120 MHz	24	2.830	21100	3400	5.8
SUN Ultra HPC 6000 250 MHz (4MB L2 Cache)	6	2.694	15552	672	3.0
SGI Origin 2000 (195 MHz, 4MB cache)	8	2.678	10000	1000	3.1
Intel iPSC/860 (40 MHz)	128	2.6	12000	4500	5.
Cray J908 (10 ns) ***	8	2.585	19456	520	1.6
CRAY T3E-900 (450 MHz)	4	2.521	7488	864	3.6
SGI POWER CHALLENGE (195 MHz, 2MB cache)	8	2.513	10000	1500	3.1
NEC SX-3/12 (2.9 ns)	1	2.5	2048	256	2.8
HP Exemplar V-Class (200 MHz)	4	2.495	14944	384	3.2
SUN Ultra HPC 6000 250 MHz (1MB L2 Cache)	6	2.483	15700	700	3.0
Cray T94 (2.2 ns) ***	1	2.474	8192	280	1.8
Sun HPC 6000(336MHz 4MB L2 Cache)	4	2.452	20352	960	2.7

Computer (Full Precision)	Number of Processors	R_{max} Gflop/s	N_{max} order	$N_{1/2}$ order	R_{peak} Gflop/s
DEC AlphaServer 8400 5/300	6	2.4	9640	540	3.6
DEC AlphaServer 8200 5/300	6	2.4	9640	540	3.6
IBM SP-1	32	2.4	16000	4000	4
Thinking Machines CM-200 (10 MHz)	512	2.4	14848	5632	5
SGI POWER CHALLENGE (75 MHz)	10	2.395	2000	470	3.0
SGI POWER CHALLENGE (90 MHz)	8	2.318	1900	360	2.9
Alliant CAMPUS/800 (40 MHz)	96	2.3	13020	4396	3.8
Intel iPSC/860 (40 MHz)	120	2.3	12000	4500	4.8
Fujitsu AP1000	512	2.3	25600	2500	2.8
SUN Ultra HPC 6000 167 MHz (1MB L2 Cache)	8	2.185	14000	500	2.7
HP Exemplar S-Class SPP-UX 5.2	4	2.121	13320	520	2.9
Sun Ultra HPC 450 (300 MHz)	4	2.09	10944	492	2.4
Convex SPP-1200(16 procs)120 MHz	16	2.032	19000	2800	3.8
DEC 4100 5/400 (400 MHz)	4	2.019	4929	1280	3.2
Intel Paragon XPS-35 (50 MHz, OS=R1.1)	64	2.0	8000	2000	3.2
SGI POWER CHALLENGE (75 MHz)	8	1.955	1900	360	2.4
Thinking Machines CM-5	32	1.9	9216	4096	4
Intel iPSC/860 (40 MHz)	96	1.9	11000	4000	3.8
nCUBE 2 (20 MHz)	1024	1.9	21376	3193	2.4
CRAY T3E (300 MHz)	4	1.806	7488	768	2.4
IBM SP2 (77 MHz, switch of 4/96)	8	1.8	9500	1200	2.5
SUN Ultra HPC 6000 250 MHz (4MB L2 Cache)	4	1.798	15552	576	2.0
IBM SP2 thin-node2,SP-sw,256MB/node(66 MHz)	8	1.768	12000	1700	2.1
Intel Delta (40 MHz)	64	1.7	8000	2500	2.6
CRAY T3E-1200 (600 MHz)	2	1.668	11040	672	2.4
SGI POWER CHALLENGE (90 MHz)	6	1.690	2000	294	2.2
Alliant CAMPUS/800 (40 MHz)	72	1.6	12012	3724	2.9
MasPar MP-2216 (80ns)	16384	1.6	11264	1920	2.4
SUN Ultra HPC 6000 250 MHz (1MB L2 Cache)	4	1.560	15700	500	2.0
DEC 4100 5/300 (300 MHz)	4	1.544	4436	500	2.4
IBM SP2-T2 (66 MHz)	8	1.5	9000	1680	2.1
Meiko CS2	16	1.5	10880	1952	2.9
NEC SX-3/11R (2.5 ns)	1	1.5	2048	130	1.6
Parsytec GC/Power Plus (80 MHz)	32	1.5	11000	3500	2.5
Convex SPP-1600(8 procs)120 MHz	8	1.455	11000	750	1.9
SGI POWER CHALLENGE (75 MHz)	6	1.430	2000	294	1.8
Intel iPSC/860 (40 MHz)	72	1.4	9000	3500	2.9
Intel iPSC/860 (40 MHz)	64	1.4	9000	3500	2.6
SGI Origin 2000 (195 MHz, 4MB cache)	4	1.385	10000	1000	1.6
SGI POWER CHALLENGE (195 MHz, 2MB cache)	4	1.305	10000	1000	1.6
Meiko Computing Surface (40 MHz)	62	1.3	8500	3500	2.5
NEC SX-3/11 (2.9 ns)	1	1.3	2816	192	1.4
SGI CHALLENGE (6.6ns)	36	1.284	8000	2000	2.7
SGI CHALLENGE (6.6ns)	32	1.254	8000	2000	2.4
CRAY T3E-900 (450 MHz)	2	1.251	5280	528	1.8
DEC AlphaServer 2100 5/250	4	1.2	4056	800	2.0
Fujitsu AP1000	256	1.2	18000	1600	1.4

Computer (Full Precision)	Number of Processors	R_{max} Gflop/s	N_{max} order	$N_{1/2}$ order	R_{peak} Gflop/s
IBM SP-1	16	1.2	12000	2300	2
Thinking Machines CM-200 (10 MHz)	256	1.2	10752	4096	2.5
SGI CHALLENGE (6.6ns)	28	1.153	8000	2000	2.1
SGI POWER CHALLENGE (90 MHz)	4	1.182	1000	240	1.4
Alliant CAMPUS/800 (40 MHz)	48	1.1	10024	3024	1.9
Sun Ultra HPC 450 (300 MHz)	2	1.05	10944	192	1.2
SGI POWER CHALLENGE (75 MHz)	4	1.046	14000	1000	1.2
Convex SPP-1200(8 procs)120 MHz	8	1.026	11000	750	1.9
SGI CHALLENGE/Onyx (6.6ns)	24	1.014	8000	1000	1.8
Sun HPC 2 (300 MHz)	2	1.01	7104	288	1.2
Convex SPP-1000(8 procs)100 MHz	8	1.005	11000	550	1.6
SGI POWER CHALLENGE (75 MHz)	4	.993	1000	240	1.2
Intel iPSC/860 (40 MHz)	48	.98	7000	3000	1.9
Thinking Machines CM-5	16	.98	6528	3008	2
nCUBE 2 (20 MHz)	512	.958	15200	2240	1.2
HITACHI SR2201/4(150MHz)	4	.941	9720	1200	1.2
IBM PVS (40MHz)	32	.925	6000	1560	1.3
Intel Delta (40 MHz)	32	.9	6000	2000	1.3
CRAY T3E (300 MHz)	2	0.896	5280	384	1.2
SGI CHALLENGE/Onyx (6.6ns)	20	.866	7000	1000	1.5
Meiko Computing Surface (40 MHz)	32	.825	7000	3000	1.3
Meiko CS2	8	.8	8064	1088	1.4
SGI CHALLENGE/Onyx (6.6ns)	18	.796	8000	1000	1.35
NEC SX-3/1LR (2.5 ns)	1	.78	2304	112	0.8
SGI CHALLENGE/Onyx (6.6ns)	16	.702	8000	1000	1.2
SGI Origin 2000 (195 MHz, 4MB cache)	2	.699	10000	600	.78
IBM RS/6000 Cluster (PARC) (62.5 MHz)	8	.694	10000	1500	1.0
Parsytec GC/Power Plus (80 MHz)	16	.68	7700	2200	1.3
NEC SX-3/1L (2.9 ns)	1	.67	2048	128	.68
Intel iPSC/860 (40 MHz)	32	.64	6000	2500	1.3
SGI POWER CHALLENGE (195 MHz, 2MB cache)	2	.663	10000	600	.78
SGI CHALLENGE/Onyx (6.6ns)	14	.631	8000	1000	1.05
SGI POWER CHALLENGE (90 MHz)	2	.601	1000	180	.72
Fujitsu AP1000	128	.566	12800	1100	.71
SGI CHALLENGE/Onyx (6.6ns)	12	.554	7000	1000	.9
IBM RS/6000 Cluster (PARC) (50 MHz)	8	.520	7500	1300	.8
Sun Ultra HPC 450 (300 MHz)	1	.52	10944	192	.6
Alliant CAMPUS/800 (40 MHz)	24	.504	7000	2492	.96
SGI POWER CHALLENGE (75 MHz)	2	.505	1000	180	.6
Sun HPC 2 (300 MHz)	1	.50	7104	288	.6
Intel iPSC/860 (40 MHz)	24	.49	5000	2000	.96
nCUBE 2 (20 MHz)	256	.482	10784	1504	.64
MasPar MP-1216 (80ns)	16384	.473	11264	1280	.55
SGI CHALLENGE/Onyx (6.6ns)	10	.472	8000	1000	.75
Intel Delta (40 MHz)	16	.45	4000	1000	.64
Meiko Computing Surface (40 MHz)	16	.445	5000	2000	.64
MasPar MP-1 (80 ns)	16384	.44	5504	1180	.58

Computer (Full Precision)	Number of Processors	R_{max} Gflop/s	N_{max} order	$N_{1/2}$ order	R_{peak} Gflop/s
IBM RS/6000 Cluster (PARC) (50 MHz)	6	.404	7000	1200	.6
ALR Revolution Quad 6 (4 Pentium 200 MHz)	4	.403	2750	530	.8
MasPar MP-2204 (80ns)	4096	.374	5632	896	.60
IBM RS/6000 Cluster (PARC) (62.5 MHz)	4	.37	5500	850	.50
Intel iPSC/860 (40 MHz)	16	.36	4500	1500	.64
SGI Origin 2000 (195 MHz, 4MB cache)	1	.356	10000	200	.39
SGI POWER CHALLENGE (195 MHz, 2MB cache)	1	.334	10000	200	.39
SGI POWER CHALLENGE (90 MHz)	1	.311	1000	100	.36
IBM RS/6000 Cluster (PARC) (50 MHz)	4	.293	5500	1000	.4
Fujitsu AP1000	64	.291	10000	648	.36
SGI POWER CHALLENGE (75 MHz)	1	.261	1000	100	.3
nCUBE 2 (20 MHz)	128	.242	7776	1050	.32
HITACHI SR2201/1(150MHz)	1	.237	4860	420	.3
Meiko Computing Surface (40 MHz)	8	.235	3500	750	.32
Parsytec FT-400 (20 MHz)	400	.232	7999	814	.6
Intel Delta (40 MHz)	8	.23	3000	1000	.32
Intel iPSC/860 (40 MHz)	8	.19	3000	850	.32
Meiko Computing Surface (40 MHz)	4	.121	2500	500	.16
nCUBE 2 (20 MHz)	64	.121	5472	701	.15
Intel Delta (40 MHz)	4	.12	2000	500	.16
MasPar MP-1204 (80ns)	4096	.116	5632	640	.138
Intel iPSC/860 (40 MHz)	4	.10	2250	550	.16
IBM RS/6000 (62.5 MHz)	1	.096	3000		.125
MasPar MP-2201 (80ns)	1024	.092	2816	448	.15
Meiko Computing Surface (40 MHz)	2	.062	1750	250	.08
Thinking Machines CM-5	1	.068	1632	672	.128
nCUBE 2 (20 MHz)	32	.061	3888	486	.075
Intel Delta (40 MHz)	2	.06	1500	500	.08
Intel iPSC/860 (40 MHz)	2	.058	1500	400	.08
nCUBE 2 (20 MHz)	16	.032	5580	342	.038
Meiko Computing Surface (40 MHz)	1	.031	1250		.04
MasPar MP-1201 (80ns)	1024	.029	2816	320	.034
Intel iPSC/860 (40 MHz)	1	.024	750		.040
nCUBE 2 (20 MHz)	8	.0161	3960	241	.019
nCUBE 2 (20 MHz)	4	.0080	2760	143	.0094
nCUBE 2 (20 MHz)	2	.0040	1280	94	.0047
nCUBE 2 (20 MHz)	1	.0020	1280	51	.0024
Thinking Machines CM-200 (half precision)	2048	18.5	39936	14336	40
Thinking Machines CM-2 (half precision)	2048	10.4	33920	14000	28
IBM GF11** (half precision) (51.9 ns)	500	5.6	2500	1060	9.6
Fujitsu AP1000 (half precision)	512	3.53	40000	2368	4.3

* The Numerical Wind Tunnel is not a commercial product, it is a computer of the National Aerospace Laboratory in Japan and is based on the Fujitsu vector processor board.

The CP-PACS (Computational Physics by Parallel Array Computer System) is not a commercial product, it is a computer of the University of Tsukuba, Japan. Hitachi modified several points in their SR-2201 computer. The processor, manufactured by Hitachi, is a custom superscalar processor. It is based on the PA-RISC Architecture enhanced with a PVP-SW (pseudo vector processor based on slide window registers) scheme.

** The IBM GF11 is an experimental research computer and not a commercial product.

*** Indicates Strassen Algorithm was used in computing the solution. Note the "achieved rate" is large than the "peak rate" for the computer. The rate of execution for this problem is based on the the number of floating point operations divided by the time to solve the problem. The floating point operation count,

$2/3n^3 + O(n^2)$, is based on a conventional Gaussian Elimination implementation. Strassen's Algorithm reduced the number of operations actually performed. The results obtained using Strassen Algorithm are as accurate as that from Gaussian Elimination.

The columns in Table 3 are defined as follows:

R_{max} the performance in Gflop/s for the largest problem run on a machine.

N_{max} the size of the largest problem run on a machine.

$N_{1/2}$ the size where half the R_{max} execution rate is achieved.

R_{peak} the theoretical peak performance in Gflop/s for the machine.

In addition, the number of processors and the cycle time is listed. Full or half precision reflects the computation was computed using 64 or 32-bit floating point arithmetic respectively.

4.3 Acknowledgments

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