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Complete results from a numerical evaluation of sparse direct solvers for the solution of large, sparse, symmetric linear systems of equations

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Complete results from a numerical evaluation of sparse direct solvers for the solution of large, sparse, symmetric linear systems of equations

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ABSTRACT

In recent years a number of solvers for the direct solution of large sparse, symmetric linear systems of equations have been developed. These include solvers that are designed for the solution of positive-definite systems as well as those that are principally intended for solving indefinite problems. In this report, we give full details of all of the numerical results obtained during an extensive comparison of these solvers. Details of the solvers themselves, of the comparison methodolgy used, and of conclusions drawn are given in an accompanying summary paper (Gould, Hu and Scott, 2005).

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[2] Current reports available from "http://www.numerical.rl.ac.uk/reports/reports.shtml".

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1 Introduction

Solving linear systems of equations lies at the heart of numerous problems in computational science and engineering. In many cases, particularly when discretizing continuous problems, the system is large and the associated matrix A is sparse. Furthermore, for many applications, the matrix is symmetric; sometimes, such as in finite-element applications, A is positive definite, while in other cases, including constrained optimization and problems involving conservation laws, it is indefinite.

A direct method for solving a sparse linear system $Ax = b$ involves the explicit factorization of the system matrix A (or, more usually, a permutation of A) into the product of lower and upper triangular matrices L and U. In the symmetric case, for positive definite problems $U = L^T$ (Cholesky factorization) or, more generally, $U = DL^T$, where D is a block diagonal matrix with 1×1 and 2×2 blocks. Forward elimination followed by backward substitution completes the solution process for each given right-hand side b. Direct methods are important because of their generality and robustness. Indeed, for the 'tough' linear systems arising from some applications, they are currently the only feasible solution methods. In many other cases, direct methods are often the method of choice because the difficulties involved in finding and computing a good preconditioner for an iterative method can outweigh the cost of using a direct method. Furthermore, direct methods provide an effective means of solving multiple systems with the same A but different right-hand sides b because the factorization needs only to be performed once.

Since the early 1990s, many new algorithms and a number of new software packages that are designed for the efficient solution of sparse symmetric systems have been developed. Because a potential user may be bewildered by such choice, our intention in this study is to compare the alternatives on a significant set of large test examples from many different application areas, and, as far as is possible, to make recommendations concerning the efficacy of the various algorithms and packages. This study is an extension of a recent comparison by Gould and Scott (2004) of sparse symmetric direct solvers in the mathematical software library HSL (2004). This earlier study concluded that the best general-purpose HSL package for solving sparse symmetric systems is currently `MA57` (Duff, 2002). Thus the only HSL direct solver included here is `MA57`, but the reader should be aware that, for some classes of problems, other HSL codes may be more appropriate. For full details and results for the HSL symmetric solvers, the reader is referred to Gould and Scott (2003, 2004).

For ease of reference, all the sparse solvers used in this study are listed in Table 1.1. The date of the version of the code used in our experiments is given. As far as we are aware, in each case, the most up-to-date version at the time of this study has been used. More details are given in Gould et al. (2005). We remark that a number of the packages offer versions for complex symmetric and/or Hermitian matrices, and some can be used for unsymmetric systems. Our experiments are limited to real symmetric matrices. A number of the packages have parallel versions (and may even have been written primarily as parallel codes); this study considers only serial codes and serial versions of parallel solvers.

Some of the solvers in this study are freely available to academics while to use others it is necessary to purchase a licence. This information is provided in Table 1.2. For each code a webpage address is also given (or, if no webpage is available, an email address is provided that may be used to obtain further information and a copy of the code).

Code	Date/version	Language	Authors
BCSLIB-EXT	November 2001, Version 4.1	F77	The Boeing Company
CHOLMOD	August.2005, v0.6	C	T. Davis
MA57	June 2005, Version 3.0.1	F77 (also F90 version)	I.S. Duff (HSL)
MUMPS	October 2005, Version 4.5.5	F90	P.R. Amestoy, I.S. Duff, J.-Y. L'Excellent, J. Koster, A. Guermouche and S. Pralet
Oblio	2003, Version 0.7	C++	F. Dobrian and A. Pothen
PARDISO	April 2005, Version 1.2.3	F77 and C	O. Schenk and K. Gäertner
SPOOLES	1999, Version 2.2	C	C. Ashcraft and R. Grimes
SPRSBLKLLT	1997, Version 0.5	F77	E.G. Ng and B.W. Peyton
TAUCS	August 2003, Version 2.2	C	S. Toledo
UMFPACK	2003, Version 4.1	C	T. Davis
WSMP	2003, Version 1.9.8	F90 and C	A. Gupta and M. Joshi, IBM

Table 1.1: Solvers used in our numerical experiments.

2 Positive definite matrices

2.1 Test matrices

Our aim in this study is to test the solvers on as wide a range of test problems from as many different application areas as possible. In collecting test data we imposed only two conditions:

- The matrix must be of order greater than $10,000$.
- The data must be available to other users.

The first condition was imposed because our interest is in large problems. The second condition was to ensure that our tests could be repeated by other users and, furthermore, it enables other software developers to test their codes on the same set of examples and thus to make comparisons with solvers we consider here. Provided the above conditions are satisfied, we have included all relevant real symmetric matrices of order exceeding $10,000$ from Matrix Market (MM) (`math.nist.gov/MatrixMarket/`), the Harwell-Boeing (HB) and Rutherford-Boeing (RB) Collections (Duff, Grimes and Lewis, 1989 and 1997), the PARASOL (PA) project (`www.parallab.uib.no/parasol/data.html`), the 2003 University of Florida (UF) Sparse Matrix Collection (`www.cise.ufl.edu/~davis/sparse/`) and those given by Kumfert and Pothen (1997) (KP), as well as representative matrices derived from the CUTE/CUTEr optimization test set (Bongartz, Conn, Gould and Toint, 1995, and Gould, Orban and Toint, 2003). In addition Christian Damhaug (Det Norske Veritas AS) (CD) provided a number of

Code	Free to academics	Webpage / email contact
BCSLIB-EXT	×	www.boeing.com/phantom/bcslib-ext
CHOLMOD	√	www.cise.ufl.edu/∼davis/
MA57	×	www.cse.clrc.ac.uk/nag/hsl
MUMPS	√	www.enseeiht.fr/lima/apo/MUMPS/
Oblio	√	pothen@cs.odu.edu or dobrian@cs.odu.edu
PARDISO	√	www.computational.unibas.ch/cs/scicomp/software/pardiso
SPOOLES	√	www.netlib.org/linalg/spooles/spooles.2.2.html
SPRSBLKLLT	√	EGNg@lbl.gov
TAUCS	√	www.cs.tau.ac.il/∼stoledo/taucs/
UMFPACK	√	www.cise.ufl.edu/research/sparse/umfpack/
WSMP	√	www-users.cs.umn.edu/∼agupta/wsmp.html

Table 1.2: Availability and contact details of the solvers used in our numerical experiments.

unassembled finite-element examples, whilst Anshul Gupta (IBM, T. J. Watson) (AG), Alison Ramage (U. Strathclyde) (AR), and Andy Wathen (Oxford U.) (AW) provided the problems bearing their names. Application areas represented by our test set include linear programming, nonlinear optimization, structural engineering, computational fluid dynamics, acoustics, and financial modelling. The test set currently comprises 88 positive-definite problems.

In Table 2.1.1, we give characteristics of all of the positive-definite matrices used in our tests. Here n and nnz give the order and number of nonzeros respectively. In keeping with our accompanying paper (Gould et al., 2005), we also indicate those belonging to the "large" *subset*, namely those whose order is $\geq 50,000$.

Some matrices are only available as a sparsity pattern, and for these cases appropriate numerical values have been generated. Reproducible pseudo-random off-diagonal entries in the range $(0, 1)$ are generated using the HSL package `FA14`, while the i-th diagonal entry, $1 \leq i \leq n$, is set to $\max(100, 10\rho_i)$, where ρ_i is the number of off-diagonal entries in row i of the matrix, thus ensuring that the generated matrix is numerically positive definite. The right-hand side for each problem is generated so that the required solution is the vector of ones.

The matrices are stored in a variety of formats, as indicated by the suffix attached to the problem name in Table 2.1.1. Matrices in Harwell–Boeing (HB) format (Duff et al., 1989) are flagged by a suffix .PSA, .PSE, .RSA or .RSE, where the initial P or R indicates whether simply the pattern is provided or if values are available, while the final A or E is used to distinguish between assembled and unassembled-finite-element problems. Lower-case equivalents .psa, .pse, .rsa or .rse indicate matrices in Rutherford–Boeing (RB) format (Duff et al., 1997) in the obvious way. Those matrices supplied by Kumfert and Pothen (1997) are held as adjacency structures of their graphs, and are indicated by the suffix .kp. All other matrices are flagged by .mat and are stored in coordinate form. We preassemble matrices presented in finite-element format prior to use.

The matrices are available from

`ftp://ftp.numerical.rl.ac.uk/pub/matrices/symmetric/`

in the subdirectory `psdef`, while a representative code showing how the matrices may be read for use by `MA57` is in the subdirectory `codes`. Additionally, all matrices here have now been added to the University of Florida (UF) Sparse Matrix Collection (`www.cise.ufl.edu/~davis/sparse/`) .

Table 2.1.1: Positive definite test matices and their characteristics

Name	n	nnz	Subset?	Application
3dtube.PSA	45330	1629474		3-D pressure tube (UF)
audikw_1.rsa	943695	39297771	√	Automotive crankshaft model (PA)
barth5.kp	15606	61484		Nasa matrix (KP)
bcsstk25.RSA	15439	133840		Stiffness matrix—76 story skyscraper (HB)
bcsstk29.PSA	13992	316740		Stiffness matrix—rear pressure bulkhead (HB)
bcsstk30.PSA	28924	1036208		Stiffness matrix—off-shore generator platform (HB)
bcsstk31.PSA	35588	608502		Stiffness matrix—automobile component (HB)
bcsstk32.PSA	44609	1029655		Stiffness matrix—automobile chassis (HB)
bcsstk36.RSA	23052	583096		Stiffness matrix—automobile shock absorber (HB)
bmw7st_1.rsa	141347	3740507	√	Linear static analysis—car body (PA)
bmwcra_1.rsa	148770	5396386	√	Automotive crankshaft model (PA)
bodyy4.RSA	17546	69742		NASA matrix (UF)
bodyy5.RSA	18589	73935		NASA matrix (UF)
bodyy6.RSA	19366	77057		NASA matrix (UF)
cfd1.RSA	70656	949510	√	CFD pressure matrix (UF)
cfd2.RSA	123440	1605669	√	CFD pressure matrix (UF)
copter1.kp	17222	114143		helicopter rota blade (KP)
copter2.kp	55476	407714	√	helicopter rota blade (KP)
crankseg_1.rsa	52804	5333507	√	Linear static analysis—crankshaft detail (PA)
crankseg_2.rsa	63838	7106348	√	Linear static analysis—crankshaft detail (PA)
crplat2.PSE	18010	489478		Corrugated plate field (CD)
ct20stif.PSA	52329	1375396	√	Stiffness matrix—engine block (UF)
CVXBQP1.rsa	50000	249984	√	Barrier Hessian from convex QP (CUTEr)
Fcondp2.PSE	201822	5748069	√	Oil production platform (CD)
finan512.RSA	74752	335872	√	Portfolio optimization (UF)
finance256.kp	37376	167936		Linear programming (KP)
ford1.kp	18728	60152		Car surface mesh (KP)
ford2.kp	100196	322442	√	Car surface mesh (KP)
Fullb.PSE	199187	5953632	√	Full-breadth barge (CD)
gearbox.PSA	153746	4617075	√	Aircraft flap actuator (UF)
GRIDGENA.rsa	48962	329485		Grid generation optimization (CUTEr)
gupta1.PSA	31802	1098006		Normal matrix from LP (AG)
gupta2.PSA	62064	2155175	√	Normal matrix from LP (AG)
gupta3.PSA	16783	4670105		Normal matrix from LP (AG)
Halfb.PSE	224617	6306219	√	Half-breadth barge (CD)
hood.rsa	220542	5494489	√	Car hood (PA)
inline_1.rsa	503712	18660027	√	Inline skater (PA)
JNLBRNG1.rsa	40000	159600		Quadratic journal bearing problem (CUTEr)
ldoor.rsa	952203	23737339	√	Large door (PA)
MINSURFO.rsa	40806	163018		Minimum surface problem (CUTEr)
msc10848.RSA	10848	620313		matrix from MSC/NASTRAN (UF)

Table 2.1.1: Positive definite test matices and their characteristics (continued)

Name	n	nnz	Subset?	Application
msc23052.RSA	23052	588933		matrix from MSC/NASTRAN (UF)
M_T1.rsa	97578	4925574	√	Tubular joint (PA)
nasasrb.RSA	54870	1366097	√	Shuttle rocket booster (UF)
OBSTCLAE.rsa	40000	158800		Quadratic obstacle problem (CUTEr)
OILPAN.rsa	73752	1835470	√	Car olipan (PA)
onera_dual.kp	85567	252384	√	NASA matrix (KP)
opt1.PSE	15449	973052		Part of condeep cylinder (CD)
pds10.kp	16558	83108		Linear programming (KP)
pkustk01.PSA	22044	500712		Beijing botanical exhibition hall (UF)
pkustk02.PSA	10800	410400		Feiyue twin tower building (UF)
pkustk03.PSA	63336	1596876	√	Dalian group silo (UF)
pkustk04.PSA	55590	2137125	√	Yunsan Plaza (UF)
pkustk05.PSA	37164	1121154		Cofferdam (reduced model) (UF)
pkustk06.PSA	43164	1307466		Cofferdam (reduced model) (UF)
pkustk07.PSA	16860	1217832		Cubic 21 nodes solid, 10x10x10 mesh (UF)
pkustk08.PSA	22209	1624440		Cubic 21 nodes solid, 11x11x11 mes (UF)
pkustk09.PSA	33960	808800		Group silo (UF)
pkustk10.PSA	80676	2194830	√	4 tower silo (UF)
pkustk11.PSA	87804	2652858	√	Cofferdam (full size) (UF)
pkustk12.PSA	94653	3803485	√	Jijian Plaza, tall building (UF)
pkustk13.PSA	94893	3355860	√	Machine element, 21 nodes solid (UF)
pkustk14.PSA	151926	7494215	√	Tall building (UF)
pwt.RSA	36519	181313		NASA matrix (UF)
pwtk.RSA	217918	5926171	√	Stiffness matrix—pressurized wind tunnel (UF)
ramage02.PSE	16830	1441591		Navier-Stokes & continuity FE equations (AR)
s3dkq4m2.rsa	90449	2455670	√	Cylindrical Shell (UF)
s3dkt3m2.rsa	90449	1921955	√	Cylindrical Shell (UF)
SHIPSEC1.rsa	140874	3977139	√	Ship section (PA)
SHIPSEC5.rsa	179860	5146478	√	Ship section (PA)
SHIPSEC8.rsa	114919	3384159	√	Ship section (PA)
SHIP_001.rse	34920	2339575		Ship structure—predesign (PA)
SHIP_003.rsa	121728	4103881	√	Ship structure—production (PA)
shuttle_eddy.PSA	10429	57014		NASA matrix (UF)
skirt.PSA	12598	104559		NASA matrix (UF)
Srb1.PSE	54924	1508538	√	Shuttle rocket booster (CD)
struct3.PSA	53570	613632	√	FE matrix (UF)
tandem_dual.kp	94069	277281	√	NASA matrix (KP)
tandem_vtx.kp	18454	135902		NASA matrix (KP)
THREAD.rsa	29736	2249892		Threaded connector/contact problem (PA)
TORSION1.rsa	40000	158800		Elastic torsion problem (CUTEr)
trdheim.PSE	22098	978711		Mesh of the Trondheim Fjord (CD)
Troll.PSE	213453	6099282	√	Structural analysis (CD)
tsyl201.PSE	20685	1237821		part of condeep cylinder (CD)
vanbody.rsa	47072	1191985		Van body model (PA)
wathen100.mat	30401	251001		Stokes problem (AW)
wathen120.mat	36441	301101		Stokes problem (AW)
X104.rsa	108384	5138004	√	Beam joint (PA)

2.2 Individual package comparisons

In this section, we report statistics when running[1] the solvers listed in Table 1.1 on the positive-definite test set described in Section 2.1. All experiments were performed on a single EV6 processor of a Compaq DS20 Alpha server, with 3.6 GBtytes of RAM. Each code was compiled with full optimization, and vendor-tuned BLAS were used. Default values were used for all controlling parameters, except that numerical pivoting was disabled and that, following preliminary experiments to find a suitable value, the blocksize for high-level BLAS was set to 16. A CPU limit of 30 minutes was set on each run, and any run exceeding this limit was deemed to have failed.

Here (and later) we report a return code from each run, the total CPU time required (as well as separate times for the analyse, factorization and solution phases), the minimum memory that would be required for a successful run along with that actually used, counts of the sizes of integer and real arrays needed to solve the problem (as well as separate counts for those required to hold the factors), and the norms of the scaled residuals $\|Ax - b\|/(\|A\|\|x\| + \|b\|)$ both following the solution phase and following a single iterative refinement. Note that not all solvers report each statistic, and we omit the relevant columns from tables for which this occurs.

A return code of 0 indicates a successful run. Other values are

-2. An allocation error occurred —too much storage was required; and

-99. The CPU limit was reached.

[1]By a run, we mean the application of a package to one problem.

Table 2.2.1: Return code

Name	BCSEXT	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
3dtube.PSA	0	0	0	0	0	0	0	0	0	0	0
audikw_1.rsa	-99	–	-99	-99	-2	-99	-2	-99	-2	-2	-2
barth5.kp	0	0	0	0	0	0	0	0	0	0	0
bcsstk25.RSA	0	0	0	0	0	0	0	0	0	0	0
bcsstk29.PSA	0	0	0	0	0	0	0	0	0	0	0
bcsstk30.PSA	0	0	0	0	0	0	0	0	0	0	0
bcsstk31.PSA	0	0	0	0	0	0	0	0	0	0	0
bcsstk32.PSA	0	0	0	0	0	0	0	0	0	0	0
bcsstk36.RSA	0	0	0	0	0	0	0	0	0	0	0
bmw7st_1.rsa	0	0	0	0	0	0	0	0	0	0	0
bmwcra_1.rsa	0	0	0	0	0	0	0	0	0	0	0
bodyy4.RSA	0	0	0	0	0	0	0	0	0	0	0
bodyy5.RSA	0	0	0	0	0	0	0	0	0	0	0
bodyy6.RSA	0	0	0	0	0	0	0	0	0	0	0
cfd1.RSA	0	0	0	0	0	0	0	0	0	0	0
cfd2.RSA	0	0	0	0	0	0	0	0	0	0	0
copter1.kp	0	0	0	0	0	0	0	0	0	0	0
copter2.kp	0	0	0	0	0	0	0	0	0	0	0
crankseg_1.rsa	0	0	0	0	0	0	0	0	0	0	0
crankseg_2.rsa	0	0	0	0	0	0	0	0	0	0	0
crplat2.PSE	0	0	0	0	0	0	0	0	0	0	0
ct20stif.PSA	0	0	0	0	0	0	0	0	0	0	0
CVXBQP1.rsa	0	0	0	0	0	0	0	0	0	0	0
Fcondp2.PSE	0	0	0	0	0	0	0	0	0	0	0
finan512.RSA	0	0	0	0	0	0	0	0	0	0	0
finance256.kp	0	0	0	0	0	0	0	0	0	0	0
ford1.kp	0	0	0	0	0	0	0	0	0	0	0
ford2.kp	0	0	0	0	0	0	0	0	0	0	0
Fullb.PSE	0	0	0	0	0	0	0	0	0	0	0
gearbox.PSA	0	0	0	0	0	0	0	0	0	0	0
GRIDGENA.rsa	0	0	0	0	0	0	0	0	0	0	0
gupta1.PSA	0	0	0	0	0	0	0	0	0	0	0
gupta2.PSA	0	0	0	0	0	0	-99	0	0	0	0
gupta3.PSA	0	0	0	0	0	0	0	0	0	0	0
Halfb.PSE	0	0	0	0	0	0	0	0	0	0	0

Table 2.2.1: Return code (continued)

Name	BCSEXT	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
hood.rsa	0	0	0	0	0	0	0	0	0	0	0
inline_1.rsa	0	0	0	0	0	0	0	0	0	-2	0
JNLBRNG1.rsa	0	0	0	0	0	0	0	0	0	0	0
ldoor.rsa	0	0	0	0	0	0	0	0	0	-2	0
MINSURFO.rsa	0	0	0	0	0	0	0	0	0	0	0
msc10848.RSA	0	0	0	0	0	0	0	0	0	0	0
msc23052.RSA	0	0	0	0	0	0	0	0	0	0	0
M_T1.rsa	0	0	0	0	0	0	0	0	0	-2	0
nasasrb.RSA	0	0	0	0	0	0	0	0	0	0	0
OBSTCLAE.rsa	0	0	0	0	0	0	0	0	0	0	0
OILPAN.rsa	0	0	0	0	0	0	0	0	0	0	0
onera_dual.kp	0	0	0	0	0	0	0	0	0	0	0
opt1.PSE	0	0	0	0	0	0	0	0	0	0	0
pds10.kp	0	0	0	0	0	0	0	0	0	0	0
pkustk01.PSA	0	0	0	0	0	0	0	0	0	0	0
pkustk02.PSA	0	0	0	0	0	0	0	0	0	0	0
pkustk03.PSA	0	0	0	0	0	0	0	0	0	0	0
pkustk04.PSA	0	0	0	0	0	0	0	0	0	0	0
pkustk05.PSA	0	0	0	0	0	0	0	0	0	0	0
pkustk06.PSA	0	0	0	0	0	0	0	0	0	0	0
pkustk07.PSA	0	0	0	0	0	0	0	0	0	0	0
pkustk08.PSA	0	0	0	0	0	0	0	0	0	0	0
pkustk09.PSA	0	0	0	0	0	0	0	0	0	0	0
pkustk10.PSA	0	0	0	0	0	0	0	0	0	0	0
pkustk11.PSA	0	0	0	0	0	0	0	0	0	0	0
pkustk12.PSA	0	0	0	0	0	0	0	0	0	0	0
pkustk13.PSA	0	0	0	0	0	0	0	0	0	0	0
pkustk14.PSA	0	0	0	0	0	0	0	0	0	0	0
pwt.RSA	0	0	0	0	0	0	0	0	0	0	0
pwtk.RSA	0	0	0	0	0	0	0	0	0	0	0
ramage02.PSE	0	0	0	0	0	0	0	0	0	0	0
s3dkq4m2.rsa	0	0	0	0	0	0	0	0	0	0	0
s3dkt3m2.rsa	0	0	0	0	0	0	0	0	0	0	0
SHIPSEC1.rsa	0	0	0	0	0	0	0	0	0	0	0
SHIPSEC5.rsa	0	0	0	0	0	0	0	0	0	0	0
SHIPSEC8.rsa	0	0	0	0	0	0	0	0	0	0	0

Table 2.2.1: Return code (continued)

Name	BCSEXT	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
SHIP_001.rse	0	0	0	0	0	0	0	0	0	0	0
SHIP_003.rsa	0	0	0	0	0	0	0	0	0	0	0
shuttle_eddy.PSA	0	0	0	0	0	0	0	0	0	0	0
skirt.PSA	0	0	0	0	0	0	0	0	0	0	0
Srb1.PSE	0	0	0	0	0	0	0	0	0	0	0
struct3.PSA	0	0	0	0	0	0	0	0	0	0	0
tandem_dual.kp	0	0	0	0	0	0	0	0	0	0	0
tandem_vtx.kp	0	0	0	0	0	0	0	0	0	0	0
THREAD.rsa	0	0	0	0	0	0	0	0	0	0	0
TORSION1.rsa	0	0	0	0	0	0	0	0	0	0	0
trdheim.PSE	0	0	0	0	0	0	0	0	0	0	0
Troll.PSE	0	0	0	0	0	0	0	0	0	0	0
tsyl201.PSE	0	0	0	0	0	0	0	0	0	0	0
vanbody.rsa	0	0	0	0	0	0	0	0	0	0	0
wathen100.mat	0	0	0	0	0	0	0	0	0	0	0
wathen120.mat	0	0	0	0	0	0	0	0	0	0	0
X104.rsa	0	0	0	0	0	0	0	0	0	0	0

Table 2.2.2: Total time (CPU seconds)

Name	BCSEXT	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
3dtube.PSA	26.75	22.90	31.31	29.76	26.10	24.26	49.80	51.02	26.50	134.00	31.66
audikw_1.rsa	-	-	-	-	-	-	-	-	-	-	-
barth5.kp	0.81	0.28	0.30	0.79	0.68	0.56	1.43	0.28	0.64	0.68	0.72
bcsstk25.RSA	2.10	1.02	1.30	2.31	2.82	1.93	3.56	1.11	2.21	2.68	2.10
bcsstk29.PSA	2.27	1.30	1.59	2.21	2.52	1.85	3.36	1.23	2.17	3.83	2.59
bcsstk30.PSA	5.21	2.95	3.99	5.34	4.97	4.63	7.15	2.68	5.00	9.13	8.03
bcsstk31.PSA	5.17	4.67	7.01	5.67	5.60	4.79	8.34	5.26	5.19	16.10	7.14
bcsstk32.PSA	5.74	3.39	4.56	6.07	5.97	5.23	8.70	3.40	5.88	10.20	9.67
bcsstk36.RSA	2.60	1.93	2.59	2.73	2.52	2.30	5.48	1.69	2.59	6.25	4.78
bmw7st_1.rsa	31.20	26.10	37.26	33.45	30.40	28.72	62.20	28.43	30.90	105.00	42.45
bmwcra_1.rsa	132.89	108.00	144.57	134.88	123.00	117.33	235.00	194.69	120.00	506.00	121.69
bodyy4.RSA	1.02	0.40	0.45	0.93	0.85	0.69	1.67	0.40	0.80	1.07	0.85
bodyy5.RSA	1.08	0.43	0.47	0.97	0.92	0.73	1.78	0.42	0.86	1.07	0.91
bodyy6.RSA	1.12	0.47	0.51	1.01	0.95	0.75	1.90	0.44	0.88	1.15	1.05

Table 2.2.2: Total time (CPU seconds) (continued)

Name	BCSEXT	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
cfd1.RSA	35.27	33.20	37.22	35.17	38.30	34.09	65.40	74.46	36.70	169.00	27.41
cfd2.RSA	75.25	60.60	89.09	76.06	67.80	62.58	159.00	148.91	65.10	472.00	64.33
copter1.kp	2.93	2.42	3.27	3.20	3.28	2.42	6.19	2.48	2.60	6.37	3.58
copter2.kp	16.75	14.10	17.41	17.64	18.80	14.84	31.30	19.45	15.60	52.60	15.91
crankseg_1.rsa	66.11	57.80	84.35	69.16	62.50	62.04	103.00	73.73	60.90	188.00	74.12
crankseg_2.rsa	93.81	77.60	110.34	91.75	83.30	84.25	133.00	126.26	83.40	324.00	100.12
crplat2.PSE	2.55	2.38	2.95	2.57	2.43	2.19	3.54	3.23	2.45	6.87	2.00
ct20stif.PSA	14.21	12.40	17.25	15.86	14.60	12.97	21.30	13.74	13.90	35.20	18.37
CVXBQP1.rsa	4.54	3.45	3.52	4.63	3.97	3.17	8.66	7.35	3.48	16.40	3.85
Fcondp2.PSE	103.68	77.40	109.65	102.68	87.80	83.10	190.00	76.92	96.30	185.00	76.08
finan512.RSA	6.51	2.74	4.07	5.30	5.05	3.93	12.20	24.52	4.86	8.52	5.31
finance256.kp	2.95	1.83	2.73	2.45	2.30	1.82	5.24	3.26	2.15	5.93	2.60
ford1.kp	0.91	0.30	0.30	0.89	0.75	0.60	1.57	0.28	0.73	0.70	0.80
ford2.kp	6.84	2.36	4.61	5.77	5.38	4.25	14.90	2.19	6.13	5.97	5.58
Fullb.PSE	180.28	146.00	223.66	202.88	193.00	164.72	439.00	317.62	225.00	735.00	219.30
gearbox.PSA	56.60	46.60	67.50	54.18	53.60	49.49	105.00	75.51	54.20	191.00	68.73
GRIDGENA.rsa	4.46	1.83	2.26	4.02	4.03	3.17	7.59	1.81	3.68	4.95	4.00
gupta1.PSA	20.42	13.40	12.50	31.17	59.00	6.18	2530.00	300.76	14.20	304.00	19.99
gupta2.PSA	75.33	69.30	46.94	87.80	267.00	18.31	-	2035.96	55.20	1030.00	55.97
gupta3.PSA	27.39	16.10	31.40	28.90	25.80	20.85	346.00	264.40	22.20	179.00	66.05
Halfb.PSE	144.60	129.00	170.44	151.22	141.00	127.79	273.00	154.93	167.00	311.00	125.14
hood.rsa	32.67	22.40	32.80	29.40	27.20	26.09	57.70	22.01	30.00	62.60	53.14
inline_1.rsa	324.70	273.00	378.35	302.06	308.00	301.65	639.00	430.52	311.00	-	341.38
JNLBRNG1.rsa	2.19	0.87	0.86	2.19	1.82	1.45	4.48	0.71	1.78	2.27	1.93
ldoor.rsa	234.69	165.00	225.21	194.35	180.00	178.26	583.00	208.66	221.00	-	363.73
MINSURFO.rsa	2.30	0.87	0.85	2.20	1.97	1.53	4.29	0.82	1.81	2.18	2.01
msc10848.RSA	2.38	1.59	2.76	2.39	2.12	2.12	3.10	1.52	2.12	4.70	4.14
msc23052.RSA	2.77	1.93	2.50	2.92	2.62	2.37	5.00	1.74	2.70	6.62	4.80
M_T1.rsa	48.09	44.60	58.13	49.74	47.10	45.49	170.00	40.97	47.70	-	58.99
nasasrb.RSA	12.15	10.20	13.98	11.97	12.90	11.19	19.10	10.27	12.20	26.70	14.73
OBSTCLAE.rsa	2.21	0.86	0.83	2.11	1.80	1.40	4.08	0.69	1.75	2.08	1.96
OILPAN.rsa	10.71	9.16	10.54	10.25	8.78	8.37	17.40	9.16	9.15	25.10	18.52
onera_dual.kp	10.96	9.19	10.86	10.79	11.60	8.86	26.00	14.56	9.84	37.10	10.11
opt1.PSE	5.97	4.80	7.00	6.10	5.38	5.16	9.32	5.93	5.20	16.70	5.21
pds10.kp	2.18	2.01	4.77	2.92	3.20	1.89	5.96	31.81	2.43	8.42	2.64
pkustk01.PSA	1.99	1.38	1.87	2.14	2.08	1.69	2.93	1.32	2.05	4.23	3.95

Table 2.2.2: Total time (CPU seconds) (continued)

Name	BCSEXT	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
pkustk02.PSA	1.45	0.90	1.31	1.43	1.55	1.34	1.84	0.83	1.54	2.90	2.58
pkustk03.PSA	8.50	7.10	9.19	8.51	7.68	6.93	13.70	7.75	8.32	20.20	14.72
pkustk04.PSA	11.53	11.10	14.70	13.09	15.00	11.40	18.40	22.40	13.20	57.10	19.06
pkustk05.PSA	11.72	9.86	13.71	13.65	13.70	10.76	17.60	29.57	11.40	68.80	15.95
pkustk06.PSA	16.34	13.10	19.17	17.73	16.80	13.88	26.30	37.26	15.90	83.00	21.32
pkustk07.PSA	12.82	10.90	15.32	13.89	12.40	11.46	22.00	16.01	12.20	46.10	17.33
pkustk08.PSA	20.65	17.30	24.61	22.72	20.40	18.41	33.70	36.20	19.30	76.80	25.65
pkustk09.PSA	4.52	4.45	5.26	4.74	4.57	3.90	7.75	4.52	4.62	11.70	7.46
pkustk10.PSA	18.92	17.00	21.44	19.60	18.40	16.72	31.80	17.85	18.80	47.50	25.18
pkustk11.PSA	48.30	41.20	58.84	55.38	51.00	44.93	98.70	138.00	47.30	244.00	61.38
pkustk12.PSA	21.79	15.10	27.56	23.82	24.30	20.42	32.70	15.85	23.30	44.10	35.03
pkustk13.PSA	49.95	43.30	55.85	53.92	48.70	46.94	76.50	55.99	46.10	158.00	54.51
pkustk14.PSA	257.98	221.00	334.54	284.95	285.00	246.33	445.00	280.43	251.00	562.00	219.86
pwt.RSA	2.59	1.04	1.18	2.23	2.23	1.79	4.69	1.03	2.05	2.62	2.41
pwtk.RSA	59.27	47.30	67.55	60.19	54.00	49.74	121.00	67.99	56.10	186.00	76.66
ramage02.PSE	21.56	17.90	25.43	22.74	28.90	19.37	42.90	50.12	20.20	104.00	17.64
s3dkq4m2.rsa	20.30	16.50	22.85	20.19	19.00	17.40	35.20	28.39	19.30	60.30	28.10
s3dkt3m2.rsa	18.56	15.20	21.45	18.96	17.10	15.92	30.10	18.05	17.50	47.50	24.01
SHIPSEC1.rsa	73.62	69.00	81.85	73.82	68.30	64.50	879.00	74.01	71.50	164.00	85.31
SHIPSEC5.rsa	108.27	103.00	125.60	119.42	107.00	96.30	1770.00	123.72	122.00	257.00	122.95
SHIPSEC8.rsa	72.68	61.20	86.04	82.42	73.60	64.40	345.00	134.94	76.70	280.00	96.14
SHIP_001.rse	22.12	18.20	27.66	24.26	36.40	19.53	28.80	21.67	21.40	52.20	15.80
SHIP_003.rsa	138.91	117.00	186.65	177.67	162.00	128.22	431.00	226.10	150.00	492.00	144.18
shuttle_eddy.PSA	0.61	0.21	0.24	0.54	0.53	0.43	1.07	0.19	0.50	0.55	0.62
skirt.PSA	0.86	0.33	0.39	0.79	0.78	0.64	1.54	0.33	0.73	0.90	0.96
Srb1.PSE	10.69	7.30	11.91	10.64	10.10	9.10	16.10	6.72	10.00	19.50	7.97
struct3.PSA	6.31	3.35	5.84	5.50	6.10	5.04	11.50	3.40	5.83	9.00	7.04
tandem_dual.kp	11.12	8.77	10.26	11.14	11.10	8.36	26.20	14.98	9.47	39.50	10.00
tandem_vtx.kp	2.82	2.35	2.88	2.79	2.82	2.29	4.87	2.17	2.59	6.20	2.65
THREAD.rsa	61.44	56.00	74.24	66.35	59.80	57.67	78.00	69.14	59.50	457.00	59.67
TORSION1.rsa	2.19	0.86	0.83	2.11	1.83	1.41	4.10	0.68	1.75	2.10	2.02
trdheim.PSE	2.23	1.24	1.90	2.12	1.75	1.92	3.17	0.87	1.92	4.55	1.83
Troll.PSE	119.60	94.50	121.54	123.26	110.00	103.17	200.00	254.31	110.00	569.00	96.80
tsyl201.PSE	7.38	6.13	8.70	7.68	6.68	6.56	11.30	5.88	6.97	19.70	6.62
vanbody.rsa	6.61	4.34	7.07	6.42	6.28	5.61	10.90	4.21	6.22	14.60	10.30
wathen100.mat	2.90	0.95	1.12	2.35	2.50	2.11	5.27	1.27	2.32	2.70	2.79

Table 2.2.2: Total time (CPU seconds) (continued)

Name	BCSEXT	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
wathen120.mat	3.60	1.20	1.42	2.85	3.10	2.53	6.06	1.57	2.78	3.53	3.47
X104.rsa	37.06	20.70	41.14	39.48	33.10	32.14	83.60	22.40	34.90	62.00	48.30

Table 2.2.3: Analyse time (CPU seconds)

Name	BCSEXT	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
3dtube.PSA	2.82	2.62	3.21	2.54	2.62	3.27	5.79	0.66	2.50	1.72	11.98
audikw_1.rsa	-	-	-	-	-	-	-	-	-	-	-
barth5.kp	0.62	0.11	0.08	0.48	0.43	0.44	1.07	0.09	0.44	0.15	0.55
bcsstk25.RSA	0.94	0.17	0.14	0.83	0.90	0.84	2.22	0.23	0.84	0.28	1.32
bcsstk29.PSA	1.12	0.18	0.14	0.81	0.87	0.91	1.94	0.19	0.82	0.25	1.80
bcsstk30.PSA	1.51	0.64	0.48	1.48	1.45	1.90	3.34	0.40	1.42	0.90	6.17
bcsstk31.PSA	1.80	1.91	0.40	1.86	1.90	2.01	3.49	0.50	1.79	0.82	4.44
bcsstk32.PSA	1.81	0.73	0.51	1.74	1.83	2.16	3.55	0.56	1.79	1.02	6.73
bcsstk36.RSA	0.60	0.34	0.23	0.51	0.50	0.78	1.35	0.21	0.51	0.48	3.34
bmw7st_1.rsa	5.92	5.19	5.46	4.59	4.63	6.83	10.40	2.45	4.54	4.02	23.93
bmwcra_1.rsa	14.06	11.90	13.87	10.95	12.40	13.89	24.10	3.10	11.10	6.82	43.23
bodyy4.RSA	0.74	0.12	0.09	0.52	0.50	0.49	1.18	0.09	0.49	0.17	0.63
bodyy5.RSA	0.79	0.13	0.09	0.53	0.52	0.51	1.24	0.09	0.53	0.18	0.67
bodyy6.RSA	0.80	0.13	0.09	0.55	0.52	0.52	1.33	0.09	0.53	0.18	0.80
cfd1.RSA	9.89	6.51	6.95	6.20	6.93	6.38	20.10	1.24	6.02	2.58	10.95
cfd2.RSA	17.45	11.10	12.00	10.48	12.00	10.88	40.70	1.63	10.30	4.43	19.25
copter1.kp	1.27	0.20	0.16	0.88	0.83	0.80	3.53	0.19	0.80	0.43	1.37
copter2.kp	5.57	3.69	3.45	3.78	3.67	3.43	12.50	1.02	3.40	2.08	6.19
crankseg_1.rsa	7.41	5.82	6.70	5.31	5.15	8.06	13.70	1.71	5.10	4.58	32.10
crankseg_2.rsa	9.62	7.43	8.24	6.46	6.53	10.61	17.50	2.30	6.47	6.27	43.22
crplat2.PSE	0.46	0.27	0.18	0.36	0.35	0.57	1.03	0.29	0.39	0.37	0.67
ct20stif.PSA	2.96	2.80	2.95	2.61	2.70	3.17	5.12	0.93	2.61	1.47	9.18
CVXBQP1.rsa	3.02	1.99	1.78	2.27	1.87	1.77	5.69	1.14	1.76	1.17	2.52
Fcondp2.PSE	8.50	7.76	7.33	5.60	5.83	8.34	14.70	3.31	5.81	5.72	8.22
finan512.RSA	5.21	0.60	2.81	3.31	3.32	3.03	9.35	14.40	3.37	1.93	4.28
finance256.kp	2.35	0.27	0.19	1.51	1.52	1.42	4.03	1.45	1.48	1.17	2.07
ford1.kp	0.71	0.13	0.09	0.52	0.48	0.47	1.17	0.10	0.51	0.17	0.64
ford2.kp	5.11	0.90	2.94	3.38	3.42	3.14	11.10	0.76	4.35	1.50	4.16
Fullb.PSE	10.20	7.11	9.08	6.40	6.87	9.45	15.60	7.10	6.67	6.95	9.72

Table 2.2.3: Analyse time (CPU seconds) (continued)

Name	BCSEXT	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
gearbox.PSA	11.11	10.70	11.11	9.52	11.00	11.97	18.30	2.52	9.92	4.88	33.09
GRIDGENA.rsa	2.87	0.44	0.34	2.10	2.08	1.92	4.94	0.42	2.00	0.72	2.93
gupta1.PSA	13.40	9.03	3.02	22.94	5.97	4.04	2500.00	298.33	5.63	13.50	14.88
gupta2.PSA	38.75	51.40	7.16	55.97	13.00	8.62	-	2024.77	11.60	70.30	31.80
gupta3.PSA	10.99	5.05	8.30	9.28	6.70	9.37	323.00	249.66	6.29	6.10	56.10
Halfb.PSE	10.53	9.08	9.21	6.73	7.05	9.77	16.30	6.87	6.98	7.02	9.78
hood.rsa	7.98	3.79	6.35	5.51	5.10	7.91	13.10	2.62	5.34	5.75	35.09
inline_1.rsa	46.22	43.40	46.31	41.99	43.10	49.35	80.80	14.46	39.50	-	160.57
JNLBRNG1.rsa	1.56	0.24	0.18	1.16	1.02	1.00	3.26	0.14	1.10	0.43	1.40
ldoor.rsa	40.53	30.60	31.43	27.12	25.40	36.87	68.50	13.01	30.30	-	201.87
MINSURFO.rsa	1.62	0.26	0.19	1.17	1.08	1.02	3.07	0.15	1.11	0.47	1.47
msc10848.RSA	0.56	0.33	0.59	0.51	0.47	0.86	1.37	0.18	0.47	0.47	3.09
msc23052.RSA	0.62	0.35	0.26	0.55	0.50	0.75	1.37	0.23	0.51	0.48	3.36
M_T1.rsa	6.32	5.99	5.87	4.54	4.38	6.61	10.90	1.31	4.37	-	30.81
nasasrb.RSA	3.37	1.01	3.70	3.10	3.58	3.86	5.84	0.80	3.32	1.38	9.13
OBSTCLAE.rsa	1.61	0.24	0.18	1.15	1.02	0.99	2.86	0.14	1.10	0.42	1.41
OILPAN.rsa	2.33	1.17	1.92	1.61	1.55	2.48	4.05	0.74	1.57	1.65	11.40
onera_dual.kp	5.25	3.53	3.14	3.48	3.42	3.13	13.10	1.07	3.24	2.57	4.60
opt1.PSE	1.06	1.00	1.10	0.91	0.87	1.34	2.62	0.27	0.90	0.70	1.71
pds10.kp	1.16	1.09	0.48	0.94	0.80	0.79	3.59	28.91	0.81	1.12	1.52
pkustk01.PSA	0.51	0.30	0.22	0.43	0.42	0.62	1.17	0.28	0.44	0.38	3.02
pkustk02.PSA	0.31	0.20	0.15	0.26	0.23	0.39	0.76	0.14	0.26	0.27	1.93
pkustk03.PSA	2.04	1.03	1.75	1.45	1.40	2.12	3.71	0.67	1.50	1.37	9.81
pkustk04.PSA	2.56	2.44	2.35	2.38	1.97	2.79	6.41	2.20	1.91	3.95	13.94
pkustk05.PSA	1.29	1.19	1.37	1.13	1.08	1.55	2.82	1.38	1.09	1.05	7.74
pkustk06.PSA	1.52	1.42	1.63	1.24	1.23	1.83	3.36	1.73	1.30	1.30	9.36
pkustk07.PSA	1.53	1.53	1.64	1.38	1.37	1.93	3.46	0.41	1.38	0.98	7.00
pkustk08.PSA	2.13	2.12	2.27	1.93	2.03	2.69	4.87	0.57	1.90	1.35	9.96
pkustk09.PSA	0.87	0.49	0.90	0.74	0.73	1.00	1.88	0.31	0.72	0.68	4.74
pkustk10.PSA	2.87	1.42	2.58	2.00	2.03	2.94	5.09	1.32	2.11	1.95	13.45
pkustk11.PSA	3.85	3.08	3.57	2.71	2.73	3.90	7.15	3.57	2.77	2.97	20.20
pkustk12.PSA	4.68	2.47	4.17	4.53	3.62	5.06	12.30	3.00	3.49	6.37	24.56
pkustk13.PSA	6.92	6.50	7.05	6.18	6.52	7.54	12.00	2.08	5.88	3.83	23.71
pkustk14.PSA	13.67	10.60	13.57	9.37	10.60	13.86	23.80	7.73	9.98	10.50	58.87
pwt.RSA	1.88	0.28	0.20	1.27	1.30	1.26	3.27	0.21	1.26	0.42	1.87
pwtk.RSA	8.85	7.32	8.07	6.21	6.65	9.05	15.20	2.22	6.50	5.28	37.98

Table 2.2.3: Analyse time (CPU seconds) (continued)

Name	BCSEXT	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
ramage02.PSE	1.93	1.67	1.99	1.51	1.57	2.33	8.80	0.46	1.59	1.07	2.11
s3dkq4m2.rsa	3.27	2.58	2.94	2.22	2.22	3.32	5.69	0.75	2.23	2.03	15.35
s3dkt3m2.rsa	2.72	2.17	2.50	1.90	1.90	2.74	4.82	0.73	1.92	1.85	12.26
SHIPSEC1.rsa	6.17	5.47	5.55	4.29	4.12	5.89	10.20	5.82	4.07	3.85	27.16
SHIPSEC5.rsa	8.17	7.20	7.22	5.34	5.50	7.77	13.20	5.77	5.37	5.70	36.53
SHIPSEC8.rsa	5.25	3.92	4.83	3.70	3.62	5.17	8.76	4.57	3.58	3.65	24.02
SHIP_001.rse	2.40	2.17	2.38	1.78	1.83	2.97	4.92	1.40	1.85	1.81	2.06
SHIP_003.rsa	6.81	4.81	6.51	4.24	4.73	6.60	10.70	5.46	4.59	4.77	33.10
shuttle_eddy.PSA	0.42	0.07	0.05	0.30	0.32	0.30	0.79	0.04	0.30	0.10	0.49
skirt.PSA	0.61	0.12	0.09	0.47	0.47	0.47	1.17	0.08	0.43	0.15	0.77
Srb1.PSE	1.94	0.93	1.76	1.40	1.30	1.97	3.36	0.54	1.37	1.27	2.10
struct3.PSA	3.60	0.65	2.67	2.48	2.82	2.71	6.94	0.55	2.53	0.83	4.86
tandem_dual.kp	5.68	3.86	3.36	3.85	3.75	3.44	14.50	1.19	3.55	2.87	5.01
tandem_vtx.kp	1.45	0.23	0.20	1.04	1.02	0.98	2.79	0.23	0.99	0.37	1.53
THREAD.rsa	3.41	3.04	3.81	2.98	3.07	4.07	7.85	0.73	2.91	1.75	15.77
TORSION1.rsa	1.60	0.24	0.18	1.16	1.05	0.99	2.88	0.14	1.10	0.42	1.43
trdheim.PSE	0.77	0.52	0.40	0.71	0.57	1.05	1.83	0.21	0.63	0.70	1.08
Troll.PSE	11.24	9.13	10.56	8.47	12.60	11.01	18.90	2.77	8.37	7.08	12.36
tsyl201.PSE	1.09	1.01	1.18	0.91	0.82	1.50	2.41	0.29	0.88	0.90	1.51
vanbody.rsa	2.09	0.81	2.01	1.79	1.78	2.24	3.63	0.67	1.74	1.10	7.50
wathen100.mat	2.06	0.23	0.15	1.34	1.52	1.45	3.79	0.13	1.38	0.32	2.03
wathen120.mat	2.56	0.28	0.19	1.67	1.90	1.77	4.22	0.15	1.69	0.40	2.47
X104.rsa	5.99	2.91	5.52	4.39	4.15	6.54	10.80	2.54	4.20	3.98	32.10

Table 2.2.4: Factorize time (CPU seconds)

Name	BCSEXT	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
3dtube.PSA	23.47	19.80	27.61	26.65	22.00	20.58	42.90	49.61	23.30	125.00	19.19
audikw_1.rsa	-	-	-	-	-	-	-	-	-	-	-
barth5.kp	0.17	0.15	0.20	0.27	0.23	0.11	0.32	0.16	0.16	0.45	0.13
bcsstk25.RSA	1.11	0.79	1.11	1.40	1.77	1.04	1.23	0.81	1.28	2.00	0.71
bcsstk29.PSA	1.10	1.06	1.40	1.33	1.52	0.89	1.32	0.98	1.26	3.03	0.74
bcsstk30.PSA	3.58	2.18	3.40	3.69	3.15	2.62	3.57	2.16	3.36	6.83	1.74
bcsstk31.PSA	3.24	2.61	6.46	3.62	3.33	2.66	4.57	4.59	3.18	13.70	2.55
bcsstk32.PSA	3.76	2.49	3.90	4.11	3.68	2.91	4.81	2.66	3.82	7.53	2.75

Table 2.2.4: Factorize time (CPU seconds) (continued)

Name	BCSEXT	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
bcsstk36.RSA	1.92	1.50	2.28	2.12	1.78	1.44	3.94	1.39	1.94	4.78	1.34
bmw7st_1.rsa	24.57	20.10	31.07	27.95	23.70	21.23	50.10	25.21	25.20	91.80	17.74
bmwcra_1.rsa	117.03	94.20	128.97	121.91	105.00	101.85	207.00	189.10	106.00	457.00	76.70
bodyy4.RSA	0.26	0.25	0.33	0.36	0.32	0.18	0.44	0.26	0.25	0.72	0.18
bodyy5.RSA	0.27	0.27	0.35	0.39	0.35	0.20	0.47	0.28	0.28	0.75	0.20
bodyy6.RSA	0.30	0.30	0.39	0.41	0.38	0.21	0.50	0.29	0.29	0.82	0.21
cfd1.RSA	24.83	26.00	29.70	28.28	29.60	27.18	44.00	72.17	29.80	157.00	15.88
cfd2.RSA	56.78	48.40	76.05	64.36	52.80	50.80	115.00	145.50	53.20	448.00	43.97
copter1.kp	1.60	2.14	3.04	2.21	2.30	1.57	2.51	2.18	1.70	5.37	2.11
copter2.kp	10.84	10.00	13.67	13.45	14.30	11.16	18.00	17.98	11.70	47.30	9.36
crankseg_1.rsa	57.52	51.10	76.83	62.95	54.70	53.23	87.80	71.02	54.50	172.00	41.23
crankseg_2.rsa	83.03	69.10	101.05	84.16	73.40	72.67	113.00	122.55	75.20	301.00	55.89
crplat2.PSE	2.01	2.02	2.69	2.11	1.87	1.55	2.36	2.85	1.93	5.62	1.25
ct20stif.PSA	10.95	9.26	14.01	12.90	11.10	9.55	15.60	12.48	10.80	30.70	8.88
CVXBQP1.rsa	1.43	1.34	1.64	2.10	1.92	1.32	2.73	5.98	1.53	14.10	1.19
Fcondp2.PSE	93.75	68.20	100.96	95.46	77.90	73.52	172.00	72.26	88.40	166.00	66.41
finan512.RSA	1.18	1.98	1.17	1.70	1.57	0.80	2.52	9.76	1.23	5.58	0.83
finance256.kp	0.55	1.47	2.46	0.81	0.70	0.35	1.05	1.66	0.54	4.25	0.43
ford1.kp	0.18	0.15	0.19	0.30	0.23	0.11	0.34	0.14	0.17	0.45	0.13
ford2.kp	1.57	1.28	1.52	2.03	1.75	0.97	3.34	1.13	1.44	3.57	1.15
Fullb.PSE	168.14	137.00	212.66	194.17	181.00	153.52	419.00	308.07	216.00	700.00	207.48
gearbox.PSA	44.39	34.80	55.34	43.49	39.70	36.63	83.80	71.63	42.60	173.00	34.57
GRIDGENA.rsa	1.49	1.26	1.80	1.74	1.72	1.15	2.40	1.21	1.48	3.42	0.94
gupta1.PSA	6.86	4.13	9.39	7.94	52.80	2.06	18.30	2.20	8.24	289.00	4.84
gupta2.PSA	36.15	17.40	39.53	31.06	253.00	9.48	-	10.62	42.80	955.00	23.48
gupta3.PSA	16.15	10.80	22.85	19.33	18.20	11.27	22.60	14.39	15.50	170.00	9.73
Halfb.PSE	132.26	119.00	159.43	142.47	129.00	116.43	252.00	146.16	157.00	286.00	113.55
hood.rsa	23.81	17.70	25.59	22.80	19.90	17.41	42.50	18.52	23.30	47.70	17.11
inline_1.rsa	273.72	225.00	327.00	255.16	251.00	248.17	545.00	409.90	265.00	-	176.17
JNLBRNG1.rsa	0.57	0.56	0.62	0.88	0.72	0.40	1.07	0.45	0.56	1.45	0.43
ldoor.rsa	188.99	130.00	189.34	162.40	143.00	137.56	489.00	190.87	183.00	-	156.93
MINSURFO.rsa	0.63	0.55	0.61	0.88	0.78	0.45	1.08	0.54	0.57	1.47	0.43
msc10848.RSA	1.77	1.21	2.12	1.82	1.48	1.21	1.63	1.29	1.56	3.67	0.99
msc23052.RSA	2.07	1.49	2.16	2.26	1.88	1.54	3.45	1.43	2.05	5.08	1.35
M_T1.rsa	40.68	37.70	51.41	44.23	40.00	38.08	157.00	38.75	41.90	-	27.35
nasasrb.RSA	8.50	8.79	9.99	8.53	8.43	7.07	12.60	9.10	8.40	22.00	5.31

Table 2.2.4: Factorize time (CPU seconds) (continued)

Name	BCSEXT	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
OBSTCLAE.rsa	0.54	0.55	0.60	0.81	0.70	0.36	1.07	0.43	0.52	1.42	0.45
OILPAN.rsa	8.04	7.66	8.34	8.28	6.50	5.65	12.70	8.09	7.11	20.80	6.79
onera_dual.kp	5.48	5.38	7.49	6.86	7.60	5.51	12.30	13.03	6.19	32.80	5.16
opt1.PSE	4.79	3.67	5.78	5.05	4.15	3.72	6.47	5.52	4.11	14.40	3.37
pds10.kp	0.99	0.87	4.23	1.88	2.30	1.06	2.19	2.81	1.52	6.88	1.04
pkustk01.PSA	1.42	1.01	1.59	1.62	1.47	1.00	1.63	0.97	1.49	3.13	0.86
pkustk02.PSA	1.10	0.66	1.12	1.12	1.18	0.90	1.01	0.65	1.20	2.13	0.60
pkustk03.PSA	6.22	5.79	7.19	6.74	5.60	4.59	9.41	6.80	6.41	16.10	4.64
pkustk04.PSA	8.74	8.39	12.09	10.40	12.30	8.39	11.50	19.85	10.90	49.50	4.88
pkustk05.PSA	10.20	8.40	12.09	12.22	11.90	8.99	14.30	27.79	9.93	64.10	7.95
pkustk06.PSA	14.53	11.40	17.23	16.12	14.70	11.79	22.30	35.03	14.20	77.30	11.64
pkustk07.PSA	11.09	9.16	13.49	12.29	10.40	9.37	18.10	15.36	10.50	42.40	10.12
pkustk08.PSA	18.24	14.90	22.07	20.47	17.40	15.47	28.20	35.23	17.00	71.50	15.39
pkustk09.PSA	3.52	3.79	4.22	3.82	3.42	2.79	5.58	4.05	3.68	9.45	2.57
pkustk10.PSA	15.60	15.00	18.40	17.04	15.10	13.37	25.70	16.02	16.00	40.60	11.25
pkustk11.PSA	43.74	37.30	54.55	51.79	46.20	40.39	89.80	133.17	43.30	230.00	40.37
pkustk12.PSA	16.69	12.20	22.96	18.77	19.40	14.97	19.50	12.45	19.10	32.90	10.07
pkustk13.PSA	42.27	35.90	48.04	46.81	39.90	38.71	62.90	52.97	39.00	144.00	30.01
pkustk14.PSA	241.67	208.00	318.27	272.63	266.00	230.06	415.00	269.60	236.00	523.00	158.53
pwt.RSA	0.66	0.68	0.91	0.84	0.80	0.48	1.26	0.71	0.66	1.88	0.45
pwtk.RSA	49.08	38.60	58.16	52.41	43.50	39.50	102.00	64.17	47.50	164.00	37.28
ramage02.PSE	19.36	15.90	23.18	20.93	25.60	16.80	33.60	49.20	18.20	98.30	15.25
s3dkq4m2.rsa	16.54	13.30	19.40	17.35	15.40	13.62	28.40	26.97	16.30	52.50	12.22
s3dkt3m2.rsa	15.38	12.50	18.48	16.48	13.90	12.76	24.20	16.79	14.80	40.70	11.26
SHIPSEC1.rsa	66.39	62.50	75.29	68.35	61.10	57.67	866.00	67.08	65.80	150.00	57.02
SHIPSEC5.rsa	98.69	93.90	116.98	112.41	97.40	87.27	1750.00	116.41	115.00	237.00	84.97
SHIPSEC8.rsa	66.49	56.30	80.28	77.62	67.20	58.38	334.00	129.13	71.60	265.00	71.02
SHIP_001.rse	19.34	15.70	24.90	22.05	32.40	16.23	23.20	19.85	18.90	45.80	13.32
SHIP_003.rsa	130.59	110.00	178.56	171.61	152.00	120.26	416.00	218.67	143.00	468.00	109.50
shuttle_eddy.PSA	0.17	0.13	0.18	0.21	0.20	0.12	0.25	0.13	0.17	0.38	0.10
skirt.PSA	0.24	0.19	0.28	0.28	0.28	0.16	0.32	0.22	0.23	0.58	0.16
Srb1.PSE	8.47	6.06	9.86	8.87	7.97	6.88	12.10	5.89	8.18	15.40	5.56
struct3.PSA	2.56	2.51	3.02	2.79	2.90	2.17	4.19	2.64	2.98	6.73	1.99
tandem_dual.kp	5.19	4.61	6.65	6.81	6.78	4.70	11.00	13.28	5.43	34.80	4.62
tandem_vtx.kp	1.31	2.03	2.61	1.66	1.63	1.25	1.94	1.84	1.48	5.18	1.03
THREAD.rsa	57.45	52.30	69.86	62.73	54.80	53.07	69.10	67.70	55.70	442.00	43.33

Table 2.2.4: Factorize time (CPU seconds) (continued)

Name	BCSEXT	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
TORSION1.rsa	0.55	0.55	0.60	0.80	0.70	0.36	1.07	0.42	0.52	1.43	0.48
trdheim.PSE	1.40	0.66	1.44	1.33	1.02	0.80	1.22	0.61	1.18	2.93	0.68
Troll.PSE	106.62	83.50	109.36	112.77	92.80	90.63	176.00	249.03	98.80	536.00	81.97
tsyl201.PSE	6.13	4.93	7.36	6.58	5.38	4.92	8.60	5.43	5.82	16.80	4.94
vanbody.rsa	4.35	3.35	4.88	4.40	4.02	3.20	6.84	3.35	4.18	11.40	2.60
wathen100.mat	0.78	0.65	0.91	0.92	0.85	0.60	1.34	1.05	0.82	1.90	0.67
wathen120.mat	0.97	0.83	1.16	1.06	1.03	0.69	1.67	1.30	0.95	2.50	0.89
X104.rsa	30.36	17.10	34.91	34.22	26.80	24.93	71.30	19.19	29.50	50.00	15.54

Table 2.2.5: Solution time given factors (CPU seconds)

Name	BCSEXT	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
3dtube.PSA	0.46	0.53	0.49	0.57	1.43	0.41	1.09	0.76	0.77	6.68	0.49
audikw_1.rsa	-	-	-	-	-	-	-	-	-	-	-
barth5.kp	0.02	0.02	0.02	0.04	0.02	0.01	0.05	0.03	0.04	0.08	0.04
bcsstk25.RSA	0.05	0.05	0.05	0.08	0.15	0.05	0.11	0.06	0.10	0.40	0.07
bcsstk29.PSA	0.04	0.06	0.05	0.07	0.13	0.05	0.10	0.06	0.09	0.55	0.06
bcsstk30.PSA	0.12	0.13	0.11	0.16	0.37	0.12	0.23	0.12	0.21	1.40	0.12
bcsstk31.PSA	0.13	0.15	0.15	0.18	0.37	0.12	0.28	0.17	0.22	1.53	0.16
bcsstk32.PSA	0.16	0.18	0.15	0.22	0.45	0.15	0.34	0.18	0.27	1.62	0.19
bcsstk36.RSA	0.08	0.09	0.08	0.11	0.23	0.08	0.18	0.09	0.15	0.98	0.09
bmw7st_1.rsa	0.72	0.77	0.73	0.91	2.07	0.67	1.71	0.77	1.18	8.98	0.77
bmwcra_1.rsa	1.80	1.98	1.74	2.03	5.38	1.59	4.41	2.49	2.73	42.60	1.75
bodyy4.RSA	0.02	0.03	0.03	0.05	0.03	0.02	0.06	0.05	0.05	0.18	0.04
bodyy5.RSA	0.02	0.03	0.03	0.06	0.05	0.02	0.07	0.05	0.06	0.13	0.04
bodyy6.RSA	0.02	0.04	0.03	0.06	0.05	0.02	0.07	0.05	0.06	0.15	0.04
cfd1.RSA	0.55	0.63	0.56	0.69	1.72	0.53	1.37	1.06	0.91	8.67	0.58
cfd2.RSA	1.01	1.08	1.05	1.22	2.95	0.90	2.78	1.78	1.59	19.00	1.12
copter1.kp	0.06	0.09	0.07	0.11	0.15	0.05	0.15	0.10	0.10	0.57	0.10
copter2.kp	0.35	0.33	0.29	0.40	0.77	0.26	0.69	0.45	0.49	3.25	0.36
crankseg_1.rsa	1.18	0.86	0.82	0.90	2.58	0.75	1.65	1.00	1.29	11.50	0.79
crankseg_2.rsa	1.16	1.10	1.05	1.14	3.33	0.97	2.07	1.40	1.69	16.40	1.01
crplat2.PSE	0.08	0.09	0.08	0.10	0.22	0.07	0.15	0.10	0.13	0.88	0.09
ct20stif.PSA	0.30	0.32	0.29	0.35	0.83	0.26	0.56	0.33	0.47	3.02	0.30
CVXBQP1.rsa	0.09	0.11	0.10	0.26	0.18	0.09	0.23	0.22	0.19	1.13	0.14

Table 2.2.5: Solution time given factors (CPU seconds) (continued)

Name	BCSEXT	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
Fcondp2.PSE	1.44	1.46	1.36	1.62	4.03	1.24	3.38	1.35	2.15	12.90	1.45
finan512.RSA	0.12	0.16	0.10	0.29	0.17	0.10	0.34	0.36	0.25	1.00	0.19
finance256.kp	0.05	0.08	0.08	0.14	0.08	0.04	0.16	0.15	0.12	0.52	0.09
ford1.kp	0.02	0.02	0.02	0.06	0.03	0.02	0.06	0.04	0.05	0.08	0.04
ford2.kp	0.16	0.18	0.14	0.36	0.22	0.14	0.46	0.29	0.34	0.90	0.26
Fullb.PSE	1.94	1.96	1.93	2.31	5.75	1.75	5.00	2.46	3.12	28.20	2.09
gearbox.PSA	1.11	1.09	1.05	1.18	2.93	0.90	2.52	1.36	1.68	12.90	1.08
GRIDGENA.rsa	0.10	0.13	0.11	0.18	0.23	0.10	0.25	0.17	0.20	0.82	0.14
gupta1.PSA	0.15	0.20	0.10	0.29	0.18	0.09	9.88	0.23	0.37	1.30	0.27
gupta2.PSA	0.43	0.51	0.26	0.77	0.57	0.21	-	0.57	0.81	2.87	0.69
gupta3.PSA	0.24	0.22	0.26	0.28	0.83	0.21	0.95	0.35	0.37	3.82	0.21
Halfb.PSE	1.81	1.75	1.80	2.02	5.17	1.59	4.23	1.91	2.87	17.50	1.81
hood.rsa	0.88	0.89	0.85	1.09	2.20	0.76	2.16	0.86	1.38	9.17	0.94
inline_1.rsa	4.76	5.04	5.04	4.92	13.80	4.14	12.90	6.16	7.19	-	4.63
JNLBRNG1.rsa	0.05	0.07	0.05	0.15	0.08	0.05	0.15	0.12	0.12	0.38	0.10
ldoor.rsa	5.17	4.67	4.44	4.83	11.50	3.83	25.60	4.77	7.24	-	4.93
MINSURFO.rsa	0.06	0.07	0.05	0.15	0.10	0.06	0.15	0.12	0.13	0.25	0.10
msc10848.RSA	0.06	0.06	0.06	0.07	0.17	0.05	0.10	0.06	0.09	0.57	0.06
msc23052.RSA	0.08	0.09	0.08	0.11	0.23	0.08	0.18	0.09	0.15	1.05	0.09
M_T1.rsa	1.09	0.89	0.85	0.98	2.70	0.80	2.07	0.91	1.40	-	0.83
nasasrb.RSA	0.28	0.36	0.29	0.35	0.83	0.26	0.61	0.36	0.47	3.40	0.29
OBSTCLAE.rsa	0.06	0.07	0.05	0.15	0.08	0.05	0.15	0.12	0.13	0.25	0.10
OILPAN.rsa	0.34	0.33	0.28	0.36	0.73	0.24	0.64	0.33	0.47	2.70	0.33
onera_dual.kp	0.23	0.28	0.24	0.45	0.55	0.21	0.67	0.47	0.42	1.70	0.35
opt1.PSE	0.12	0.13	0.12	0.14	0.37	0.10	0.23	0.14	0.19	1.62	0.13
pds10.kp	0.04	0.05	0.06	0.10	0.10	0.04	0.18	0.10	0.10	0.42	0.07
pkustk01.PSA	0.06	0.07	0.06	0.09	0.20	0.07	0.13	0.07	0.12	0.72	0.07
pkustk02.PSA	0.04	0.04	0.04	0.05	0.13	0.04	0.07	0.04	0.07	0.50	0.04
pkustk03.PSA	0.24	0.29	0.25	0.32	0.68	0.22	0.54	0.28	0.41	2.70	0.27
pkustk04.PSA	0.23	0.28	0.26	0.31	0.80	0.23	0.51	0.34	0.42	3.67	0.24
pkustk05.PSA	0.24	0.27	0.24	0.30	0.80	0.21	0.48	0.41	0.40	3.73	0.26
pkustk06.PSA	0.29	0.33	0.30	0.36	0.87	0.26	0.63	0.49	0.48	4.47	0.33
pkustk07.PSA	0.19	0.21	0.19	0.22	0.60	0.17	0.42	0.24	0.30	2.72	0.21
pkustk08.PSA	0.28	0.31	0.27	0.32	0.95	0.24	0.61	0.41	0.43	3.93	0.29
pkustk09.PSA	0.13	0.17	0.14	0.17	0.42	0.12	0.29	0.17	0.23	1.58	0.15
pkustk10.PSA	0.44	0.54	0.46	0.56	1.33	0.41	1.03	0.51	0.76	4.97	0.47

Table 2.2.5: Solution time given factors (CPU seconds) (continued)

Name	BCSEXT	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
pkustk11.PSA	0.71	0.80	0.72	0.89	2.13	0.64	1.67	1.25	1.15	10.30	0.80
pkustk12.PSA	0.42	0.42	0.43	0.52	1.33	0.39	0.89	0.41	0.70	4.87	0.40
pkustk13.PSA	0.77	0.86	0.76	0.94	2.30	0.69	1.63	0.94	1.22	9.53	0.79
pkustk14.PSA	2.64	2.85	2.70	2.96	8.08	2.42	6.31	3.11	4.13	28.20	2.46
pwt.RSA	0.06	0.08	0.07	0.12	0.13	0.06	0.16	0.11	0.13	0.32	0.09
pwtk.RSA	1.34	1.40	1.32	1.57	3.83	1.20	3.48	1.60	2.09	15.90	1.40
ramage02.PSE	0.27	0.28	0.26	0.30	1.67	0.25	0.57	0.46	0.43	4.39	0.28
s3dkq4m2.rsa	0.49	0.57	0.50	0.61	1.45	0.45	1.12	0.67	0.82	5.77	0.53
s3dkt3m2.rsa	0.46	0.53	0.47	0.58	1.32	0.42	1.02	0.53	0.76	4.98	0.49
SHIPSEC1.rsa	1.05	1.08	1.01	1.18	3.05	0.94	3.05	1.10	1.62	10.10	1.13
SHIPSEC5.rsa	1.41	1.41	1.40	1.67	4.12	1.26	4.33	1.55	2.24	13.80	1.46
SHIPSEC8.rsa	0.94	0.99	0.93	1.10	2.80	0.84	2.53	1.24	1.56	11.20	1.11
SHIP_001.rse	0.37	0.39	0.38	0.44	2.23	0.33	0.68	0.42	0.61	4.63	0.42
SHIP_003.rsa	1.50	1.53	1.57	1.83	4.53	1.36	3.96	1.97	2.42	19.50	1.57
shuttle_eddy.PSA	0.01	0.01	0.01	0.03	0.02	0.01	0.03	0.02	0.03	0.07	0.02
skirt.PSA	0.02	0.02	0.02	0.04	0.03	0.02	0.04	0.03	0.06	0.17	0.03
Srb1.PSE	0.28	0.31	0.29	0.38	0.83	0.26	0.59	0.29	0.47	2.85	0.30
struct3.PSA	0.15	0.19	0.16	0.22	0.38	0.15	0.35	0.21	0.33	1.43	0.19
tandem_dual.kp	0.25	0.29	0.25	0.49	0.57	0.23	0.71	0.51	0.49	1.85	0.37
tandem_vtx.kp	0.06	0.09	0.08	0.10	0.17	0.06	0.14	0.10	0.12	0.65	0.09
THREAD.rsa	0.58	0.58	0.57	0.64	1.85	0.54	1.06	0.70	0.90	12.80	0.57
TORSION1.rsa	0.05	0.07	0.05	0.14	0.08	0.05	0.15	0.12	0.13	0.25	0.11
trdheim.PSE	0.06	0.06	0.05	0.08	0.17	0.06	0.12	0.06	0.11	0.92	0.07
Troll.PSE	1.74	1.88	1.62	2.02	5.00	1.53	4.37	2.51	2.73	26.00	2.48
tsyl201.PSE	0.15	0.18	0.16	0.19	0.48	0.14	0.30	0.16	0.26	2.05	0.17
vanbody.rsa	0.18	0.19	0.18	0.23	0.48	0.16	0.38	0.19	0.30	2.10	0.19
wathen100.mat	0.06	0.07	0.06	0.09	0.13	0.06	0.14	0.10	0.12	0.48	0.09
wathen120.mat	0.07	0.08	0.07	0.12	0.17	0.07	0.18	0.12	0.14	0.63	0.11
X104.rsa	0.71	0.68	0.71	0.87	2.17	0.67	1.55	0.67	1.17	8.00	0.67

Table 2.2.6: Actual memory used (Mbytes)

Name	BCSEXT	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
3dtube.PSA	2.3E+2	1.9E+2	2.5E+2	2.6E+2	2.4E+2	2.0E+2	2.5E+2	2.6E+2	2.5E+2	1.4E+3	2.8E+2
audikw_1.rsa	-	-	-	-	-	-	-	-	-	-	-

Table 2.2.6: Actual memory used (Mbytes) (continued)

Name	BCSEXT	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
barth5.kp	1.2E+1	6.6E+0	8.0E+0	8.1E+0	7.6E+0	7.3E+0	1.0E+1	6.5E+0	9.0E+0	1.3E+1	1.0E+1
bcsstk25.RSA	2.5E+1	1.8E+1	2.2E+1	2.6E+1	2.5E+1	2.0E+1	2.3E+1	1.9E+1	2.6E+1	4.2E+1	2.4E+1
bcsstk29.PSA	3.6E+1	2.2E+1	3.4E+1	3.3E+1	2.8E+1	2.5E+1	2.7E+1	2.4E+1	3.3E+1	1.0E+2	3.5E+1
bcsstk30.PSA	7.8E+1	4.0E+1	8.3E+1	8.2E+1	7.1E+1	6.8E+1	7.1E+1	5.9E+1	7.8E+1	2.2E+2	9.2E+1
bcsstk31.PSA	7.8E+1	4.9E+1	8.4E+1	7.3E+1	6.4E+1	5.6E+1	6.9E+1	6.2E+1	7.0E+1	3.0E+2	8.4E+1
bcsstk32.PSA	8.9E+1	5.4E+1	9.5E+1	9.8E+1	8.1E+1	7.9E+1	9.3E+1	7.2E+1	9.7E+1	2.6E+2	1.1E+2
bcsstk36.RSA	4.6E+1	3.0E+1	5.6E+1	5.2E+1	4.3E+1	4.1E+1	5.0E+1	3.9E+1	4.8E+1	1.6E+2	6.3E+1
bmw7st_1.rsa	4.0E+2	2.6E+2	4.1E+2	4.0E+2	3.4E+2	3.6E+2	4.2E+2	3.1E+2	3.6E+2	1.4E+3	4.2E+2
bmwcra_1.rsa	8.8E+2	7.0E+2	8.8E+2	9.1E+2	8.3E+2	7.8E+2	9.2E+2	9.3E+2	8.0E+2	3.0E+3	9.3E+2
bodyy4.RSA	1.5E+1	9.2E+0	1.1E+1	1.0E+1	1.0E+1	9.3E+0	1.3E+1	8.8E+0	1.2E+1	1.8E+1	1.3E+1
bodyy5.RSA	1.3E+1	9.7E+0	1.1E+1	1.3E+1	1.1E+1	1.0E+1	1.4E+1	9.5E+0	1.3E+1	1.9E+1	1.4E+1
bodyy6.RSA	1.7E+1	1.1E+1	1.2E+1	1.4E+1	1.1E+1	9.5E+0	1.5E+1	9.9E+0	1.4E+1	2.1E+1	1.4E+1
cfd1.RSA	2.7E+2	2.5E+2	2.5E+2	2.7E+2	3.1E+2	2.2E+2	2.8E+2	3.5E+2	3.1E+2	1.9E+3	2.3E+2
cfd2.RSA	5.1E+2	4.0E+2	4.8E+2	4.9E+2	4.8E+2	3.7E+2	5.5E+2	5.9E+2	4.5E+2	3.3E+3	4.5E+2
copter1.kp	3.1E+1	3.3E+1	3.8E+1	3.7E+1	3.6E+1	2.2E+1	2.8E+1	2.6E+1	3.4E+1	1.4E+2	3.9E+1
copter2.kp	1.4E+2	1.3E+2	1.3E+2	1.5E+2	1.5E+2	9.9E+1	1.3E+2	1.3E+2	1.4E+2	6.8E+2	1.4E+2
crankseg_1.rsa	5.1E+2	3.5E+2	5.5E+2	5.3E+2	4.8E+2	4.7E+2	4.4E+2	4.5E+2	4.3E+2	2.3E+3	5.7E+2
crankseg_2.rsa	6.6E+2	4.8E+2	7.3E+2	6.9E+2	5.9E+2	6.2E+2	5.7E+2	6.9E+2	5.6E+2	1.6E+3	7.2E+2
crplat2.PSE	4.1E+1	3.2E+1	5.4E+1	4.6E+1	4.0E+1	4.2E+1	4.2E+1	4.3E+1	4.7E+1	1.7E+2	5.0E+1
ct20stif.PSA	1.5E+2	1.2E+2	1.7E+2	1.7E+2	1.7E+2	1.3E+2	1.4E+2	1.3E+2	1.6E+2	5.9E+2	1.9E+2
CVXBQP1.rsa	5.3E+1	4.0E+1	4.3E+1	4.5E+1	3.8E+1	3.0E+1	4.9E+1	4.9E+1	4.1E+1	2.6E+2	4.3E+1
Fcondp2.PSE	7.2E+2	5.0E+2	7.6E+2	7.7E+2	7.4E+2	5.7E+2	7.7E+2	5.4E+2	7.0E+2	2.4E+3	7.8E+2
finan512.RSA	7.1E+1	4.6E+1	3.9E+1	4.2E+1	3.7E+1	3.7E+1	6.9E+1	7.1E+1	4.6E+1	1.6E+2	5.1E+1
finance256.kp	3.4E+1	3.0E+1	3.5E+1	2.2E+1	1.9E+1	1.9E+1	3.0E+1	2.5E+1	2.1E+1	1.6E+2	2.8E+1
ford1.kp	1.3E+1	6.7E+0	7.7E+0	9.7E+0	8.1E+0	7.6E+0	1.1E+1	5.9E+0	9.6E+0	1.2E+1	1.2E+1
ford2.kp	8.4E+1	4.3E+1	5.8E+1	5.7E+1	4.7E+1	4.0E+1	9.2E+1	3.6E+1	5.9E+1	7.8E+1	6.1E+1
Fullb.PSE	9.8E+2	7.9E+2	9.7E+2	1.0E+3	1.0E+3	7.6E+2	1.0E+3	8.6E+2	1.3E+3	3.0E+3	1.1E+3
gearbox.PSA	5.2E+2	3.9E+2	6.0E+2	5.4E+2	4.8E+2	4.5E+2	5.9E+2	5.2E+2	4.9E+2	2.2E+3	6.2E+2
GRIDGENA.rsa	6.3E+1	3.6E+1	4.5E+1	5.1E+1	4.0E+1	3.7E+1	5.7E+1	3.6E+1	4.8E+1	7.0E+1	4.9E+1
gupta1.PSA	4.7E+2	3.6E+1	4.4E+2	3.1E+2	8.6E+2	7.2E+1	1.3E+2	4.9E+1	1.3E+2	7.2E+2	1.2E+2
gupta2.PSA	1.6E+3	1.2E+2	1.3E+3	5.9E+2	2.9E+3	1.5E+2	-	1.3E+2	6.2E+2	2.4E+3	2.8E+2
gupta3.PSA	5.3E+2	6.6E+1	5.4E+2	4.8E+2	6.0E+2	3.2E+2	4.1E+2	1.6E+2	2.0E+2	6.0E+2	3.0E+2
Halfb.PSE	9.5E+2	6.8E+2	9.5E+2	9.7E+2	1.0E+3	7.0E+2	9.1E+2	7.0E+2	1.0E+3	3.0E+3	9.3E+2
hood.rsa	5.2E+2	2.7E+2	4.9E+2	4.7E+2	4.0E+2	4.5E+2	5.5E+2	4.1E+2	4.0E+2	6.9E+2	5.2E+2
inline_1.rsa	2.4E+3	1.7E+3	2.4E+3	2.5E+3	2.1E+3	2.2E+3	2.7E+3	2.3E+3	2.1E+3	-	2.5E+3
JNLBRNG1.rsa	3.2E+1	1.9E+1	2.0E+1	2.2E+1	1.9E+1	1.7E+1	3.1E+1	1.5E+1	2.5E+1	3.5E+1	2.6E+1

Table 2.2.6: Actual memory used (Mbytes) (continued)

Name	BCSEXT	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
ldoor.rsa	2.8E+3	1.5E+3	2.3E+3	2.2E+3	2.0E+3	2.2E+3	2.8E+3	1.9E+3	2.0E+3	-	2.5E+3
MINSURFO.rsa	3.3E+1	1.9E+1	2.0E+1	2.5E+1	2.1E+1	1.8E+1	3.2E+1	1.6E+1	2.7E+1	3.6E+1	2.6E+1
msc10848.RSA	4.0E+1	2.1E+1	5.0E+1	4.5E+1	3.7E+1	3.4E+1	3.6E+1	3.3E+1	3.5E+1	1.0E+2	5.4E+1
msc23052.RSA	4.7E+1	3.0E+1	5.5E+1	5.4E+1	4.5E+1	4.2E+1	4.8E+1	3.9E+1	4.7E+1	1.6E+2	6.3E+1
M_T1.rsa	4.9E+2	3.2E+2	5.4E+2	5.2E+2	4.5E+2	4.8E+2	5.1E+2	4.0E+2	4.5E+2	-	5.3E+2
nasasrb.RSA	1.5E+2	1.2E+2	1.7E+2	1.5E+2	1.3E+2	1.3E+2	1.6E+2	1.4E+2	1.4E+2	2.9E+2	1.7E+2
OBSTCLAE.rsa	3.1E+1	1.9E+1	1.9E+1	2.3E+1	1.8E+1	1.6E+1	3.1E+1	1.5E+1	2.5E+1	3.4E+1	2.6E+1
OILPAN.rsa	1.7E+2	1.1E+2	1.6E+2	1.7E+2	1.3E+2	1.5E+2	1.7E+2	1.3E+2	1.4E+2	3.4E+2	1.9E+2
onera_dual.kp	1.1E+2	9.5E+1	9.1E+1	9.2E+1	1.1E+2	7.0E+1	1.3E+2	1.0E+2	1.1E+2	5.9E+2	1.1E+2
opt1.PSE	7.6E+1	5.2E+1	9.4E+1	8.3E+1	7.3E+1	6.1E+1	6.9E+1	6.9E+1	7.2E+1	3.5E+2	9.8E+1
pds10.kp	2.6E+1	1.8E+1	5.3E+1	2.8E+1	2.9E+1	1.6E+1	2.5E+1	2.0E+1	2.8E+1	2.7E+2	2.9E+1
pkustk01.PSA	3.6E+1	2.2E+1	4.4E+1	4.2E+1	3.3E+1	3.2E+1	3.8E+1	3.0E+1	4.1E+1	1.2E+2	4.9E+1
pkustk02.PSA	2.7E+1	1.4E+1	3.3E+1	3.1E+1	3.2E+1	2.4E+1	2.4E+1	2.2E+1	3.1E+1	8.9E+1	3.7E+1
pkustk03.PSA	1.3E+2	9.2E+1	1.5E+2	1.4E+2	1.2E+2	1.2E+2	1.4E+2	1.2E+2	1.4E+2	4.7E+2	1.7E+2
pkustk04.PSA	1.5E+2	1.0E+2	1.9E+2	1.7E+2	1.7E+2	1.3E+2	1.5E+2	1.6E+2	1.6E+2	7.9E+2	1.9E+2
pkustk05.PSA	1.2E+2	9.6E+1	1.4E+2	1.4E+2	1.4E+2	1.1E+2	1.2E+2	1.6E+2	1.4E+2	8.5E+2	1.7E+2
pkustk06.PSA	1.5E+2	1.3E+2	1.7E+2	1.7E+2	1.6E+2	1.3E+2	1.6E+2	1.9E+2	1.8E+2	9.8E+2	2.0E+2
pkustk07.PSA	1.2E+2	8.6E+1	1.4E+2	1.4E+2	1.3E+2	9.5E+1	1.1E+2	1.1E+2	1.3E+2	6.6E+2	1.6E+2
pkustk08.PSA	1.7E+2	1.3E+2	2.0E+2	2.1E+2	1.9E+2	1.3E+2	1.5E+2	1.7E+2	1.8E+2	9.3E+2	2.2E+2
pkustk09.PSA	7.0E+1	5.9E+1	8.3E+1	7.9E+1	6.8E+1	6.3E+1	7.7E+1	6.7E+1	8.0E+1	1.4E+2	9.5E+1
pkustk10.PSA	2.2E+2	1.8E+2	2.6E+2	2.5E+2	2.4E+2	2.0E+2	2.6E+2	2.1E+2	2.5E+2	8.8E+2	2.7E+2
pkustk11.PSA	3.5E+2	3.0E+2	3.9E+2	4.1E+2	4.2E+2	3.0E+2	3.9E+2	4.6E+2	4.1E+2	2.2E+3	4.8E+2
pkustk12.PSA	2.6E+2	1.4E+2	3.3E+2	2.8E+2	2.7E+2	2.2E+2	2.6E+2	2.0E+2	2.7E+2	6.5E+2	3.3E+2
pkustk13.PSA	4.0E+2	3.1E+2	4.4E+2	4.4E+2	4.2E+2	3.4E+2	3.9E+2	3.7E+2	4.1E+2	1.8E+3	4.6E+2
pkustk14.PSA	1.2E+3	1.1E+3	1.3E+3	1.4E+3	1.3E+3	1.1E+3	1.3E+3	1.2E+3	1.4E+3	2.2E+3	1.4E+3
pwt.RSA	3.7E+1	2.2E+1	2.6E+1	2.4E+1	2.3E+1	2.1E+1	3.4E+1	2.2E+1	3.0E+1	4.4E+1	2.8E+1
pwtk.RSA	6.4E+2	4.9E+2	7.0E+2	6.8E+2	6.0E+2	5.7E+2	7.9E+2	6.3E+2	6.1E+2	1.4E+3	7.5E+2
ramage02.PSE	1.6E+2	1.4E+2	1.8E+2	1.9E+2	5.2E+1	1.3E+2	1.4E+2	1.9E+2	1.8E+2	1.1E+3	2.1E+2
s3dkq4m2.rsa	2.7E+2	1.9E+2	2.8E+2	2.8E+2	2.3E+2	2.5E+2	2.8E+2	2.7E+2	2.5E+2	1.0E+3	2.9E+2
s3dkt3m2.rsa	2.4E+2	1.7E+2	2.4E+2	2.5E+2	2.2E+2	2.2E+2	2.5E+2	2.2E+2	2.3E+2	9.1E+2	2.5E+2
SHIPSEC1.rsa	5.5E+2	4.3E+2	5.3E+2	5.7E+2	5.5E+2	4.8E+2	7.3E+2	4.3E+2	5.4E+2	2.0E+3	6.1E+2
SHIPSEC5.rsa	7.5E+2	5.5E+2	7.3E+2	7.8E+2	7.5E+2	6.3E+2	1.1E+3	5.8E+2	8.2E+2	2.5E+3	7.7E+2
SHIPSEC8.rsa	5.1E+2	4.1E+2	5.1E+2	5.5E+2	5.7E+2	4.3E+2	5.9E+2	4.6E+2	5.5E+2	2.3E+3	6.2E+2
SHIP_001.rse	2.0E+2	1.6E+2	2.2E+2	2.1E+2	1.0E+2	1.7E+2	1.6E+2	1.9E+2	1.8E+2	4.9E+2	2.3E+2
SHIP_003.rsa	7.3E+2	6.4E+2	7.6E+2	8.5E+2	8.4E+2	6.4E+2	8.1E+2	7.2E+2	9.3E+2	3.1E+3	8.1E+2
shuttle_eddy.PS	1.0E+1	5.5E+0	6.8E+0	8.4E+0	7.0E+0	6.4E+0	8.2E+0	5.6E+0	9.2E+0	1.2E+1	9.5E+0

Table 2.2.6: Actual memory used (Mbytes) (continued)

Name	BCSEXT	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
skirt.PSA	1.2E+1	7.4E+0	1.1E+1	1.0E+1	9.3E+0	9.7E+0	1.1E+1	8.8E+0	1.1E+1	1.5E+1	1.3E+1
Srb1.PSE	1.4E+2	9.7E+1	1.6E+2	1.5E+2	1.4E+2	1.5E+2	1.6E+2	1.2E+2	1.6E+2	2.5E+2	1.7E+2
struct3.PSA	8.4E+1	5.5E+1	7.5E+1	7.2E+1	6.7E+1	6.1E+1	8.4E+1	6.2E+1	7.5E+1	1.3E+2	8.5E+1
tandem_dual.kp	1.2E+2	9.5E+1	9.2E+1	1.1E+2	9.5E+1	7.3E+1	1.4E+2	1.1E+2	1.1E+2	6.4E+2	1.0E+2
tandem_vtx.kp	3.6E+1	3.4E+1	3.8E+1	3.7E+1	3.1E+1	2.4E+1	3.0E+1	2.8E+1	3.2E+1	1.4E+2	3.3E+1
THREAD.rsa	3.5E+2	3.0E+2	4.0E+2	4.1E+2	4.3E+2	2.8E+2	2.6E+2	2.8E+2	3.9E+2	3.0E+3	3.8E+2
TORSION1.rsa	3.1E+1	1.9E+1	1.9E+1	2.3E+1	1.8E+1	1.6E+1	3.1E+1	1.5E+1	2.5E+1	3.4E+1	2.6E+1
trdheim.PSE	5.9E+1	1.9E+1	6.0E+1	5.1E+1	4.7E+1	5.6E+1	4.6E+1	3.9E+1	4.5E+1	1.4E+2	6.4E+1
Troll.PSE	8.2E+2	6.7E+2	8.5E+2	9.2E+2	8.1E+2	6.8E+2	9.1E+2	9.3E+2	8.9E+2	3.2E+3	9.6E+2
tsyl201.PSE	1.1E+2	6.6E+1	1.2E+2	1.1E+2	9.9E+1	8.2E+1	8.7E+1	8.2E+1	9.6E+1	3.9E+2	1.2E+2
vanbody.rsa	1.1E+2	6.1E+1	1.1E+2	1.0E+2	8.8E+1	9.7E+1	1.0E+2	7.8E+1	9.2E+1	3.3E+2	1.2E+2
wathen100.mat	4.0E+1	2.0E+1	2.8E+1	3.5E+1	2.6E+1	2.5E+1	3.4E+1	2.8E+1	2.8E+1	4.4E+1	3.5E+1
wathen120.mat	4.8E+1	2.5E+1	3.5E+1	4.1E+1	3.0E+1	3.0E+1	4.2E+1	3.4E+1	3.3E+1	5.3E+1	4.2E+1
X104.rsa	4.7E+2	2.3E+2	4.9E+2	4.7E+2	4.2E+2	4.3E+2	4.3E+2	3.3E+2	4.0E+2	1.2E+3	4.7E+2

Table 2.2.7: Number of integers used for factors

Name	CHOLMOD	MA57	MUMPS	Oblio	SPOOLES	TAUCS	UMFPACK
3dtube.PSA	4.4E+5	3.7E+5	7.9E+5	6.2E+5	2.1E+7	3.0E+5	5.6E+7
audikw_1.rsa	-	-	-	-	-	-	-
barth5.kp	8.3E+4	7.0E+4	2.0E+5	1.2E+5	6.4E+5	1.1E+5	7.7E+5
bcsstk25.RSA	1.1E+5	9.9E+4	2.4E+5	2.6E+5	1.6E+6	1.3E+5	2.9E+6
bcsstk29.PSA	1.0E+5	7.4E+4	1.8E+5	1.9E+5	1.7E+6	8.6E+4	3.6E+6
bcsstk30.PSA	2.3E+5	1.8E+5	3.8E+5	2.6E+5	4.2E+6	1.5E+5	7.8E+6
bcsstk31.PSA	2.6E+5	2.1E+5	4.7E+5	3.8E+5	5.0E+6	2.2E+5	1.1E+7
bcsstk32.PSA	3.4E+5	2.5E+5	5.5E+5	4.3E+5	6.3E+6	2.3E+5	1.0E+7
bcsstk36.RSA	1.8E+5	1.3E+5	2.8E+5	1.9E+5	3.4E+6	1.1E+5	5.7E+6
bmw7st_1.rsa	1.1E+6	8.8E+5	1.9E+6	1.4E+6	3.3E+7	7.4E+5	6.2E+7
bmwcra_1.rsa	1.5E+6	1.3E+6	2.8E+6	2.3E+6	8.2E+7	1.1E+6	1.9E+8
bodyy4.RSA	9.7E+4	8.5E+4	2.3E+5	1.4E+5	8.6E+5	1.3E+5	1.2E+6
bodyy5.RSA	1.0E+5	9.0E+4	2.5E+5	1.5E+5	9.4E+5	1.3E+5	1.3E+6
bodyy6.RSA	1.1E+5	9.5E+4	2.6E+5	1.6E+5	1.0E+6	1.4E+5	1.4E+6
cfd1.RSA	6.6E+5	5.9E+5	1.3E+6	1.2E+6	2.6E+7	5.7E+5	7.5E+7
cfd2.RSA	1.1E+6	1.0E+6	2.2E+6	2.0E+6	5.3E+7	1.0E+6	1.5E+8
copter1.kp	1.3E+5	1.5E+5	3.4E+5	2.6E+5	2.2E+6	1.7E+5	4.7E+6

Table 2.2.7: Number of integers used for factors (continued)

Name	CHOLMOD	MA57	MUMPS	Oblio	SPOOLES	TAUCS	UMFPACK
copter2.kp	4.3E+5	4.3E+5	9.6E+5	9.5E+5	1.2E+7	5.0E+5	2.8E+7
crankseg_1.rsa	5.5E+5	5.0E+5	1.0E+6	6.7E+5	3.3E+7	3.5E+5	7.8E+7
crankseg_2.rsa	7.0E+5	6.3E+5	1.2E+6	8.1E+5	4.2E+7	4.3E+5	1.1E+8
crplat2.PSE	1.5E+5	1.1E+5	2.3E+5	1.5E+5	2.8E+6	8.8E+4	6.1E+6
ct20stif.PSA	4.2E+5	3.4E+5	7.3E+5	5.8E+5	1.1E+7	3.0E+5	2.2E+7
CVXBQP1.rsa	2.7E+5	2.2E+5	7.1E+5	4.5E+5	3.8E+6	4.6E+5	8.6E+6
Fcondp2.PSE	1.8E+6	1.4E+6	2.8E+6	1.9E+6	6.5E+7	1.1E+6	9.5E+7
finan512.RSA	4.0E+5	3.2E+5	1.1E+6	6.1E+5	5.1E+6	6.6E+5	5.8E+6
finance256.kp	2.0E+5	2.0E+5	5.6E+5	2.9E+5	2.0E+6	3.3E+5	3.5E+6
ford1.kp	9.4E+4	7.9E+4	2.5E+5	1.3E+5	7.0E+5	1.5E+5	6.4E+5
ford2.kp	5.2E+5	4.4E+5	1.4E+6	7.4E+5	7.1E+6	8.0E+5	4.9E+6
Fullb.PSE	1.8E+6	1.6E+6	3.4E+6	2.4E+6	9.2E+7	1.4E+6	1.8E+8
gearbox.PSA	1.3E+6	1.1E+6	2.2E+6	1.8E+6	4.9E+7	1.2E+6	9.7E+7
GRIDGENA.rsa	3.2E+5	2.8E+5	6.8E+5	5.4E+5	4.3E+6	3.7E+5	5.6E+6
gupta1.PSA	1.1E+6	1.4E+6	2.0E+6	1.8E+6	4.6E+6	1.3E+6	4.7E+6
gupta2.PSA	2.2E+6	3.1E+6	4.4E+6	4.9E+6	-	2.7E+6	1.2E+7
gupta3.PSA	4.7E+5	2.5E+5	5.1E+5	2.7E+5	8.1E+6	2.3E+5	1.1E+7
Halfb.PSE	2.0E+6	1.5E+6	3.3E+6	2.3E+6	8.1E+7	1.3E+6	1.3E+8
hood.rsa	1.7E+6	1.2E+6	2.6E+6	1.6E+6	4.2E+7	1.2E+6	4.9E+7
inline_1.rsa	4.7E+6	3.9E+6	9.4E+6	7.1E+6	2.4E+8	3.3E+6	-
JNLBRNG1.rsa	2.1E+5	2.2E+5	5.8E+5	3.1E+5	2.3E+6	3.3E+5	2.2E+6
ldoor.rsa	7.2E+6	5.1E+6	1.2E+7	7.3E+6	2.8E+8	5.2E+6	-
MINSURFO.rsa	2.2E+5	2.2E+5	5.9E+5	3.2E+5	2.3E+6	3.4E+5	2.3E+6
msc10848.RSA	9.3E+4	7.0E+4	1.4E+5	1.0E+5	1.9E+6	4.9E+4	4.0E+6
msc23052.RSA	1.7E+5	1.2E+5	2.7E+5	1.9E+5	3.2E+6	1.1E+5	6.0E+6
M_T1.rsa	8.8E+5	7.2E+5	1.4E+6	8.8E+5	4.1E+7	4.9E+5	-
nasasrb.RSA	4.9E+5	3.7E+5	7.5E+5	6.7E+5	1.2E+7	3.1E+5	2.4E+7
OBSTCLAE.rsa	2.1E+5	2.2E+5	5.8E+5	3.0E+5	2.3E+6	3.3E+5	2.2E+6
OILPAN.rsa	5.6E+5	3.9E+5	9.0E+5	5.4E+5	1.3E+7	4.3E+5	1.2E+7
onera_dual.kp	5.4E+5	5.0E+5	1.4E+6	9.3E+5	1.1E+7	7.7E+5	2.1E+7
opt1.PSE	1.4E+5	1.1E+5	2.2E+5	1.5E+5	4.5E+6	7.5E+4	1.1E+7
pds10.kp	1.2E+5	1.5E+5	3.6E+5	3.1E+5	1.7E+6	2.0E+5	3.2E+6
pkustk01.PSA	1.5E+5	1.0E+5	2.6E+5	1.8E+5	2.3E+6	1.1E+5	3.9E+6
pkustk02.PSA	8.0E+4	5.7E+4	1.2E+5	8.4E+4	1.3E+6	5.0E+4	2.6E+6
pkustk03.PSA	4.8E+5	3.4E+5	7.6E+5	5.0E+5	1.0E+7	2.9E+5	1.7E+7
pkustk04.PSA	3.9E+5	3.1E+5	6.7E+5	4.9E+5	9.2E+6	2.9E+5	2.4E+7

Table 2.2.7: Number of integers used for factors (continued)

Name	CHOLMOD	MA57	MUMPS	Oblio	SPOOLES	TAUCS	UMFPACK
pkustk05.PSA	3.3E+5	2.7E+5	5.7E+5	4.5E+5	9.3E+6	2.3E+5	3.1E+7
pkustk06.PSA	3.8E+5	3.3E+5	6.6E+5	5.4E+5	1.2E+7	2.7E+5	3.7E+7
pkustk07.PSA	1.8E+5	1.7E+5	3.2E+5	2.4E+5	8.0E+6	1.2E+5	2.0E+7
pkustk08.PSA	2.4E+5	2.3E+5	4.4E+5	3.2E+5	1.1E+7	1.7E+5	2.9E+7
pkustk09.PSA	2.6E+5	1.9E+5	4.0E+5	2.6E+5	5.5E+6	1.6E+5	1.1E+7
pkustk10.PSA	7.1E+5	5.2E+5	1.1E+6	7.3E+5	2.0E+7	4.2E+5	3.6E+7
pkustk11.PSA	7.8E+5	6.7E+5	1.4E+6	1.0E+6	3.3E+7	5.6E+5	8.6E+7
pkustk12.PSA	6.7E+5	5.1E+5	1.0E+6	8.2E+5	1.6E+7	4.6E+5	2.6E+7
pkustk13.PSA	8.6E+5	7.3E+5	1.6E+6	1.3E+6	3.2E+7	6.1E+5	7.2E+7
pkustk14.PSA	1.6E+6	1.8E+6	3.2E+6	2.8E+6	1.2E+8	1.2E+6	2.3E+8
pwt.RSA	2.2E+5	2.0E+5	4.7E+5	3.3E+5	2.5E+6	2.6E+5	3.1E+6
pwtk.RSA	1.8E+6	1.4E+6	3.0E+6	2.1E+6	6.6E+7	1.1E+6	1.2E+8
ramage02.PSE	1.7E+5	1.5E+5	3.1E+5	2.3E+5	1.2E+7	1.0E+5	3.6E+7
s3dkq4m2.rsa	7.4E+5	5.5E+5	1.2E+6	8.1E+5	2.2E+7	4.5E+5	4.0E+7
s3dkt3m2.rsa	7.3E+5	5.4E+5	1.2E+6	7.5E+5	2.0E+7	4.7E+5	3.7E+7
SHIPSEC1.rsa	1.3E+6	9.2E+5	2.0E+6	1.4E+6	6.4E+7	8.1E+5	7.3E+7
SHIPSEC5.rsa	1.6E+6	1.2E+6	2.7E+6	1.9E+6	9.1E+7	1.1E+6	1.0E+8
SHIPSEC8.rsa	1.0E+6	8.5E+5	1.9E+6	1.3E+6	5.3E+7	7.4E+5	8.6E+7
SHIP_001.rse	3.4E+5	3.3E+5	6.8E+5	4.4E+5	1.4E+7	2.1E+5	3.1E+7
SHIP_003.rsa	1.2E+6	1.3E+6	2.6E+6	2.0E+6	7.5E+7	9.1E+5	1.5E+8
shuttle_eddy.PSA	6.0E+4	5.3E+4	1.3E+5	9.1E+4	4.9E+5	7.0E+4	6.7E+5
skirt.PSA	7.4E+4	6.0E+4	1.4E+5	1.2E+5	6.4E+5	1.0E+5	9.9E+5
Srb1.PSE	4.7E+5	3.4E+5	7.2E+5	4.8E+5	1.2E+7	2.8E+5	2.0E+7
struct3.PSA	3.9E+5	3.2E+5	6.8E+5	6.1E+5	6.3E+6	4.7E+5	1.0E+7
tandem_dual.kp	5.9E+5	5.5E+5	1.5E+6	1.0E+6	1.2E+7	8.5E+5	2.4E+7
tandem_vtx.kp	1.4E+5	1.4E+5	2.9E+5	2.7E+5	2.3E+6	1.5E+5	5.4E+6
THREAD.rsa	3.2E+5	2.8E+5	5.9E+5	4.2E+5	2.1E+7	2.0E+5	1.0E+8
TORSION1.rsa	2.1E+5	2.2E+5	5.8E+5	3.0E+5	2.3E+6	3.3E+5	2.2E+6
trdheim.PSE	1.5E+5	1.0E+5	2.2E+5	1.3E+5	2.2E+6	8.3E+4	3.5E+6
Troll.PSE	1.9E+6	1.5E+6	3.1E+6	2.3E+6	7.8E+7	1.3E+6	1.8E+8
tsyl201.PSE	1.9E+5	1.4E+5	2.7E+5	1.7E+5	6.1E+6	9.5E+4	1.3E+7
vanbody.rsa	3.6E+5	2.6E+5	5.8E+5	4.4E+5	7.0E+6	2.4E+5	1.3E+7
wathen100.mat	1.8E+5	1.5E+5	3.5E+5	2.6E+5	2.3E+6	1.8E+5	3.0E+6
wathen120.mat	2.1E+5	1.8E+5	4.2E+5	3.1E+5	2.9E+6	2.2E+5	3.8E+6
X104.rsa	9.4E+5	6.9E+5	1.4E+6	8.8E+5	3.1E+7	5.1E+5	4.2E+7

Table 2.2.8: Number of reals used for factors

Name	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
3dtube.PSA	2.2E+7	1.9E+7	2.3E+7	2.1E+7	1.9E+7	2.1E+7	2.6E+7	2.4E+7	5.6E+7	1.8E+7
audikw_1.rsa	-	-	-	-	-	-	-	-	-	-
barth5.kp	6.3E+5	4.8E+5	4.5E+5	3.9E+5	3.9E+5	6.4E+5	3.7E+5	6.6E+5	7.4E+5	3.7E+5
bcsstk25.RSA	1.9E+6	1.6E+6	2.1E+6	1.8E+6	1.7E+6	1.6E+6	1.4E+6	2.4E+6	2.9E+6	1.4E+6
bcsstk29.PSA	2.3E+6	1.8E+6	2.2E+6	1.8E+6	1.9E+6	1.7E+6	1.7E+6	2.6E+6	3.6E+6	1.6E+6
bcsstk30.PSA	4.6E+6	4.0E+6	5.4E+6	5.1E+6	4.9E+6	4.2E+6	3.8E+6	6.4E+6	7.7E+6	3.5E+6
bcsstk31.PSA	5.4E+6	5.6E+6	5.4E+6	4.9E+6	4.7E+6	5.0E+6	5.3E+6	6.0E+6	1.1E+7	4.4E+6
bcsstk32.PSA	6.1E+6	5.4E+6	6.9E+6	6.3E+6	6.1E+6	6.3E+6	5.2E+6	8.0E+6	1.0E+7	5.2E+6
bcsstk36.RSA	3.4E+6	2.9E+6	3.5E+6	3.2E+6	3.1E+6	3.4E+6	2.7E+6	4.2E+6	5.6E+6	2.8E+6
bmw7st_1.rsa	3.1E+7	2.7E+7	3.1E+7	2.8E+7	2.7E+7	3.3E+7	2.6E+7	3.5E+7	6.2E+7	2.5E+7
bmwcra_1.rsa	8.4E+7	7.1E+7	8.3E+7	7.9E+7	7.3E+7	8.2E+7	9.6E+7	8.7E+7	1.9E+8	6.4E+7
bodyy4.RSA	9.2E+5	7.1E+5	6.4E+5	5.7E+5	5.7E+5	8.6E+5	5.8E+5	9.1E+5	1.2E+6	5.4E+5
bodyy5.RSA	9.7E+5	7.5E+5	7.0E+5	6.3E+5	6.3E+5	9.4E+5	6.4E+5	1.0E+6	1.2E+6	5.9E+5
bodyy6.RSA	1.1E+6	8.2E+5	7.4E+5	6.6E+5	6.6E+5	1.0E+6	6.7E+5	1.0E+6	1.4E+6	6.2E+5
cfd1.RSA	2.8E+7	2.1E+7	2.5E+7	2.5E+7	2.3E+7	2.6E+7	3.8E+7	2.8E+7	7.5E+7	1.9E+7
cfd2.RSA	4.6E+7	4.1E+7	4.6E+7	4.2E+7	3.9E+7	5.3E+7	6.5E+7	4.7E+7	1.5E+8	3.7E+7
copter1.kp	3.4E+6	2.5E+6	2.5E+6	2.1E+6	1.9E+6	2.2E+6	2.3E+6	2.6E+6	4.7E+6	2.4E+6
copter2.kp	1.3E+7	1.0E+7	1.2E+7	1.1E+7	1.0E+7	1.2E+7	1.3E+7	1.3E+7	2.8E+7	9.9E+6
crankseg_1.rsa	4.3E+7	3.5E+7	3.9E+7	3.8E+7	3.5E+7	3.3E+7	3.9E+7	4.1E+7	7.8E+7	3.1E+7
crankseg_2.rsa	5.5E+7	4.4E+7	5.0E+7	4.9E+7	4.5E+7	4.2E+7	5.6E+7	5.3E+7	1.1E+8	3.9E+7
crplat2.PSE	3.6E+6	3.0E+6	3.3E+6	3.1E+6	3.0E+6	2.8E+6	3.4E+6	3.9E+6	6.0E+6	2.7E+6
ct20stif.PSA	1.3E+7	1.1E+7	1.3E+7	1.2E+7	1.1E+7	1.1E+7	1.1E+7	1.4E+7	2.2E+7	9.9E+6
CVXBQP1.rsa	3.3E+6	2.4E+6	2.5E+6	2.4E+6	2.3E+6	3.8E+6	4.4E+6	3.1E+6	8.5E+6	2.1E+6
Fcondp2.PSE	5.7E+7	5.3E+7	6.3E+7	5.7E+7	5.4E+7	6.5E+7	4.8E+7	6.7E+7	9.5E+7	5.0E+7
finan512.RSA	4.8E+6	2.3E+6	2.2E+6	2.0E+6	2.0E+6	5.1E+6	6.5E+6	3.5E+6	5.7E+6	2.0E+6
finance256.kp	2.8E+6	2.3E+6	1.1E+6	9.7E+5	9.8E+5	2.0E+6	2.0E+6	1.6E+6	3.4E+6	1.1E+6
ford1.kp	6.2E+5	4.2E+5	4.1E+5	3.5E+5	3.5E+5	7.0E+5	3.1E+5	6.6E+5	6.1E+5	3.6E+5
ford2.kp	4.2E+6	3.1E+6	2.9E+6	2.6E+6	2.6E+6	7.1E+6	2.4E+6	4.5E+6	4.7E+6	2.7E+6
Fullb.PSE	8.8E+7	7.5E+7	8.7E+7	8.2E+7	7.7E+7	9.2E+7	8.7E+7	9.9E+7	1.8E+8	7.8E+7
gearbox.PSA	4.5E+7	4.0E+7	4.3E+7	4.1E+7	3.9E+7	4.9E+7	4.9E+7	4.7E+7	9.7E+7	3.7E+7
GRIDGENA.rsa	3.8E+6	3.2E+6	3.3E+6	3.0E+6	2.9E+6	4.3E+6	2.7E+6	4.1E+6	5.5E+6	2.6E+6
gupta1.PSA	3.6E+6	2.7E+6	3.7E+6	2.1E+6	2.1E+6	4.6E+6	2.0E+6	3.6E+6	4.6E+6	2.0E+6
gupta2.PSA	1.3E+7	8.5E+6	1.3E+7	5.9E+6	5.8E+6	-	5.9E+6	1.3E+7	1.2E+7	6.6E+6
gupta3.PSA	7.9E+6	9.9E+6	1.1E+7	1.1E+7	1.0E+7	8.1E+6	5.7E+6	1.2E+7	1.1E+7	5.8E+6
Halfb.PSE	7.5E+7	7.0E+7	8.0E+7	7.4E+7	6.9E+7	8.1E+7	6.6E+7	9.2E+7	1.3E+8	6.5E+7

Table 2.2.8: Number of reals used for factors (continued)

Name	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
hood.rsa	3.1E+7	2.9E+7	3.2E+7	3.0E+7	2.9E+7	4.2E+7	2.7E+7	3.5E+7	4.9E+7	2.7E+7
inline_1.rsa	2.0E+8	1.8E+8	2.0E+8	1.9E+8	1.8E+8	2.4E+8	2.3E+8	2.1E+8	-	1.6E+8
JNLBRNG1.rsa	1.9E+6	1.2E+6	1.2E+6	1.1E+6	1.1E+6	2.3E+6	9.8E+5	1.9E+6	2.2E+6	1.2E+6
ldoor.rsa	1.7E+8	1.5E+8	1.7E+8	1.6E+8	1.5E+8	2.8E+8	1.5E+8	1.8E+8	-	1.5E+8
MINSURFO.rsa	1.9E+6	1.2E+6	1.3E+6	1.2E+6	1.2E+6	2.3E+6	1.1E+6	1.9E+6	2.2E+6	1.2E+6
msc10848.RSA	2.4E+6	2.2E+6	2.6E+6	2.4E+6	2.3E+6	1.9E+6	2.1E+6	3.0E+6	3.9E+6	1.9E+6
msc23052.RSA	3.3E+6	2.8E+6	3.6E+6	3.3E+6	3.2E+6	3.2E+6	2.8E+6	4.3E+6	5.9E+6	2.8E+6
M_T1.rsa	3.9E+7	3.4E+7	3.9E+7	3.9E+7	3.6E+7	4.1E+7	3.3E+7	4.4E+7	-	3.0E+7
nasasrb.RSA	1.4E+7	1.1E+7	1.2E+7	1.2E+7	1.1E+7	1.2E+7	1.2E+7	1.4E+7	2.4E+7	9.4E+6
OBSTCLAE.rsa	1.9E+6	1.1E+6	1.1E+6	9.9E+5	1.0E+6	2.3E+6	9.5E+5	1.8E+6	2.1E+6	1.2E+6
OILPAN.rsa	1.2E+7	9.6E+6	1.1E+7	1.0E+7	9.7E+6	1.3E+7	1.0E+7	1.2E+7	1.2E+7	1.0E+7
onera_dual.kp	9.2E+6	7.2E+6	7.5E+6	7.0E+6	6.7E+6	1.1E+7	1.0E+7	9.4E+6	2.1E+7	6.8E+6
opt1.PSE	5.5E+6	4.8E+6	5.5E+6	5.1E+6	4.8E+6	4.5E+6	5.3E+6	5.9E+6	1.1E+7	4.4E+6
pds10.kp	1.7E+6	2.0E+6	1.8E+6	1.2E+6	1.2E+6	1.7E+6	1.7E+6	2.0E+6	3.2E+6	1.2E+6
pkustk01.PSA	2.4E+6	2.2E+6	2.6E+6	2.3E+6	2.3E+6	2.3E+6	1.9E+6	3.1E+6	3.9E+6	1.9E+6
pkustk02.PSA	1.6E+6	1.4E+6	1.8E+6	1.8E+6	1.7E+6	1.3E+6	1.3E+6	2.3E+6	2.6E+6	1.3E+6
pkustk03.PSA	1.1E+7	8.8E+6	1.0E+7	9.2E+6	9.0E+6	1.0E+7	9.2E+6	1.2E+7	1.7E+7	8.4E+6
pkustk04.PSA	1.2E+7	9.2E+6	1.0E+7	1.0E+7	9.6E+6	9.2E+6	1.2E+7	1.3E+7	2.4E+7	7.4E+6
pkustk05.PSA	1.1E+7	9.3E+6	1.1E+7	1.0E+7	9.5E+6	9.3E+6	1.5E+7	1.2E+7	3.1E+7	9.0E+6
pkustk06.PSA	1.4E+7	1.2E+7	1.4E+7	1.2E+7	1.2E+7	1.2E+7	1.8E+7	1.5E+7	3.7E+7	1.2E+7
pkustk07.PSA	9.5E+6	7.8E+6	9.6E+6	8.7E+6	7.9E+6	8.0E+6	9.4E+6	9.8E+6	2.0E+7	7.8E+6
pkustk08.PSA	1.4E+7	1.1E+7	1.4E+7	1.3E+7	1.2E+7	1.1E+7	1.6E+7	1.4E+7	2.9E+7	1.1E+7
pkustk09.PSA	6.5E+6	5.0E+6	5.7E+6	5.3E+6	5.1E+6	5.5E+6	5.4E+6	6.7E+6	1.1E+7	4.6E+6
pkustk10.PSA	2.1E+7	1.7E+7	2.0E+7	1.9E+7	1.8E+7	2.0E+7	1.8E+7	2.2E+7	3.6E+7	1.6E+7
pkustk11.PSA	3.3E+7	2.8E+7	3.2E+7	3.1E+7	2.9E+7	3.3E+7	4.8E+7	3.5E+7	8.6E+7	2.9E+7
pkustk12.PSA	1.6E+7	1.6E+7	1.8E+7	1.7E+7	1.6E+7	1.6E+7	1.3E+7	2.1E+7	2.6E+7	1.2E+7
pkustk13.PSA	3.6E+7	3.0E+7	3.6E+7	3.2E+7	3.0E+7	3.2E+7	3.4E+7	3.7E+7	7.1E+7	2.8E+7
pkustk14.PSA	1.3E+8	1.1E+8	1.2E+8	1.2E+8	1.1E+8	1.2E+8	1.2E+8	1.3E+8	2.3E+8	9.5E+7
pwt.RSA	2.3E+6	1.8E+6	1.7E+6	1.5E+6	1.5E+6	2.5E+6	1.6E+6	2.2E+6	3.0E+6	1.4E+6
pwtk.RSA	5.6E+7	5.1E+7	5.7E+7	5.3E+7	5.1E+7	6.6E+7	5.6E+7	6.2E+7	1.2E+8	4.8E+7
ramage02.PSE	1.4E+7	1.1E+7	1.4E+7	0.0E+0	1.2E+7	1.2E+7	1.9E+7	1.4E+7	3.6E+7	1.1E+7
s3dkq4m2.rsa	2.1E+7	1.9E+7	2.1E+7	2.0E+7	1.9E+7	2.2E+7	2.4E+7	2.4E+7	4.0E+7	1.8E+7
s3dkt3m2.rsa	2.0E+7	1.7E+7	2.0E+7	1.8E+7	1.8E+7	2.0E+7	1.9E+7	2.2E+7	3.6E+7	1.6E+7
SHIPSEC1.rsa	4.6E+7	4.0E+7	4.5E+7	4.3E+7	4.1E+7	6.4E+7	4.0E+7	5.1E+7	7.3E+7	3.9E+7
SHIPSEC5.rsa	6.1E+7	5.3E+7	6.4E+7	5.7E+7	5.5E+7	9.1E+7	5.5E+7	7.2E+7	1.0E+8	5.0E+7
SHIPSEC8.rsa	4.4E+7	3.6E+7	4.4E+7	3.9E+7	3.7E+7	5.3E+7	4.6E+7	4.8E+7	8.6E+7	4.0E+7

Table 2.2.8: Number of reals used for factors (continued)

Name	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
SHIP_001.rse	1.8E+7	1.5E+7	1.7E+7	0.0E+0	1.5E+7	1.4E+7	1.6E+7	1.9E+7	3.1E+7	1.4E+7
SHIP_003.rsa	7.3E+7	6.1E+7	7.5E+7	6.4E+7	6.1E+7	7.5E+7	7.6E+7	7.7E+7	1.5E+8	5.9E+7
shuttle_eddy.PSA	5.1E+5	4.0E+5	4.4E+5	4.0E+5	4.0E+5	4.9E+5	3.2E+5	6.5E+5	6.5E+5	3.5E+5
skirt.PSA	7.2E+5	5.7E+5	6.0E+5	5.4E+5	5.4E+5	6.4E+5	5.0E+5	7.3E+5	9.6E+5	4.6E+5
Srb1.PSE	1.1E+7	1.1E+7	1.2E+7	1.2E+7	1.1E+7	1.2E+7	9.6E+6	1.4E+7	2.0E+7	1.0E+7
struct3.PSA	6.2E+6	5.1E+6	5.4E+6	5.2E+6	5.1E+6	6.3E+6	5.0E+6	6.4E+6	9.9E+6	4.5E+6
tandem_dual.kp	9.1E+6	7.4E+6	8.2E+6	6.9E+6	6.8E+6	1.2E+7	1.1E+7	9.5E+6	2.3E+7	6.9E+6
tandem_vtx.kp	3.6E+6	2.8E+6	2.6E+6	2.3E+6	2.2E+6	2.3E+6	2.6E+6	3.0E+6	5.4E+6	2.0E+6
THREAD.rsa	3.4E+7	2.4E+7	3.1E+7	2.8E+7	2.5E+7	2.1E+7	2.7E+7	3.0E+7	1.0E+8	2.3E+7
TORSION1.rsa	1.9E+6	1.1E+6	1.1E+6	9.9E+5	1.0E+6	2.3E+6	9.5E+5	1.8E+6	2.1E+6	1.2E+6
trdheim.PSE	2.0E+6	1.8E+6	2.4E+6	2.4E+6	2.4E+6	2.2E+6	1.7E+6	3.3E+6	3.4E+6	1.8E+6
Troll.PSE	7.6E+7	6.4E+7	7.8E+7	7.0E+7	6.6E+7	7.8E+7	9.4E+7	8.2E+7	1.8E+8	6.6E+7
tsyl201.PSE	7.6E+6	6.4E+6	7.5E+6	7.1E+6	6.7E+6	6.1E+6	6.1E+6	8.5E+6	1.3E+7	6.3E+6
vanbody.rsa	7.0E+6	6.3E+6	7.2E+6	6.6E+6	6.4E+6	7.0E+6	5.6E+6	8.4E+6	1.2E+7	5.5E+6
wathen100.mat	2.1E+6	1.7E+6	1.9E+6	1.8E+6	1.8E+6	2.3E+6	2.1E+6	2.5E+6	3.0E+6	1.7E+6
wathen120.mat	2.5E+6	2.1E+6	2.3E+6	2.2E+6	2.1E+6	2.9E+6	2.6E+6	2.9E+6	3.7E+6	2.2E+6
X104.rsa	2.7E+7	2.7E+7	3.3E+7	3.1E+7	2.9E+7	3.1E+7	2.4E+7	3.7E+7	4.2E+7	2.3E+7

Table 2.2.9: Norm of scaled residuals

Name	BCSEXT	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
3dtube.PSA	6.1E-16	1.6E-15	9.3E-16	2.3E-16	1.2E-15	1.5E-15	6.0E-16	5.1E-16	4.7E-16	3.9E-16	3.4E-16
audikw_1.rsa	-	-	-	-	-	-	-	-	-	-	-
barth5.kp	2.0E-16	4.3E-16	5.4E-16	3.1E-16	2.9E-16	2.7E-16	1.8E-16	1.8E-16	1.9E-16	1.4E-16	2.5E-16
bcsstk25.RSA	1.4E-16	1.5E-16	1.4E-16	5.4E-17	2.4E-16	1.8E-16	2.0E-16	2.3E-16	2.3E-16	2.6E-16	1.9E-16
bcsstk29.PSA	3.9E-16	9.4E-16	8.0E-16	4.8E-16	6.9E-16	7.0E-16	3.8E-16	2.9E-16	3.4E-16	3.0E-16	3.5E-16
bcsstk30.PSA	4.5E-16	6.1E-16	1.1E-15	5.9E-16	7.8E-16	8.0E-16	4.2E-16	4.1E-16	3.9E-16	3.7E-16	4.1E-16
bcsstk31.PSA	3.5E-16	5.0E-16	3.2E-16	1.9E-16	6.7E-16	6.1E-16	3.8E-16	2.6E-16	3.3E-16	2.7E-16	3.3E-16
bcsstk32.PSA	3.8E-16	5.2E-16	8.7E-16	2.9E-16	6.9E-16	7.0E-16	4.0E-16	2.9E-16	3.5E-16	3.1E-16	3.6E-16
bcsstk36.RSA	3.8E-16	1.2E-16	9.8E-17	8.0E-17	7.5E-16	5.4E-16	4.8E-16	2.9E-16	4.6E-16	4.7E-16	3.7E-16
bmw7st_1.rsa	3.1E-16	2.3E-17	1.4E-16	8.1E-17	1.2E-16	8.3E-16	1.6E-17	3.1E-16	2.5E-16	4.9E-16	1.2E-16
bmwcra_1.rsa	4.4E-15	2.2E-16	2.5E-16	1.5E-16	1.2E-15	3.9E-15	8.1E-16	4.6E-16	6.4E-16	5.3E-16	3.9E-15
bodyy4.RSA	1.2E-16	1.4E-16	1.7E-16	8.0E-17	1.8E-16	1.5E-16	1.7E-16	1.8E-16	1.5E-16	1.2E-16	1.3E-16
bodyy5.RSA	1.1E-16	1.1E-16	1.9E-16	8.9E-17	1.8E-16	1.5E-16	1.7E-16	1.8E-16	1.4E-16	1.2E-16	1.3E-16
bodyy6.RSA	1.0E-16	1.3E-16	1.5E-16	1.2E-16	1.5E-16	1.3E-16	1.5E-16	1.8E-16	1.4E-16	1.1E-16	1.2E-16

Table 2.2.9: Norm of scaled residuals (continued)

Name	BCSEXT	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
cfd1.RSA	1.2E-15	2.0E-16	2.1E-16	1.2E-16	8.5E-16	1.2E-15	6.0E-16	2.9E-16	4.9E-16	3.3E-16	1.2E-15
cfd2.RSA	5.9E-16	2.9E-16	2.1E-16	1.6E-16	7.1E-16	6.6E-16	5.4E-16	2.8E-16	4.1E-16	3.1E-16	5.6E-16
copter1.kp	2.4E-16	1.0E-15	1.3E-15	6.0E-16	5.3E-16	4.2E-16	2.7E-16	2.3E-16	2.3E-16	1.7E-16	2.6E-16
copter2.kp	3.0E-16	9.3E-16	6.1E-16	2.8E-16	6.8E-16	5.6E-16	3.5E-16	2.4E-16	2.7E-16	1.8E-16	2.9E-16
crankseg_1.rsa	5.9E-16	3.6E-16	2.2E-17	6.2E-17	1.9E-16	6.9E-16	1.4E-15	5.9E-16	7.1E-16	1.2E-15	3.0E-16
crankseg_2.rsa	2.1E-16	3.0E-16	6.0E-16	4.4E-16	4.1E-15	3.8E-16	2.5E-15	6.5E-16	2.1E-15	2.5E-15	1.0E-16
crplat2.PSE	4.7E-16	9.0E-16	1.3E-15	5.2E-16	7.7E-16	7.6E-16	4.1E-16	3.0E-16	3.6E-16	3.3E-16	4.0E-16
ct20stif.PSA	4.0E-16	1.2E-15	6.7E-16	7.3E-16	8.5E-16	8.3E-16	4.5E-16	3.3E-16	3.8E-16	3.2E-16	4.1E-16
CVXBQP1.rsa	1.3E-16	2.6E-16	3.2E-16	2.2E-16	2.0E-16	1.8E-16	1.8E-16	1.7E-16	1.3E-16	1.2E-16	1.3E-16
Fcondp2.PSE	4.4E-16	1.4E-15	1.2E-15	9.8E-16	8.9E-16	9.8E-16	4.9E-16	3.1E-16	3.8E-16	3.3E-16	4.1E-16
finan512.RSA	2.7E-16	5.8E-16	3.8E-16	2.0E-16	5.1E-16	5.0E-16	3.6E-16	1.9E-16	3.0E-16	2.1E-16	2.5E-16
finance256.kp	2.5E-16	5.7E-16	1.0E-15	3.7E-16	3.2E-16	3.7E-16	1.9E-16	1.9E-16	1.9E-16	1.4E-16	2.5E-16
ford1.kp	1.8E-16	3.8E-16	4.1E-16	2.1E-16	2.4E-16	2.5E-16	1.6E-16	1.7E-16	1.7E-16	1.2E-16	2.3E-16
ford2.kp	1.8E-16	3.8E-16	2.0E-16	2.0E-16	2.5E-16	2.5E-16	1.6E-16	1.7E-16	1.7E-16	1.1E-16	2.3E-16
Fullb.PSE	4.7E-16	1.3E-15	9.9E-16	8.7E-16	1.0E-15	1.0E-15	5.1E-16	3.4E-16	3.9E-16	3.4E-16	4.0E-16
gearbox.PSA	4.2E-16	1.2E-15	1.2E-15	8.7E-16	9.3E-16	8.0E-16	5.1E-16	3.8E-16	3.9E-16	3.4E-16	4.0E-16
GRIDGENA.rsa	1.5E-14	4.6E-16	5.8E-16	2.3E-16	5.4E-16	1.5E-14	4.0E-16	1.9E-16	3.7E-16	2.3E-16	1.4E-14
gupta1.PSA	2.5E-15	5.7E-15	6.9E-15	3.6E-16	6.4E-16	5.7E-15	5.1E-16	1.4E-14	4.3E-16	3.9E-16	5.1E-16
gupta2.PSA	3.6E-15	8.8E-15	7.1E-15	6.7E-16	1.8E-15	1.9E-14	-	2.0E-14	4.6E-16	3.9E-16	8.3E-16
gupta3.PSA	7.5E-16	3.4E-15	4.2E-15	2.8E-15	1.9E-15	1.1E-15	1.1E-15	1.1E-15	9.2E-16	1.2E-15	7.8E-16
Halfb.PSE	4.7E-16	1.3E-15	8.3E-16	6.7E-16	8.9E-16	9.3E-16	4.8E-16	3.2E-16	3.8E-16	3.3E-16	4.2E-16
hood.rsa	4.8E-16	2.8E-16	2.9E-16	1.7E-16	5.6E-16	6.0E-16	5.1E-16	2.9E-16	3.7E-16	5.2E-16	4.6E-16
inline_1.rsa	7.8E-16	3.5E-16	8.3E-16	5.6E-16	1.5E-15	1.8E-15	7.8E-16	4.3E-16	5.2E-16	-	9.7E-16
JNLBRNG1.rsa	5.7E-15	2.8E-16	3.8E-16	2.2E-16	3.4E-16	7.0E-15	3.0E-16	1.5E-16	3.0E-16	2.0E-16	6.4E-15
ldoor.rsa	2.8E-16	2.8E-16	3.3E-16	2.5E-16	5.9E-16	4.9E-16	4.9E-16	2.8E-16	3.0E-16	-	2.6E-16
MINSURFO.rsa	2.8E-15	3.5E-16	3.7E-16	2.5E-16	4.4E-16	3.4E-15	3.5E-16	1.5E-16	3.0E-16	1.8E-16	2.9E-15
msc10848.RSA	1.9E-16	2.0E-16	1.4E-16	1.0E-16	9.2E-16	3.5E-16	8.0E-16	5.2E-16	1.0E-15	1.8E-15	1.3E-16
msc23052.RSA	3.7E-16	1.4E-16	1.1E-16	6.9E-17	6.8E-16	5.4E-16	4.6E-16	2.9E-16	4.1E-16	4.4E-16	3.9E-16
M_T1.rsa	3.2E-16	1.6E-16	2.6E-16	1.6E-16	6.9E-16	4.7E-16	5.2E-16	5.2E-16	4.0E-16	-	3.0E-16
nasasrb.RSA	3.7E-16	1.2E-16	1.6E-16	7.4E-17	5.6E-16	4.4E-16	4.7E-16	3.0E-16	3.7E-16	3.6E-16	3.5E-16
OBSTCLAE.rsa	2.2E-15	4.5E-16	4.5E-16	3.0E-16	4.2E-16	3.3E-15	3.1E-16	1.5E-16	3.3E-16	1.8E-16	2.6E-15
OILPAN.rsa	2.2E-16	1.6E-16	1.6E-16	1.1E-16	4.1E-16	3.1E-16	3.6E-16	3.0E-16	2.6E-16	2.9E-16	2.1E-16
onera_dual.kp	1.9E-16	6.0E-16	6.2E-16	3.2E-16	3.0E-16	2.7E-16	1.9E-16	1.8E-16	1.9E-16	1.2E-16	2.3E-16
opt1.PSE	6.1E-16	7.0E-16	1.2E-15	9.9E-16	9.4E-16	1.0E-15	5.2E-16	6.0E-16	4.6E-16	4.8E-16	5.6E-16
pds10.kp	2.7E-16	8.4E-16	2.2E-15	8.5E-16	5.2E-16	6.3E-16	2.8E-16	2.3E-16	2.3E-16	1.4E-16	2.3E-16
pkustk01.PSA	3.3E-16	8.1E-16	9.2E-16	4.5E-16	6.5E-16	5.5E-16	3.7E-16	2.9E-16	3.4E-16	3.1E-16	3.0E-16

Table 2.2.9: Norm of scaled residuals (continued)

Name	BCSEXT	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
pkustk02.PSA	3.7E-16	7.0E-16	7.2E-16	4.3E-16	7.5E-16	5.4E-16	4.0E-16	4.0E-16	3.9E-16	3.8E-16	3.7E-16
pkustk03.PSA	3.5E-16	8.4E-16	5.4E-16	3.9E-16	7.1E-16	5.0E-16	4.1E-16	2.9E-16	3.6E-16	3.1E-16	3.1E-16
pkustk04.PSA	6.0E-16	1.8E-15	2.0E-15	1.3E-15	1.2E-15	9.4E-16	6.0E-16	4.5E-16	5.9E-16	7.7E-16	5.6E-16
pkustk05.PSA	4.3E-16	8.3E-16	7.5E-16	8.2E-16	9.4E-16	8.6E-16	4.7E-16	3.9E-16	3.9E-16	3.4E-16	4.1E-16
pkustk06.PSA	4.1E-16	1.1E-15	9.3E-16	9.1E-16	9.8E-16	8.6E-16	4.8E-16	3.9E-16	4.0E-16	3.4E-16	4.2E-16
pkustk07.PSA	5.3E-16	1.0E-15	8.2E-16	8.0E-16	1.1E-15	9.9E-16	5.9E-16	6.0E-16	5.2E-16	5.3E-16	6.0E-16
pkustk08.PSA	5.3E-16	1.1E-15	9.6E-16	8.1E-16	1.2E-15	1.3E-15	6.0E-16	6.2E-16	5.2E-16	5.3E-16	5.5E-16
pkustk09.PSA	3.4E-16	1.0E-15	6.3E-16	4.3E-16	7.2E-16	5.3E-16	4.0E-16	2.9E-16	3.5E-16	3.1E-16	3.1E-16
pkustk10.PSA	3.5E-16	1.0E-15	7.3E-16	6.0E-16	8.3E-16	4.9E-16	4.5E-16	3.1E-16	3.6E-16	3.2E-16	3.2E-16
pkustk11.PSA	4.1E-16	1.1E-15	9.7E-16	1.2E-15	1.0E-15	8.9E-16	5.1E-16	3.9E-16	4.0E-16	3.4E-16	4.2E-16
pkustk12.PSA	5.3E-16	2.2E-15	2.5E-15	1.9E-15	1.4E-15	9.8E-16	8.0E-16	4.7E-16	7.9E-16	1.1E-15	5.3E-16
pkustk13.PSA	4.2E-16	1.0E-15	8.3E-16	5.3E-16	9.8E-16	9.2E-16	5.1E-16	4.3E-16	4.1E-16	3.7E-16	4.3E-16
pkustk14.PSA	5.2E-16	1.4E-15	1.7E-15	1.1E-15	1.4E-15	1.3E-15	6.9E-16	5.3E-16	5.3E-16	4.4E-16	5.5E-16
pwt.RSA	2.0E-16	4.9E-16	5.6E-16	2.9E-16	3.4E-16	2.9E-16	2.3E-16	1.9E-16	2.2E-16	1.5E-16	2.4E-16
pwtk.RSA	5.6E-16	1.1E-16	1.2E-16	5.9E-17	6.4E-16	5.7E-16	5.8E-16	3.0E-16	4.5E-16	4.2E-16	5.4E-16
ramage02.PSE	7.1E-16	1.1E-15	3.1E-15	2.8E-15	3.5E-15	1.5E-15	1.2E-15	7.0E-16	5.6E-16	9.6E-16	8.0E-16
s3dkq4m2.rsa	4.3E-15	5.1E-16	5.8E-16	2.5E-16	9.9E-16	3.9E-15	7.1E-16	3.1E-16	5.9E-16	4.4E-16	4.0E-15
s3dkt3m2.rsa	4.9E-15	4.1E-16	3.9E-16	2.5E-16	8.6E-16	4.4E-15	6.3E-16	2.6E-16	5.0E-16	4.0E-16	4.6E-15
SHIPSEC1.rsa	5.0E-16	2.5E-16	2.2E-16	3.3E-16	1.0E-15	7.6E-16	7.0E-16	3.2E-16	4.5E-16	3.7E-16	4.0E-16
SHIPSEC5.rsa	6.6E-16	1.2E-15	3.8E-16	3.2E-16	1.2E-15	1.1E-15	7.4E-16	3.3E-16	4.6E-16	3.6E-16	6.1E-16
SHIPSEC8.rsa	4.4E-16	2.7E-16	2.2E-16	1.3E-16	1.2E-15	8.3E-16	7.9E-16	3.4E-16	4.6E-16	3.5E-16	4.5E-16
SHIP_001.rse	6.9E-16	2.2E-16	2.3E-16	1.1E-16	3.3E-16	6.9E-16	1.2E-22	5.7E-16	8.2E-16	8.8E-17	5.6E-16
SHIP_003.rsa	1.5E-15	3.5E-16	3.7E-16	1.5E-16	8.7E-16	1.5E-15	5.0E-16	4.2E-16	4.5E-16	2.6E-16	1.4E-15
shuttle_eddy.PS	1.9E-16	5.4E-16	3.7E-16	2.0E-16	3.6E-16	3.0E-16	2.3E-16	1.9E-16	2.3E-16	1.6E-16	2.4E-16
skirt.PSA	2.4E-16	5.7E-16	3.5E-16	2.7E-16	4.4E-16	3.7E-16	2.7E-16	2.1E-16	2.6E-16	1.9E-16	2.5E-16
Srb1.PSE	4.3E-16	5.8E-16	8.8E-16	5.3E-16	8.6E-16	6.7E-16	4.5E-16	3.1E-16	3.6E-16	3.3E-16	3.7E-16
struct3.PSA	2.8E-16	7.3E-16	6.4E-16	4.9E-16	5.4E-16	4.6E-16	3.4E-16	2.4E-16	2.9E-16	2.2E-16	2.8E-16
tandem_dual.kp	1.9E-16	5.4E-16	6.2E-16	3.2E-16	3.0E-16	2.7E-16	1.9E-16	1.8E-16	1.9E-16	1.2E-16	2.3E-16
tandem_vtx.kp	2.8E-16	1.4E-15	4.9E-16	3.2E-16	6.4E-16	5.0E-16	3.3E-16	2.4E-16	2.8E-16	1.8E-16	2.8E-16
THREAD.rsa	2.9E-15	2.5E-16	2.8E-16	6.7E-17	9.7E-16	2.7E-15	7.3E-16	6.3E-16	6.9E-16	6.1E-16	3.2E-15
TORSION1.rsa	2.2E-15	4.5E-16	4.5E-16	3.0E-16	4.2E-16	3.3E-15	3.1E-16	1.5E-16	3.3E-16	1.8E-16	2.6E-15
trdheim.PSE	4.7E-16	5.0E-16	1.0E-15	7.0E-16	6.2E-16	6.1E-16	4.0E-16	4.5E-16	3.8E-16	4.1E-16	3.7E-16
Troll.PSE	4.9E-16	6.9E-16	8.6E-16	6.1E-16	9.4E-16	1.1E-15	5.1E-16	3.4E-16	3.9E-16	3.3E-16	4.4E-16
tsyl201.PSE	5.5E-16	1.7E-15	1.3E-15	1.7E-15	9.6E-16	1.0E-15	5.0E-16	5.3E-16	4.7E-16	4.6E-16	5.2E-16
vanbody.rsa	2.2E-16	2.0E-16	1.4E-16	5.7E-17	8.3E-16	3.3E-16	5.5E-16	3.1E-16	5.0E-16	2.6E-16	2.7E-16
wathen100.mat	1.6E-16	1.5E-16	2.1E-16	1.1E-16	2.4E-16	2.0E-16	2.3E-16	1.6E-16	1.8E-16	1.8E-16	1.6E-16

Table 2.2.9: Norm of scaled residuals (continued)

Name	BCSEXT	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
wathen120.mat	1.6E-16	1.5E-16	1.8E-16	1.2E-16	2.4E-16	2.0E-16	2.3E-16	1.6E-16	1.8E-16	1.8E-16	1.6E-16
X104.rsa	3.8E-15	2.3E-16	2.3E-16	9.9E-17	1.2E-15	3.6E-15	6.9E-16	4.9E-16	5.9E-16	5.0E-16	3.2E-15

Table 2.2.10: Norm of scaled residuals following a single refinement

Name	BCSEXT	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
3dtube.PSA	6.6E-17	1.7E-16	4.8E-17	3.9E-17	1.6E-16	7.3E-17	1.3E-16	5.6E-17	1.2E-16	1.1E-16	7.0E-17
audikw_1.rsa	-	-	-	-	-	-	-	-	-	-	-
barth5.kp	9.1E-17	1.1E-16	2.0E-16	1.3E-16	6.5E-17	8.7E-17	5.3E-17	4.7E-17	5.5E-17	4.6E-17	8.7E-17
bcsstk25.RSA	1.3E-16	6.5E-17	6.8E-17	4.1E-17	1.6E-16	1.3E-16	1.8E-16	5.2E-17	1.6E-16	2.0E-16	1.5E-16
bcsstk29.PSA	8.1E-17	1.1E-16	1.4E-16	9.0E-17	1.1E-16	9.2E-17	9.3E-17	5.4E-17	9.1E-17	8.7E-17	8.1E-17
bcsstk30.PSA	8.3E-17	1.1E-16	1.3E-16	9.7E-17	1.4E-16	9.3E-17	1.2E-16	6.0E-17	1.1E-16	1.1E-16	8.2E-17
bcsstk31.PSA	7.6E-17	9.9E-17	6.5E-17	2.7E-17	9.9E-17	8.5E-17	8.9E-17	5.3E-17	8.4E-17	7.7E-17	7.7E-17
bcsstk32.PSA	7.8E-17	8.2E-17	8.7E-17	5.9E-17	1.1E-16	8.7E-17	9.6E-17	5.4E-17	9.3E-17	8.7E-17	7.8E-17
bcsstk36.RSA	3.1E-16	8.2E-17	8.2E-17	8.6E-17	4.0E-16	3.1E-16	3.9E-16	5.4E-17	3.9E-16	4.3E-16	3.1E-16
bmw7st_1.rsa	8.3E-17	1.1E-16	8.0E-17	2.3E-16	4.9E-16	4.9E-17	1.2E-16	5.4E-17	2.5E-16	2.5E-16	2.1E-16
bmwcra_1.rsa	3.0E-15	2.4E-16	2.3E-16	1.5E-16	5.1E-16	3.1E-15	5.1E-16	6.1E-17	5.2E-16	5.1E-16	3.1E-15
bodyy4.RSA	6.9E-17	5.1E-17	7.5E-17	6.4E-17	1.0E-16	6.9E-17	9.9E-17	4.9E-17	1.0E-16	9.9E-17	7.5E-17
bodyy5.RSA	7.1E-17	5.7E-17	9.1E-17	7.4E-17	1.0E-16	7.2E-17	1.0E-16	4.9E-17	9.9E-17	1.0E-16	6.7E-17
bodyy6.RSA	6.6E-17	5.6E-17	9.3E-17	5.3E-17	9.6E-17	7.0E-17	1.1E-16	5.0E-17	1.1E-16	1.0E-16	6.9E-17
cfd1.RSA	7.2E-16	1.5E-16	1.4E-16	8.1E-17	3.4E-16	7.2E-16	3.4E-16	5.3E-17	3.4E-16	3.4E-16	7.2E-16
cfd2.RSA	4.1E-16	1.7E-16	2.0E-16	9.6E-17	3.1E-16	4.1E-16	3.1E-16	5.3E-17	3.1E-16	3.1E-16	4.1E-16
copter1.kp	9.1E-17	1.1E-16	2.8E-16	1.5E-16	7.2E-17	8.8E-17	5.4E-17	5.0E-17	5.6E-17	5.0E-17	8.7E-17
copter2.kp	8.8E-17	1.1E-16	6.8E-17	9.2E-17	7.8E-17	8.8E-17	6.3E-17	5.0E-17	6.1E-17	5.2E-17	8.3E-17
crankseg_1.rsa	6.1E-16	3.1E-18	1.1E-16	4.5E-16	1.6E-15	5.2E-16	5.3E-16	7.8E-17	1.2E-15	8.9E-16	1.7E-16
crankseg_2.rsa	2.8E-16	3.6E-18	1.0E-15	6.3E-16	7.1E-16	2.4E-16	1.8E-16	8.0E-17	7.1E-16	3.6E-16	4.0E-16
crplat2.PSE	9.6E-17	1.1E-16	1.6E-16	9.3E-17	1.2E-16	9.2E-17	9.8E-17	5.5E-17	9.5E-17	9.4E-17	8.1E-17
ct20stif.PSA	7.9E-17	1.0E-16	9.4E-17	6.3E-17	1.2E-16	8.8E-17	1.0E-16	5.5E-17	9.5E-17	9.2E-17	8.0E-17
CVXBQP1.rsa	1.2E-16	1.4E-16	2.2E-16	1.5E-16	1.2E-16	1.2E-16	1.2E-16	4.9E-17	1.2E-16	1.2E-16	1.2E-16
Fcondp2.PSE	8.9E-17	1.3E-16	1.6E-16	1.3E-16	1.2E-16	8.7E-17	1.1E-16	5.6E-17	9.7E-17	9.4E-17	7.9E-17
finan512.RSA	1.2E-16	5.9E-17	1.2E-16	8.6E-17	1.6E-16	1.3E-16	1.5E-16	4.9E-17	1.4E-16	1.3E-16	1.2E-16
finance256.kp	8.4E-17	1.1E-16	1.4E-16	9.3E-17	6.3E-17	7.9E-17	5.1E-17	4.6E-17	5.3E-17	3.8E-17	7.9E-17
ford1.kp	8.4E-17	1.1E-16	1.5E-16	1.0E-16	5.9E-17	8.0E-17	4.6E-17	4.5E-17	5.2E-17	3.9E-17	8.1E-17
ford2.kp	8.5E-17	1.1E-16	1.0E-16	5.1E-17	5.9E-17	8.1E-17	4.7E-17	4.5E-17	5.2E-17	3.0E-17	8.1E-17
Fullb.PSE	8.9E-17	1.1E-16	1.5E-16	9.5E-17	1.3E-16	8.9E-17	1.1E-16	5.6E-17	1.0E-16	9.7E-17	7.9E-17

Table 2.2.10: Norm of scaled residuals following a single refinement (continued)

Name	BCSEXT	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
gearbox.PSA	8.3E-17	1.2E-16	1.3E-16	8.5E-17	1.3E-16	9.2E-17	1.1E-16	5.7E-17	1.0E-16	9.8E-17	8.3E-17
GRIDGENA.rsa	1.1E-14	1.9E-16	2.2E-16	1.3E-16	2.2E-16	6.9E-15	2.4E-16	5.1E-17	2.4E-16	2.2E-16	6.9E-15
gupta1.PSA	7.1E-17	1.2E-16	8.9E-17	6.3E-17	6.0E-17	7.7E-17	5.3E-17	7.7E-17	6.1E-17	4.7E-17	7.6E-17
gupta2.PSA	7.3E-17	1.2E-16	8.6E-17	5.8E-17	6.2E-17	7.7E-17	-	8.1E-17	5.9E-17	4.6E-17	7.4E-17
gupta3.PSA	8.9E-17	1.2E-16	2.4E-16	1.6E-16	6.7E-17	9.6E-17	6.2E-17	9.2E-17	6.2E-17	5.5E-17	8.9E-17
Halfb.PSE	9.0E-17	1.3E-16	1.8E-16	7.7E-17	1.2E-16	8.9E-17	1.1E-16	5.5E-17	9.8E-17	9.4E-17	7.9E-17
hood.rsa	5.6E-16	3.2E-16	3.5E-16	2.3E-16	4.1E-16	5.8E-16	4.2E-16	5.4E-17	4.2E-16	4.2E-16	5.7E-16
inline_1.rsa	1.1E-15	5.6E-17	9.2E-16	7.3E-16	4.7E-16	1.0E-15	4.6E-16	6.4E-17	4.6E-16	-	1.3E-15
JNLBRNG1.rsa	4.7E-15	3.3E-16	2.8E-16	1.7E-16	2.1E-16	4.5E-15	2.2E-16	4.8E-17	2.2E-16	2.0E-16	4.4E-15
ldoor.rsa	2.7E-16	1.1E-16	2.8E-16	2.6E-16	3.2E-16	2.7E-16	3.2E-16	5.5E-17	3.1E-16	-	2.7E-16
MINSURFO.rsa	2.1E-15	1.9E-16	3.2E-16	1.9E-16	1.9E-16	2.3E-15	1.9E-16	4.8E-17	1.9E-16	1.8E-16	2.3E-15
msc10848.RSA	1.5E-16	4.1E-17	6.9E-17	1.6E-16	1.7E-15	1.1E-16	7.2E-16	6.5E-17	1.4E-15	2.6E-15	1.2E-16
msc23052.RSA	3.7E-16	1.1E-16	1.3E-16	6.4E-17	4.2E-16	3.7E-16	3.7E-16	5.4E-17	4.1E-16	4.2E-16	3.4E-16
M_T1.rsa	3.3E-16	1.2E-16	2.3E-16	1.9E-16	4.5E-16	3.3E-16	4.3E-16	6.7E-17	4.2E-16	-	3.3E-16
nasasrb.RSA	3.0E-16	1.2E-16	1.1E-16	7.4E-17	3.3E-16	2.9E-16	3.3E-16	5.4E-17	3.3E-16	3.3E-16	2.9E-16
OBSTCLAE.rsa	1.8E-15	1.3E-16	2.2E-16	1.3E-16	2.0E-16	1.7E-15	1.8E-16	4.8E-17	1.8E-16	1.8E-16	1.8E-15
OILPAN.rsa	2.2E-16	8.2E-17	1.6E-16	1.4E-16	2.7E-16	2.2E-16	2.8E-16	5.5E-17	2.7E-16	2.7E-16	2.2E-16
onera_dual.kp	8.5E-17	1.1E-16	2.1E-16	1.8E-16	5.9E-17	8.0E-17	4.9E-17	4.4E-17	5.1E-17	3.5E-17	8.1E-17
opt1.PSE	9.9E-17	1.2E-16	2.0E-16	1.3E-16	1.9E-16	1.0E-16	1.5E-16	7.4E-17	1.5E-16	1.5E-16	8.8E-17
pds10.kp	8.7E-17	9.2E-17	1.1E-16	7.7E-17	7.1E-17	7.9E-17	5.2E-17	4.4E-17	5.3E-17	4.1E-17	7.7E-17
pkustk01.PSA	7.6E-17	1.3E-16	1.4E-16	1.1E-16	1.2E-16	8.0E-17	9.4E-17	5.3E-17	9.4E-17	8.8E-17	7.6E-17
pkustk02.PSA	7.9E-17	1.2E-16	1.3E-16	9.0E-17	1.4E-16	8.1E-17	1.2E-16	5.8E-17	1.1E-16	1.2E-16	7.9E-17
pkustk03.PSA	7.2E-17	1.2E-16	1.1E-16	6.3E-17	1.2E-16	7.5E-17	9.8E-17	5.4E-17	9.3E-17	9.0E-17	7.1E-17
pkustk04.PSA	8.2E-17	2.0E-16	1.4E-16	1.2E-16	2.2E-16	8.8E-17	1.7E-16	6.0E-17	1.7E-16	1.9E-16	8.1E-17
pkustk05.PSA	8.1E-17	1.3E-16	1.4E-16	8.3E-17	1.4E-16	8.8E-17	1.1E-16	5.7E-17	1.0E-16	1.0E-16	8.1E-17
pkustk06.PSA	8.0E-17	1.3E-16	1.3E-16	9.2E-17	1.4E-16	8.8E-17	1.1E-16	5.7E-17	1.0E-16	1.0E-16	8.2E-17
pkustk07.PSA	8.3E-17	2.8E-16	1.5E-16	9.3E-17	2.3E-16	9.1E-17	1.8E-16	7.7E-17	1.7E-16	1.8E-16	8.3E-17
pkustk08.PSA	8.3E-17	2.1E-16	2.0E-16	9.9E-17	2.3E-16	9.4E-17	1.8E-16	7.8E-17	1.7E-16	1.8E-16	8.4E-17
pkustk09.PSA	7.2E-17	1.1E-16	1.1E-16	1.0E-16	1.2E-16	7.6E-17	9.6E-17	5.4E-17	9.2E-17	8.7E-17	7.2E-17
pkustk10.PSA	7.1E-17	1.2E-16	1.5E-16	9.9E-17	1.2E-16	7.4E-17	1.0E-16	5.4E-17	9.7E-17	9.2E-17	7.1E-17
pkustk11.PSA	8.1E-17	1.4E-16	1.4E-16	9.1E-17	1.4E-16	8.9E-17	1.1E-16	5.8E-17	1.0E-16	1.0E-16	8.2E-17
pkustk12.PSA	7.9E-17	2.9E-16	1.2E-16	1.5E-16	2.3E-16	8.6E-17	2.1E-16	6.0E-17	2.1E-16	2.0E-16	8.0E-17
pkustk13.PSA	7.9E-17	1.3E-16	1.0E-16	6.5E-17	1.5E-16	8.8E-17	1.2E-16	5.9E-17	1.1E-16	1.1E-16	8.0E-17
pkustk14.PSA	8.2E-17	1.9E-16	1.1E-16	6.8E-17	1.9E-16	9.3E-17	1.5E-16	6.9E-17	1.4E-16	1.4E-16	8.3E-17
pwt.RSA	8.0E-17	1.1E-16	1.7E-16	1.2E-16	6.8E-17	8.6E-17	6.4E-17	5.1E-17	6.4E-17	5.3E-17	8.7E-17
pwtk.RSA	4.3E-16	1.2E-16	1.6E-16	7.9E-17	4.1E-16	4.3E-16	4.4E-16	5.5E-17	4.1E-16	4.1E-16	4.3E-16

Table 2.2.10: Norm of scaled residuals following a single refinement (continued)

Name	BCSEXT	CHOLMOD	MA57	MUMPS	Oblio	PARDISO	SPOOLES	SPRSBLK	TAUCS	UMFPACK	WSMP
ramage02.PSE	1.0E-16	2.1E-16	2.6E-16	1.8E-16	5.7E-16	1.1E-16	4.8E-16	9.0E-17	1.8E-16	4.0E-16	1.0E-16
s3dkq4m2.rsa	3.1E-15	3.0E-16	3.0E-16	1.7E-16	4.4E-16	3.1E-15	4.5E-16	5.4E-17	4.4E-16	4.4E-16	3.0E-15
s3dkt3m2.rsa	3.1E-15	1.9E-16	2.1E-16	1.2E-16	4.0E-16	3.1E-15	4.0E-16	5.3E-17	4.0E-16	4.0E-16	3.0E-15
SHIPSEC1.rsa	2.2E-16	1.0E-16	1.3E-16	6.4E-17	2.2E-16	2.3E-16	2.3E-16	5.5E-17	2.2E-16	2.1E-16	2.2E-16
SHIPSEC5.rsa	3.2E-16	1.3E-16	2.2E-16	1.0E-16	2.4E-16	3.2E-16	2.3E-16	5.6E-17	2.3E-16	2.2E-16	3.3E-16
SHIPSEC8.rsa	2.1E-16	1.0E-16	9.7E-17	6.1E-17	2.1E-16	2.2E-16	2.2E-16	5.6E-17	2.3E-16	2.2E-16	2.0E-16
SHIP_001.rse	4.3E-16	1.3E-16	1.1E-16	9.5E-17	1.2E-16	4.6E-16	3.9E-23	7.6E-17	5.0E-16	1.0E-16	4.5E-16
SHIP_003.rsa	7.3E-16	1.8E-16	1.9E-16	1.1E-16	2.2E-16	8.2E-16	2.3E-16	5.9E-17	2.6E-16	2.3E-16	7.1E-16
shuttle_eddy.PS	8.0E-17	1.0E-16	1.2E-16	7.9E-17	6.9E-17	8.5E-17	6.4E-17	5.1E-17	6.6E-17	5.5E-17	8.6E-17
skirt.PSA	8.0E-17	1.1E-16	1.2E-16	9.1E-17	8.0E-17	8.7E-17	7.2E-17	5.1E-17	7.1E-17	5.6E-17	8.3E-17
Srb1.PSE	9.2E-17	1.1E-16	1.5E-16	9.6E-17	1.2E-16	8.8E-17	1.0E-16	5.5E-17	9.6E-17	9.3E-17	7.9E-17
struct3.PSA	7.7E-17	1.1E-16	2.4E-16	1.8E-16	8.4E-17	8.4E-17	7.8E-17	5.2E-17	7.5E-17	6.5E-17	7.8E-17
tandem_dual.kp	8.6E-17	1.1E-16	2.1E-16	1.4E-16	6.0E-17	8.0E-17	4.9E-17	4.4E-17	5.1E-17	3.4E-17	8.1E-17
tandem_vtx.kp	9.0E-17	1.1E-16	9.4E-17	6.3E-17	7.9E-17	8.6E-17	6.4E-17	4.9E-17	6.3E-17	5.2E-17	8.4E-17
THREAD.rsa	2.1E-15	1.4E-16	1.9E-16	8.3E-17	6.8E-16	2.1E-15	6.5E-16	7.9E-17	6.9E-16	6.7E-16	2.1E-15
TORSION1.rsa	1.8E-15	1.3E-16	2.2E-16	1.3E-16	2.0E-16	1.7E-15	1.8E-16	4.8E-17	1.8E-16	1.8E-16	1.8E-15
trdheim.PSE	9.3E-17	1.1E-16	2.0E-16	1.3E-16	1.4E-16	8.7E-17	1.2E-16	6.5E-17	1.2E-16	1.2E-16	8.1E-17
Troll.PSE	9.1E-17	1.1E-16	9.6E-17	5.9E-17	1.3E-16	9.4E-17	1.1E-16	5.6E-17	1.0E-16	9.6E-17	8.2E-17
tsyl201.PSE	9.9E-17	1.6E-16	2.1E-16	1.5E-16	1.8E-16	9.4E-17	1.4E-16	7.2E-17	1.4E-16	1.4E-16	8.6E-17
vanbody.rsa	2.5E-16	4.6E-17	9.4E-17	1.8E-16	4.4E-16	2.7E-16	4.6E-16	5.5E-17	5.9E-16	4.1E-16	1.7E-16
wathen100.mat	1.5E-16	9.0E-17	1.6E-16	1.6E-16	1.8E-16	1.6E-16	1.8E-16	1.5E-16	1.8E-16	1.8E-16	1.5E-16
wathen120.mat	1.5E-16	6.8E-17	1.4E-16	1.3E-16	1.8E-16	1.6E-16	1.8E-16	1.5E-16	1.8E-16	1.8E-16	1.5E-16
X104.rsa	2.0E-15	1.2E-16	1.3E-16	6.9E-17	4.0E-16	2.0E-15	4.1E-16	6.5E-17	4.1E-16	4.1E-16	2.0E-15

3 Indefinite matrices

3.1 Test matrices

Our indefinite test matrices come from many of the same sources as the positive definite ones described in Section 2.1. In addition, Mario Arioli (RAL) (MA) generated the Darcy and Stokes examples, Olaf Schenk (Universität Basel) (OS) provided the c-* examples, and Miroslav Tuma (Academy of Sciences of the Czech Republic) (MT) generated the mining examples, while other optimization applications came from the Maros and Meszaros (1999) (M2) quadratic programming (QP) collection. The test set currently comprises 61 numerically indefinite problems.

As before, the matrices are available from

`ftp://ftp.numerical.rl.ac.uk/pub/matrices/symmetric/`

in the subdirectory `indef`, and as part of the University of Florida (UF) Sparse Matrix Collection (`www.cise.ufl.edu/~davis/sparse/`) .

Table 3.1.1: Indefinite test matices and their characteristics. † indicates a structurally singular matrix

Name	n	nnz	Subset?	Application
A0NSDSIL.rsa	80016	200021	√	Linear Complementarity problem (CUTEr)
A2NNSNSL.rsa	80016	196115	√	Linear Complementarity problem (CUTEr)
A5ESINDL.rsa	60008	145004	√	Linear Complementarity problem (CUTEr)
AUG2D.mat †	29008	38416		Expanded system—2D PDE (CUTEr)
AUG2DC.mat †	30200	40000		Expanded system—2D PDE (CUTEr)
AUG3D.mat †	24300	34992		Expanded system—3D PDE (CUTEr)
AUG3DCQP.mat	35543	105372		Expanded system—3D PDE (CUTEr)
bcsstk35.RSA	30237	740200		Stiffness matrix—automobile seat frame (UF)
bcsstk37.RSA	25503	583240		Stiffness matrix—track ball (UF)
bcsstk39.RSA	46772	1068033		Stiffness matrix—shuttle rocket booster (UF)
BLOCKQP1.rsa	60012	340032	√	QP with block structure (CUTEr)
BLOWEYA.rsa	30004	90006		Cahn-Hilliard problem (CUTEr)
bmw3_2.rsa	227362	5757996	√	Linear static analysis—car body (PA)
BOYD1.RSA	93279	745507	√	KKT matrix—Convex QP (CUTEr)
BOYD2.RSA	466316	890093	√	KKT matrix—Convex QP (CUTEr)
BRAINPC2.rsa	27607	96732		Biological model (CUTEr)
BRATU3D.RSA	27792	88627		3D Bratu problee (CUTEr)
c-55.RSA	32780	218115		Optimization model (OS)
c-58.RSA	37595	295076		Optimization model (OS)
c-59.RSA	41282	260909		Optimization model (OS)
c-62.RSA	41731	300537		Optimization model (OS)
c-63.RSA	44234	239469		Optimization model (OS)
c-68.RSA	64810	315408	√	Optimization model (OS)
c-69.RSA	67458	345714	√	Optimization model (OS)
c-70.RSA	68924	363955	√	Optimization model (OS)
c-71.RSA	76638	468096	√	Optimization model (OS)
c-72.RSA	84064	395811	√	Optimization model (OS)
CONT-201.RSA	80595	249996	√	KKT matrix—Convex QP (M2)
CONT-300.RSA	180895	562496	√	KKT matrix—Convex QP (M2)
copter2.rsa	55476	407714	√	Helicopter rota blade (KP)
crystk02.RSA	13965	491274		Stiffness matrix—crystal free vibration (UF)
crystk03.RSA	24696	887937		Stiffness matrix—crystal free vibration (UF)

Table 3.1.1: Indefinite test matices and their characteristics (continued). † indicates a structurally singular matrix

Name	n	nnz	Subset?	Application
DARCY003.rsa	389874	1167685	√	KKT matrix from Darcy's equation (MA)
dawson5.rsa	51537	531157	√	Aeroplane aactuator sytem (UF)
DIXMAANL.rsa	60000	179999	√	Dixon-Maany optimization example (CUTEr)
DTOC.mat †	24993	34986		Discrete-time optimal control (CUTEr)
D_PRETOK.rsa	182730	885416	√	Straz pod Ralskem mine model (MT)
HELM2D03.rsa	392257	1567096	√	Helmholtz problem (MA)
HELM3D01.rsa	32226	230335		Helmholtz problem (MA)
K1_SAN.rsa †	67759	303364	√	Straz pod Ralskem mine model (MT)
LINVERSE.rsa	11999	59988		Matrix inverse approximation (CUTEr)
mario001.rsa	38434	114643		Stokes equation (MA)
mario002.rsa	389874	1167685		Stokes equation (MA)
NCVXBQP1.rsa	50000	249984	√	Nonconvex QP Hessian (CUTEr)
NCVXQP1.mat	12111	47648		KKT matrix—nonconvex QP (CUTEr)
NCVXQP3.rsa	75000	324982	√	KKT matrix—nonconvex QP (CUTEr)
NCVXQP5.rsa	62500	287481	√	KKT matrix—nonconvex QP (CUTEr)
NCVXQP7.rsa	87500	362481	√	KKT matrix—nonconvex QP (CUTEr)
NCVXQP9.mat	16554	31547		KKT matrix—nonconvex QP (CUTEr)
olesnik0.rsa	88263	402623	√	Straz pod Ralskem mine model (MT)
qa8fk.RSA	66127	863353	√	FE matrix from 3D acoustics (UF)
SIT100.rsa	10262	34094		Straz pod Ralskem mine model (MT)
SPARSINE.rsa	50000	799494	√	Structural optimization (CUTEr)
SPMSRTLS.rsa	29995	129971		Sparse matrix square root (CUTEr)
stokes128.mat	49666	295938	√	Stokes equation (MA)
stokes64.mat	12546	74242		Stokes equation (AW)
stokes64s.mat	12546	74242		Stokes equation (AW)
tuma1.mat	22967	76199		Mine model (MT)
tuma2.mat	12992	42935		Mine model (MT)
TURON_M.rsa	189924	912345	√	Model of uranium mine (MT)
vibrobox.RSA	12328	177578		Vibroacoustic problem (UF)

3.2 Individual package comparisons

In this section, we report statistics when running the packages outlined in Table 1.1 on the indefinite test set described in Section 3.1. The test environment is identical to that described in Section 2.2, excepting that now numerical pivoting is important and we need to assess the effects of different ordering/pivoting and scaling strategies. Note that `SPRSBLKLLT` and `TAUCS` were not designed for indefinite problems, and thus are omitted from these tests. Moreover, many of the other solvers only offer limited forms of pivoting, and thus give no stability guarantees. However, at the authors' suggestion, we have included results for both the symmetric (here denoted `MUMPS`) and unsymmetric (`MUMPS_US`) versions of `MUMPS` in our indefinite tests.

We consider four pivoting strategies. The first (default) is to use the default pivoting strategy suggested for the solver in the indefinite case. The second is only available if the code has a threshold parameter u (see, Duff, Erisman and Reid, 1986, §5.4) that can be set by the user. In this case, we set $u = 10^{-10}$. This has the potential to allow the code to stick closer to the ordering suggested by the analysis phase, but also allows the possibility of large growth. If a package does not provide any means of setting u, we simply repeat the results obtained with the default strategy. The third and fourth strategies are to pre-scale the matrix (using the HSL package `MC30`) to try to

equilibrate the entries prior to factorization, and then to use default and small threshold pivoting, respectively, on the resulting scaled system. These scaling strategies are only applied to solvers that do not do there own internal scaling.

Once again we report a return code from each run, the total CPU time required (as well as separate times for the analyse, [2] factorization and solution phases), the minimum memory that would be required for a successful run along with that actually used, counts of the sizes of integer and real arrays needed to solve the problem (as well as separate counts for those required to hold the factors), and the norms of the residuals $Ax - b$ both following the solution phase and following a single iterative refinement.

A return code of 0 indicates a successful run. Other values include

-2. An allocation error occurred —too much storage was required;

-6. The factorization failed as the matrix was reported to be singular and the solver was unable to proceed;

-13. The normalized residual $\|Ax - b\|/(\|A\|\|x\| + \|b\|)$ exceeded 0.0001;

-14. The factorization failed to find a satisfactory pivot;

-17. The factorization failed with internal flag -513 (`BCSLIB-EXT` only); and

-99. The CPU limit was reached;

Positive values are associated with a warning:

6. The run was successful, but the matrix was reported to be singular.

7. The run was successful, but one or more pivots were perturbed to avoid breakdown; and

20. The run was successful, but the computed solution was inaccurate because of ill-conditioning.

[2] Since the analyis is the same for all four pivoting strategies, we only report the analyse time in Section 3.2.

3.2.1 Default runs

Here are the results obtained with the (solver-dependent) default threshold pivoting parameter.

Table 3.2.1.1: Return code

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	0	0	0	0	0	0	0	0	0
A2NNSNSL.rsa	0	0	0	0	0	0	0	0	-14
A5ESINDL.rsa	0	0	0	0	0	0	-2	0	0
AUG2D.mat	-6	6	-5	-6	0	7	-2	0	-14
AUG2DC.mat	-6	20	-5	-6	20	20	-2	20	-14
AUG3D.mat	-6	6	-5	-6	-99	7	-2	0	-14
AUG3DCQP.mat	20	0	0	0	0	0	-2	0	0
bcsstk35.RSA	0	0	0	0	0	0	0	0	0
bcsstk37.RSA	0	0	0	0	0	0	0	0	0
bcsstk39.RSA	0	0	0	0	0	0	0	0	0
BLOCKQP1.rsa	0	0	0	0	0	7	-2	0	0
BLOWEYA.rsa	-99	0	0	0	-99	7	-99	0	-14
bmw3_2.rsa	0	0	0	0	0	0	0	-2	0
BOYD1.RSA	-99	0	0	-99	-2	0	-2	0	0
BOYD2.RSA	-99	0	0	-99	-99	0	-99	-99	0
BRAINPC2.rsa	0	0	2	0	0	7	0	0	-14
BRATU3D.RSA	0	0	0	0	0	7	0	0	-14
c-55.RSA	0	0	0	0	0	0	0	0	0
c-58.RSA	0	0	0	0	0	0	0	0	0
c-59.RSA	0	0	0	0	0	0	0	0	0
c-62.RSA	0	0	0	0	0	0	0	0	0
c-63.RSA	0	0	0	0	0	0	0	0	0
c-68.RSA	0	0	0	0	0	0	0	0	0
c-69.RSA	0	0	0	0	0	0	0	0	0
c-70.RSA	0	0	0	0	0	0	0	0	0
c-71.RSA	0	0	0	0	0	0	0	-2	0
c-72.RSA	0	0	0	0	0	0	0	0	0
CONT-201.RSA	-17	0	0	0	0	7	0	0	-14
CONT-300.RSA	-17	0	0	0	0	7	0	0	-14
copter2.rsa	0	0	0	0	0	0	0	0	0
crystk02.RSA	0	0	0	0	0	7	0	0	-14
crystk03.RSA	0	0	0	0	0	7	0	0	-14
DARCY003.rsa	0	0	0	0	0	7	0	0	-14

Table 3.2.1.1: Return code (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
dawson5.rsa	0	0	0	0	0	0	0	0	0
DIXMAANL.rsa	0	0	0	0	0	0	0	0	0
DTOC.mat	-99	20	-5	-6	0	20	-13	20	-14
D_PRETOK.rsa	20	0	0	20	20	7	20	20	-14
HELM2D03.rsa	0	0	0	0	0	0	0	0	0
HELM3D01.rsa	0	0	0	0	0	0	0	0	0
K1_SAN.rsa	-99	6	-5	-6	0	7	0	0	-14
LINVERSE.rsa	0	0	0	0	0	0	0	0	0
mario001.rsa	0	0	0	0	0	7	0	0	-14
mario002.rsa	0	0	0	0	0	7	0	0	-14
NCVXBQP1.rsa	0	0	0	0	0	0	0	0	0
NCVXQP1.mat	-99	20	0	20	20	20	-99	20	-14
NCVXQP3.rsa	-99	0	0	0	-2	20	-2	0	-14
NCVXQP5.rsa	-99	0	0	0	-2	7	-99	0	-14
NCVXQP7.rsa	-99	0	0	0	-2	7	-2	-2	-14
NCVXQP9.mat	0	0	0	0	0	7	0	0	-14
olesnik0.rsa	0	20	20	0	20	7	20	0	-14
qa8fk.RSA	0	0	0	0	0	7	0	0	0
SIT100.rsa	20	0	20	20	20	7	20	0	-14
SPARSINE.rsa	-99	-99	-99	-99	-99	-99	-2	-99	-99
SPMSRTLS.rsa	0	0	0	0	0	0	0	0	0
stokes128.mat	20	20	20	20	0	7	0	20	-14
stokes64.mat	0	20	20	20	0	7	20	20	-14
stokes64s.mat	20	20	20	0	0	7	20	20	-14
tuma1.mat	0	0	0	0	0	7	0	0	-14
tuma2.mat	0	0	0	0	0	7	0	0	-14
TURON_M.rsa	0	0	0	0	20	7	20	20	-14
vibrobox.RSA	20	20	20	20	20	20	20	20	20

Table 3.2.1.2: Total time (CPU seconds)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	4.97	0.78	2.62	5.53	4.25	2.72	49.60	16.90	3.93
A2NNSNSL.rsa	5.73	0.85	2.66	4.77	4.03	2.65	44.40	15.40	-
A5ESINDL.rsa	3.34	0.49	1.79	3.58	2.22	1.29	-	7.19	2.88

Table 3.2.1.2: Total time (CPU seconds) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
AUG2D.mat	-	273.84	-	-	56.70	0.98	-	0.09	-
AUG2DC.mat	-	325.07	-	-	75.60	1.03	-	0.09	-
AUG3D.mat	-	999.90	-	-	-	1.60	-	0.08	-
AUG3DCQP.mat	20.18	2.73	4.91	3.68	10.90	2.59	-	10.40	4.79
bcsstk35.RSA	3.08	2.49	3.62	4.55	4.18	2.94	4.49	5.76	5.75
bcsstk37.RSA	5.46	2.56	3.69	4.55	16.10	3.20	7.54	5.03	4.98
bcsstk39.RSA	8.15	6.29	8.76	10.80	10.90	7.60	10.70	12.80	10.90
BLOCKQP1.rsa	26.89	1.07	3.75	24.43	21.10	4.07	-	24.20	85.06
BLOWEYA.rsa	-	0.32	1.44	1.17	-	0.72	-	2.03	-
bmw3_2.rsa	309.97	84.83	87.74	106.72	481.00	71.33	244.00	-	91.83
BOYD1.RSA	-	59.56	35.97	-	-	64.94	-	1370.00	379.20
BOYD2.RSA	-	7.07	49.94	-	-	74.30	-	-	421.62
BRAINPC2.rsa	1.39	0.41	0.70	1.28	0.93	0.69	14.00	2.55	-
BRATU3D.RSA	145.41	69.56	25.05	47.97	219.00	11.72	47.60	51.10	-
c-55.RSA	9.77	17.26	20.89	13.63	95.40	8.16	74.10	84.10	49.81
c-58.RSA	10.45	12.82	13.89	11.52	856.00	6.54	112.00	29.40	51.13
c-59.RSA	10.87	18.68	37.16	17.06	147.00	9.78	73.10	22.60	48.19
c-62.RSA	19.03	38.26	79.61	31.01	1480.00	18.29	206.00	183.00	93.31
c-63.RSA	6.80	7.53	10.83	7.69	31.90	5.12	44.20	13.60	18.92
c-68.RSA	19.73	33.17	64.23	32.71	389.00	18.89	423.00	100.00	106.89
c-69.RSA	10.20	10.54	14.85	10.22	47.80	7.03	52.40	30.90	29.49
c-70.RSA	11.68	15.75	17.90	13.45	71.70	9.07	170.00	33.80	32.41
c-71.RSA	44.59	102.63	109.74	78.08	903.00	47.54	753.00	-	846.34
c-72.RSA	12.16	13.22	20.24	13.96	117.00	9.23	62.80	27.10	42.71
CONT-201.RSA	-	17.64	6.43	17.29	18.00	5.90	17.90	18.70	-
CONT-300.RSA	-	47.80	19.66	91.23	48.70	16.08	59.20	54.50	-
copter2.rsa	17.95	18.86	20.70	22.65	26.80	16.74	30.10	58.00	16.52
crystk02.RSA	5.58	5.95	6.40	8.11	8.63	5.91	8.03	19.30	-
crystk03.RSA	14.43	15.77	17.00	21.11	23.00	14.45	19.70	50.00	-
DARCY003.rsa	40.09	9.96	29.58	27.53	26.90	21.94	77.90	60.40	-
dawson5.rsa	6.75	5.07	6.75	7.05	7.78	5.54	11.60	10.70	6.80
DIXMAANL.rsa	2.37	0.64	2.48	2.05	2.02	1.51	4.39	6.25	1.73
DTOC.mat	-	14.86	-	-	19.30	0.49	-	0.07	-
D_PRETOK.rsa	29.86	22.07	27.73	28.53	38.60	22.48	55.10	758.00	-
HELM2D03.rsa	48.30	31.06	37.60	39.54	42.20	29.86	108.00	79.60	36.16
HELM3D01.rsa	9.58	10.53	10.82	12.41	14.30	8.61	17.40	38.20	9.32

Table 3.2.1.2: Total time (CPU seconds) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
K1_SAN.rsa	-	5.61	-	-	6.43	5.07	10.60	45.90	-
LINVERSE.rsa	0.37	0.11	0.35	0.35	0.28	0.24	0.66	0.25	0.33
mario001.rsa	2.45	0.65	2.00	1.96	1.85	1.53	3.33	2.67	-
mario002.rsa	40.19	9.91	29.55	27.46	26.90	22.00	78.00	60.30	-
NCVXBQP1.rsa	4.84	4.14	5.08	5.02	8.82	3.50	8.94	21.50	3.97
NCVXQP1.mat	-	6.06	18.57	15.29	1300.00	2.89	-	26.50	-
NCVXQP3.rsa	-	188.75	495.62	207.26	-	60.20	-	1640.00	-
NCVXQP5.rsa	-	51.95	72.31	56.47	-	28.68	-	542.00	-
NCVXQP7.rsa	-	378.99	1041.85	723.78	-	99.40	-	-	-
NCVXQP9.mat	1.46	0.49	1.50	1.05	3.12	0.53	2.17	0.81	-
olesnik0.rsa	9.79	7.31	9.15	8.33	9.03	6.78	15.10	66.00	-
qa8fk.RSA	45.56	56.54	46.26	59.34	90.00	43.52	84.70	219.00	45.87
SIT100.rsa	0.77	0.59	0.73	0.68	0.67	0.52	1.13	2.51	-
SPARSINE.rsa	-	-	-	-	-	-	-	-	-
SPMSRTLS.rsa	0.74	0.30	0.82	0.76	0.63	0.49	1.42	0.71	0.95
stokes128.mat	9.20	2.90	5.94	4.79	15.90	3.92	12.20	11.90	-
stokes64.mat	1.26	0.42	1.14	0.99	2.30	0.74	1.53	2.09	-
stokes64s.mat	1.56	0.46	1.09	0.97	3.05	0.74	1.86	2.14	-
tuma1.mat	1.30	0.51	1.23	1.12	1.15	0.89	2.08	2.54	-
tuma2.mat	0.66	0.22	0.61	0.54	0.53	0.43	1.01	0.86	-
TURON_M.rsa	29.68	21.57	26.68	28.04	30.90	21.84	54.90	679.00	-
vibrobox.RSA	4.38	3.79	3.86	4.46	79.90	3.44	10.40	6.21	3.64

Table 3.2.1.3: Analyse time (CPU seconds)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	4.42	0.26	0.91	4.23	3.42	2.50	47.80	15.00	3.37
A2NNSNSL.rsa	5.19	0.35	0.92	3.55	3.22	2.42	42.60	13.50	-
A5ESINDL.rsa	2.99	0.17	0.62	2.66	1.68	1.15	-	6.04	2.49
AUG2D.mat	-	0.08	-	-	0.82	0.77	-	0.03	-
AUG2DC.mat	-	0.08	-	-	0.85	0.81	-	0.03	-
AUG3D.mat	-	0.09	-	-	-	0.88	-	0.02	-
AUG3DCQP.mat	18.87	1.57	2.01	1.89	1.62	1.49	-	0.35	3.05
bcsstk35.RSA	0.83	0.33	1.32	1.24	0.75	1.08	1.82	0.63	4.35
bcsstk37.RSA	0.81	0.25	1.17	1.10	0.73	0.96	1.64	0.51	3.47

Table 3.2.1.3: Analyse time (CPU seconds) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
bcsstk39.RSA	1.47	0.48	1.86	1.75	1.08	1.57	2.70	0.94	6.76
BLOCKQP1.rsa	25.92	0.38	2.47	18.66	18.20	3.59	-	22.20	84.51
BLOWEYA.rsa	-	0.08	0.93	0.85	-	0.57	-	1.49	-
bmw3_2.rsa	10.73	9.83	12.59	11.66	8.88	11.18	17.80	-	39.33
BOYD1.RSA	-	57.78	33.76	-	-	64.61	-	52.50	378.42
BOYD2.RSA	-	4.61	40.18	-	-	73.11	-	-	418.59
BRAINPC2.rsa	0.80	0.10	0.24	0.87	0.53	0.51	13.50	1.85	-
BRATU3D.RSA	2.01	1.50	1.36	1.81	1.43	1.22	4.86	0.85	-
c-55.RSA	3.65	2.92	3.35	3.13	2.62	2.16	45.50	2.01	8.60
c-58.RSA	4.10	3.07	1.36	3.32	2.88	2.42	72.50	2.36	8.64
c-59.RSA	4.54	3.67	4.81	4.55	3.30	2.67	47.40	2.28	15.53
c-62.RSA	4.87	4.08	2.01	5.20	4.08	2.89	121.00	3.62	11.03
c-63.RSA	4.10	2.93	3.46	3.16	2.83	2.48	25.10	1.94	11.19
c-68.RSA	6.32	6.03	6.36	6.01	4.75	3.78	299.00	6.17	45.70
c-69.RSA	6.66	4.46	5.62	5.09	4.55	4.01	36.70	3.90	18.35
c-70.RSA	6.94	4.69	5.72	5.24	4.75	4.10	116.00	4.48	19.93
c-71.RSA	9.14	7.51	9.58	8.85	7.97	5.31	442.00	-	30.35
c-72.RSA	7.76	5.40	6.53	6.00	5.40	4.64	44.80	4.94	31.74
CONT-201.RSA	-	3.42	2.44	3.16	2.92	2.79	9.93	0.87	-
CONT-300.RSA	-	6.45	6.06	7.87	7.12	6.71	28.30	2.15	-
copter2.rsa	5.59	4.29	4.73	4.04	3.67	3.52	11.40	2.05	6.15
crystk02.RSA	0.73	0.95	0.94	0.93	0.65	0.88	1.59	0.36	-
crystk03.RSA	1.48	1.95	1.79	1.69	1.25	1.69	2.92	0.81	-
DARCY003.rsa	30.36	3.10	19.81	19.30	18.80	17.49	57.40	5.46	-
dawson5.rsa	3.82	0.49	3.87	3.31	3.42	3.16	6.86	0.84	4.68
DIXMAANL.rsa	1.92	0.24	1.56	1.44	1.30	1.28	3.41	4.96	1.48
DTOC.mat	-	0.32	-	-	0.37	0.39	-	0.02	-
D_PRETOK.rsa	16.29	8.64	12.05	10.35	10.80	10.03	24.40	2.87	-
HELM2D03.rsa	27.09	15.54	18.68	17.80	17.30	16.27	63.70	8.98	22.64
HELM3D01.rsa	3.06	2.50	2.48	2.35	1.97	1.91	7.80	1.30	3.77
K1_SAN.rsa	-	3.11	-	-	3.32	3.20	6.83	0.93	-
LINVERSE.rsa	0.29	0.03	0.23	0.22	0.20	0.20	0.52	0.05	0.28
mario001.rsa	2.02	0.17	1.27	1.32	1.27	1.24	2.50	0.35	-
mario002.rsa	30.43	3.06	19.77	19.27	18.80	17.54	57.50	5.46	-
NCVXBQP1.rsa	3.02	2.29	2.50	2.35	1.87	1.81	5.82	1.15	2.54
NCVXQP1.mat	-	0.67	1.77	0.73	0.58	0.55	-	0.34	-

Table 3.2.1.3: Analyse time (CPU seconds) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
NCVXQP3.rsa	-	8.51	90.14	9.32	-	4.75	-	5.08	-
NCVXQP5.rsa	-	5.02	13.80	5.68	-	3.28	-	3.00	-
NCVXQP7.rsa	-	10.35	63.48	14.21	-	6.07	-	-	-
NCVXQP9.mat	0.68	0.07	1.16	0.48	0.43	0.42	1.25	0.16	-
olesnik0.rsa	6.65	4.09	5.07	4.33	4.42	4.17	9.45	1.27	-
qa8fk.RSA	8.95	7.49	5.89	5.84	6.18	5.75	20.10	2.46	11.33
SIT100.rsa	0.54	0.35	0.38	0.36	0.33	0.35	0.76	0.11	-
SPARSINE.rsa	-	-	-	-	-	-	-	-	-
SPMSRTLS.rsa	0.52	0.07	0.49	0.45	0.37	0.39	1.00	0.16	0.81
stokes128.mat	3.76	0.24	3.33	2.49	2.58	2.38	4.71	1.11	-
stokes64.mat	0.71	0.06	0.66	0.51	0.50	0.48	0.92	0.26	-
stokes64s.mat	0.70	0.06	0.57	0.51	0.48	0.48	0.92	0.27	-
tuma1.mat	0.99	0.08	0.70	0.68	0.65	0.64	1.42	0.20	-
tuma2.mat	0.50	0.05	0.36	0.35	0.32	0.32	0.73	0.11	-
TURON_M.rsa	16.62	8.94	12.72	10.71	11.20	10.38	25.80	3.11	-
vibrobox.RSA	1.42	1.32	1.11	1.07	0.98	1.00	4.87	0.35	1.96

Table 3.2.1.4: Factorize time (CPU seconds)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	0.49	0.46	1.31	1.00	0.75	0.15	1.13	1.57	0.37
A2NNSNSL.rsa	0.48	0.45	1.36	0.95	0.73	0.15	1.15	1.55	-
A5ESINDL.rsa	0.30	0.29	0.95	0.69	0.48	0.09	-	0.98	0.25
AUG2D.mat	-	273.57	-	-	55.40	0.11	-	0.05	-
AUG2DC.mat	-	324.78	-	-	74.30	0.12	-	0.05	-
AUG3D.mat	-	999.08	-	-	-	0.61	-	0.05	-
AUG3DCQP.mat	1.25	1.12	2.72	1.65	9.18	1.04	-	9.59	1.60
bcsstk35.RSA	2.15	2.07	2.17	3.18	3.18	1.76	2.47	4.07	1.28
bcsstk37.RSA	4.55	2.22	2.40	3.33	15.00	2.14	5.70	3.86	1.40
bcsstk39.RSA	6.48	5.61	6.60	8.77	9.27	5.81	7.60	9.73	3.92
BLOCKQP1.rsa	0.91	0.65	1.08	3.35	2.80	0.22	-	1.65	0.43
BLOWEYA.rsa	-	0.21	0.43	0.26	-	0.05	-	0.43	-
bmw3_2.rsa	297.87	73.70	73.42	93.50	467.00	58.88	223.00	-	51.06
BOYD1.RSA	-	1.71	1.73	-	-	0.23	-	1320.00	0.54
BOYD2.RSA	-	2.21	7.81	-	-	0.68	-	-	1.96

Table 3.2.1.4: Factorize time (CPU seconds) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
BRAINPC2.rsa	0.57	0.28	0.39	0.36	0.37	0.08	0.44	0.62	-
BRATU3D.RSA	141.78	67.75	23.44	45.84	216.00	10.02	42.10	48.30	-
c-55.RSA	6.00	14.21	17.20	10.31	92.50	5.89	26.40	80.00	40.77
c-58.RSA	6.24	9.65	12.27	8.02	852.00	4.03	39.10	26.00	42.10
c-59.RSA	6.20	14.88	31.91	12.29	143.00	6.99	24.10	19.30	32.27
c-62.RSA	13.95	33.95	77.02	25.50	1470.00	15.21	78.00	175.00	81.60
c-63.RSA	2.60	4.51	7.08	4.34	28.90	2.54	16.90	10.80	7.47
c-68.RSA	13.20	26.94	57.13	26.34	384.00	14.91	117.00	91.50	60.63
c-69.RSA	3.40	5.96	8.81	4.87	42.90	2.89	14.20	25.70	10.74
c-70.RSA	4.59	10.91	11.72	7.92	66.60	4.82	50.00	27.90	12.08
c-71.RSA	35.07	94.68	99.17	68.64	894.00	41.85	284.00	-	813.58
c-72.RSA	4.23	7.67	13.18	7.65	111.00	4.43	16.70	20.80	10.55
CONT-201.RSA	-	13.91	3.65	13.72	14.50	2.50	7.48	16.60	-
CONT-300.RSA	-	40.65	12.78	82.38	40.20	7.92	29.50	49.20	-
copter2.rsa	12.08	14.28	15.54	18.21	22.40	12.95	18.10	52.50	9.99
crystk02.RSA	4.74	4.88	5.32	7.04	7.67	4.70	6.22	17.40	-
crystk03.RSA	12.70	13.57	14.90	19.12	21.00	12.05	16.30	46.10	-
DARCY003.rsa	9.12	6.36	8.40	7.15	7.35	2.40	18.10	51.10	-
dawson5.rsa	2.80	4.42	2.65	3.54	4.05	2.23	4.38	8.45	1.94
DIXMAANL.rsa	0.40	0.35	0.73	0.49	0.65	0.14	0.81	1.10	0.16
DTOC.mat	-	14.52	-	-	18.10	0.04	-	0.04	-
D_PRETOK.rsa	13.08	12.94	14.87	17.45	26.50	10.92	29.00	731.00	-
HELM2D03.rsa	20.24	14.72	17.32	20.40	23.20	12.63	41.40	63.00	12.18
HELM3D01.rsa	6.38	7.87	8.09	9.84	11.90	6.56	9.20	35.00	5.34
K1_SAN.rsa	-	2.37	-	-	2.85	1.44	3.41	44.00	-
LINVERSE.rsa	0.08	0.07	0.10	0.11	0.08	0.03	0.13	0.16	0.03
mario001.rsa	0.39	0.44	0.62	0.55	0.52	0.14	0.72	2.07	-
mario002.rsa	9.15	6.36	8.40	7.10	7.35	2.41	18.10	51.10	-
NCVXBQP1.rsa	1.73	1.76	2.30	2.47	6.72	1.58	2.88	19.10	1.28
NCVXQP1.mat	-	5.33	16.69	14.45	1300.00	2.22	-	25.20	-
NCVXQP3.rsa	-	179.46	404.12	196.93	-	54.04	-	1610.00	-
NCVXQP5.rsa	-	46.48	57.72	50.16	-	24.41	-	529.00	-
NCVXQP7.rsa	-	367.50	976.67	707.86	-	91.64	-	-	-
NCVXQP9.mat	0.71	0.41	0.29	0.52	2.63	0.07	0.85	0.59	-
olesnik0.rsa	2.97	3.04	3.75	3.72	4.25	2.04	5.15	60.50	-
qa8fk.RSA	36.04	48.42	39.63	52.80	82.20	36.10	63.00	208.00	33.87

Table 3.2.1.4: Factorize time (CPU seconds) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
SIT100.rsa	0.22	0.23	0.31	0.28	0.30	0.14	0.33	2.14	-
SPARSINE.rsa	-	-	-	-	-	-	-	-	-
SPMSRTLS.rsa	0.20	0.21	0.28	0.27	0.23	0.07	0.36	0.42	0.08
stokes128.mat	4.88	2.55	2.40	2.12	12.80	1.19	7.13	9.47	-
stokes64.mat	0.53	0.34	0.44	0.44	1.72	0.19	0.55	1.58	-
stokes64s.mat	0.77	0.39	0.47	0.42	2.45	0.20	0.87	1.60	-
tuma1.mat	0.28	0.40	0.46	0.39	0.45	0.17	0.59	2.15	-
tuma2.mat	0.15	0.17	0.22	0.17	0.20	0.07	0.24	0.68	-
TURON_M.rsa	12.57	12.16	13.15	16.60	18.60	9.96	27.50	654.00	-
vibrobox.RSA	2.89	2.41	2.67	3.32	78.50	2.38	5.35	5.32	1.62

Table 3.2.1.5: Solution time given factors (CPU seconds)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	0.06	0.05	0.40	0.30	0.08	0.07	0.73	0.36	0.20
A2NNSNSL.rsa	0.06	0.05	0.38	0.27	0.08	0.08	0.71	0.36	-
A5ESINDL.rsa	0.04	0.03	0.23	0.24	0.05	0.05	-	0.17	0.14
AUG2D.mat	-	0.20	-	-	0.45	0.10	-	0.01	-
AUG2DC.mat	-	0.21	-	-	0.50	0.10	-	0.01	-
AUG3D.mat	-	0.73	-	-	-	0.11	-	0.00	-
AUG3DCQP.mat	0.06	0.04	0.18	0.14	0.12	0.06	-	0.46	0.14
bcsstk35.RSA	0.09	0.09	0.14	0.13	0.25	0.10	0.20	1.06	0.11
bcsstk37.RSA	0.10	0.09	0.13	0.12	0.37	0.09	0.20	0.66	0.10
bcsstk39.RSA	0.21	0.20	0.29	0.28	0.58	0.21	0.43	2.08	0.23
BLOCKQP1.rsa	0.07	0.04	0.20	2.41	0.10	0.25	-	0.42	0.13
BLOWEYA.rsa	-	0.02	0.08	0.05	-	0.10	-	0.11	-
bmw3_2.rsa	1.36	1.30	1.74	1.56	4.72	1.26	3.58	-	1.44
BOYD1.RSA	-	0.07	0.48	-	-	0.10	-	0.76	0.24
BOYD2.RSA	-	0.26	1.95	-	-	0.50	-	-	1.08
BRAINPC2.rsa	0.02	0.03	0.06	0.06	0.03	0.10	0.07	0.09	-
BRATU3D.RSA	1.62	0.32	0.25	0.32	1.00	0.48	0.64	2.02	-
c-55.RSA	0.12	0.13	0.33	0.20	0.33	0.11	2.18	2.06	0.45
c-58.RSA	0.11	0.10	0.26	0.17	0.75	0.09	0.84	0.98	0.39
c-59.RSA	0.13	0.14	0.44	0.22	0.43	0.12	1.64	1.02	0.40
c-62.RSA	0.20	0.23	0.58	0.31	1.28	0.19	6.53	3.86	0.67

Table 3.2.1.5: Solution time given factors (CPU seconds) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
c-63.RSA	0.10	0.09	0.29	0.18	0.20	0.09	2.19	0.82	0.26
c-68.RSA	0.22	0.20	0.74	0.36	0.75	0.20	7.17	2.25	0.56
c-69.RSA	0.13	0.12	0.42	0.25	0.33	0.13	1.46	1.36	0.40
c-70.RSA	0.15	0.15	0.46	0.28	0.35	0.15	3.82	1.44	0.40
c-71.RSA	0.39	0.44	1.00	0.59	1.40	0.38	27.70	-	2.41
c-72.RSA	0.16	0.15	0.53	0.31	0.48	0.16	1.32	1.35	0.42
CONT-201.RSA	-	0.31	0.35	0.41	0.60	0.61	0.48	1.22	-
CONT-300.RSA	-	0.69	0.82	0.99	1.42	1.45	1.39	3.11	-
copter2.rsa	0.28	0.29	0.43	0.40	0.77	0.28	0.67	3.45	0.38
crystk02.RSA	0.11	0.11	0.14	0.14	0.32	0.33	0.22	1.54	-
crystk03.RSA	0.24	0.24	0.30	0.29	0.72	0.71	0.47	3.11	-
DARCY003.rsa	0.60	0.49	1.38	1.08	0.77	2.05	2.38	3.78	-
dawson5.rsa	0.13	0.15	0.22	0.20	0.32	0.15	0.34	1.40	0.18
DIXMAANL.rsa	0.05	0.05	0.19	0.13	0.07	0.08	0.16	0.20	0.10
DTOC.mat	-	0.02	-	-	0.75	0.06	-	0.00	-
D_PRETOK.rsa	0.49	0.48	0.82	0.74	1.27	1.53	1.63	23.80	-
HELM2D03.rsa	0.96	0.80	1.60	1.33	1.70	0.96	3.21	7.57	1.34
HELM3D01.rsa	0.14	0.16	0.25	0.23	0.40	0.15	0.35	1.88	0.21
K1_SAN.rsa	-	0.13	-	-	0.27	0.42	0.39	0.95	-
LINVERSE.rsa	0.01	0.01	0.02	0.02	0.00	0.01	0.02	0.03	0.02
mario001.rsa	0.04	0.04	0.11	0.09	0.07	0.15	0.11	0.24	-
mario002.rsa	0.60	0.48	1.38	1.08	0.77	2.05	2.38	3.78	-
NCVXBQP1.rsa	0.09	0.10	0.28	0.20	0.23	0.11	0.24	1.25	0.15
NCVXQP1.mat	-	0.07	0.12	0.12	0.97	0.12	-	0.98	-
NCVXQP3.rsa	-	0.77	1.36	1.01	-	1.42	-	23.00	-
NCVXQP5.rsa	-	0.44	0.78	0.63	-	0.98	-	10.50	-
NCVXQP7.rsa	-	1.14	1.69	1.72	-	1.70	-	-	-
NCVXQP9.mat	0.06	0.01	0.05	0.05	0.05	0.05	0.06	0.07	-
olesnik0.rsa	0.17	0.17	0.33	0.28	0.37	0.58	0.48	4.21	-
qa8fk.RSA	0.57	0.63	0.73	0.69	1.65	1.68	1.57	8.88	0.68
SIT100.rsa	0.01	0.01	0.03	0.03	0.03	0.04	0.04	0.26	-
SPARSINE.rsa	-	-	-	-	-	-	-	-	-
SPMSRTLS.rsa	0.02	0.02	0.06	0.04	0.03	0.03	0.06	0.14	0.06
stokes128.mat	0.56	0.11	0.21	0.18	0.53	0.35	0.33	1.28	-
stokes64.mat	0.02	0.02	0.05	0.04	0.08	0.06	0.06	0.25	-
stokes64s.mat	0.10	0.02	0.05	0.04	0.12	0.06	0.06	0.26	-

Table 3.2.1.5: Solution time given factors (CPU seconds) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
tuma1.mat	0.02	0.03	0.07	0.05	0.05	0.08	0.08	0.18	-
tuma2.mat	0.01	0.01	0.03	0.02	0.02	0.04	0.03	0.07	-
TURON_M.rsa	0.49	0.47	0.81	0.73	1.10	1.51	1.60	22.10	-
vibrobox.RSA	0.06	0.06	0.08	0.08	0.43	0.06	0.18	0.54	0.07

Table 3.2.1.6: Actual memory used (Mbytes)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	3.7E+1	2.1E+1	2.7E+1	3.3E+1	2.6E+1	2.8E+1	3.0E+1	4.2E+1	2.6E+1
A2NNSNSL.rsa	3.6E+1	2.1E+1	2.5E+1	3.2E+1	2.5E+1	2.8E+1	3.0E+1	4.1E+1	-
A5ESINDL.rsa	2.4E+1	1.5E+1	1.8E+1	2.2E+1	1.7E+1	1.9E+1	-	2.8E+1	1.8E+1
AUG2D.mat	-	1.6E+3	-	-	8.4E+1	1.1E+1	-	6.0E+0	-
AUG2DC.mat	-	1.8E+3	-	-	9.7E+1	1.1E+1	-	6.2E+0	-
AUG3D.mat	-	2.4E+3	-	-	-	1.3E+1	-	6.3E+0	-
AUG3DCQP.mat	3.4E+1	2.4E+1	3.5E+1	3.4E+1	3.4E+1	1.9E+1	-	1.6E+2	2.9E+1
bcsstk35.RSA	5.8E+1	6.1E+1	5.8E+1	9.9E+1	5.1E+1	4.8E+1	5.3E+1	1.6E+2	7.1E+1
bcsstk37.RSA	5.3E+1	5.6E+1	5.5E+1	9.0E+1	8.0E+1	4.5E+1	5.2E+1	7.8E+1	6.3E+1
bcsstk39.RSA	1.1E+2	1.2E+2	1.1E+2	1.9E+2	1.0E+2	9.5E+1	1.1E+2	1.8E+2	1.3E+2
BLOCKQP1.rsa	5.1E+1	3.8E+1	4.3E+1	5.5E+1	5.4E+1	2.8E+1	-	4.9E+1	3.4E+1
BLOWEYA.rsa	-	9.5E+0	1.1E+1	1.2E+1	-	1.1E+1	-	1.4E+1	-
bmw3_2.rsa	7.3E+2	7.3E+2	7.4E+2	1.2E+3	8.3E+2	6.1E+2	7.4E+2	-	7.8E+2
BOYD1.RSA	-	6.0E+1	6.8E+1	-	-	4.7E+1	-	1.5E+2	9.6E+1
BOYD2.RSA	-	9.8E+1	1.3E+2	-	-	1.3E+2	-	-	1.4E+2
BRAINPC2.rsa	1.9E+1	1.3E+1	1.1E+1	2.4E+1	1.2E+1	1.1E+1	1.4E+1	1.6E+1	-
BRATU3D.RSA	8.5E+1	1.5E+2	9.8E+1	3.5E+2	2.0E+2	6.5E+1	1.2E+2	8.3E+2	-
c-55.RSA	7.2E+1	6.9E+1	9.3E+1	9.5E+1	1.0E+2	4.0E+1	1.1E+2	1.1E+3	1.3E+2
c-58.RSA	7.4E+1	5.6E+1	1.6E+2	9.0E+1	2.3E+2	3.8E+1	8.5E+1	6.2E+2	1.2E+2
c-59.RSA	8.6E+1	7.3E+1	1.1E+2	1.1E+2	1.2E+2	4.3E+1	1.1E+2	4.8E+2	1.2E+2
c-62.RSA	1.2E+2	1.1E+2	3.7E+2	1.7E+2	2.8E+2	7.1E+1	2.0E+2	2.1E+3	1.9E+2
c-63.RSA	5.8E+1	4.4E+1	6.0E+1	6.6E+1	6.5E+1	3.2E+1	1.0E+2	2.6E+2	7.1E+1
c-68.RSA	1.2E+2	9.9E+1	1.8E+2	1.5E+2	2.2E+2	6.2E+1	2.3E+2	1.8E+3	1.6E+2
c-69.RSA	9.5E+1	5.5E+1	9.6E+1	8.1E+1	7.8E+1	4.6E+1	1.2E+2	6.2E+2	9.6E+1
c-70.RSA	9.2E+1	7.4E+1	9.2E+1	1.0E+2	1.1E+2	5.0E+1	1.8E+2	8.0E+2	1.0E+2
c-71.RSA	2.3E+2	2.1E+2	2.9E+2	3.1E+2	4.1E+2	1.3E+2	4.4E+2	-	9.5E+2
c-72.RSA	9.5E+1	6.7E+1	9.5E+1	1.0E+2	1.1E+2	5.3E+1	1.4E+2	6.8E+2	1.0E+2

Table 3.2.1.6: Actual memory used (Mbytes) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
CONT-201.RSA	-	1.2E+2	6.7E+1	2.6E+2	1.1E+2	4.9E+1	1.0E+2	4.1E+2	-
CONT-300.RSA	-	2.8E+2	1.6E+2	6.7E+2	2.5E+2	1.2E+2	2.9E+2	1.0E+3	-
copter2.rsa	1.5E+2	1.3E+2	1.4E+2	2.1E+2	1.6E+2	1.0E+2	1.3E+2	7.3E+2	1.4E+2
crystk02.RSA	6.4E+1	6.7E+1	6.7E+1	1.1E+2	6.4E+1	5.1E+1	5.2E+1	1.7E+2	-
crystk03.RSA	1.3E+2	1.4E+2	1.4E+2	2.3E+2	1.3E+2	1.1E+2	1.1E+2	6.9E+2	-
DARCY003.rsa	3.8E+2	1.6E+2	1.8E+2	2.6E+2	1.7E+2	1.7E+2	4.4E+2	1.2E+3	-
dawson5.rsa	9.4E+1	7.8E+1	6.9E+1	1.2E+2	6.3E+1	5.6E+1	7.7E+1	2.5E+2	7.3E+1
DIXMAANL.rsa	3.7E+1	1.9E+1	2.1E+1	2.5E+1	1.9E+1	2.1E+1	3.1E+1	4.8E+1	2.2E+1
DTOC.mat	-	4.1E+2	-	-	2.3E+2	8.3E+0	-	4.7E+0	-
D_PRETOK.rsa	2.5E+2	1.9E+2	2.1E+2	3.2E+2	2.3E+2	1.5E+2	3.3E+2	2.2E+3	-
HELM2D03.rsa	5.2E+2	2.9E+2	3.4E+2	4.7E+2	2.9E+2	2.4E+2	6.3E+2	7.0E+2	3.2E+2
HELM3D01.rsa	8.7E+1	7.6E+1	8.5E+1	1.2E+2	8.8E+1	5.4E+1	6.9E+1	7.4E+2	8.5E+1
K1_SAN.rsa	-	5.8E+1	-	-	5.2E+1	3.9E+1	7.2E+1	8.7E+2	-
LINVERSE.rsa	8.3E+0	4.5E+0	5.3E+0	7.2E+0	4.1E+0	5.3E+0	4.4E+0	6.7E+0	5.6E+0
mario001.rsa	3.0E+1	1.4E+1	1.8E+1	3.0E+1	1.6E+1	1.7E+1	2.3E+1	8.2E+1	-
mario002.rsa	3.8E+2	1.6E+2	1.8E+2	2.6E+2	1.7E+2	1.7E+2	4.4E+2	1.2E+3	-
NCVXBQP1.rsa	5.6E+1	4.5E+1	4.5E+1	6.5E+1	5.2E+1	2.9E+1	4.7E+1	4.6E+2	4.3E+1
NCVXQP1.mat	-	3.5E+1	5.3E+1	1.2E+2	3.5E+2	1.9E+1	-	2.8E+2	-
NCVXQP3.rsa	-	3.5E+2	6.1E+2	6.1E+2	-	1.9E+2	-	2.2E+3	-
NCVXQP5.rsa	-	1.8E+2	2.7E+2	3.0E+2	-	1.3E+2	-	2.4E+3	-
NCVXQP7.rsa	-	5.0E+2	8.5E+2	1.1E+3	-	2.3E+2	-	-	-
NCVXQP9.mat	9.8E+0	7.5E+0	7.9E+0	1.3E+1	1.4E+1	6.0E+0	9.9E+0	2.4E+1	-
olesnik0.rsa	1.1E+2	7.1E+1	8.4E+1	1.1E+2	7.0E+1	5.1E+1	1.0E+2	1.1E+3	-
qa8fk.RSA	3.0E+2	3.1E+2	2.9E+2	4.5E+2	3.1E+2	2.2E+2	2.9E+2	2.0E+3	3.0E+2
SIT100.rsa	8.7E+0	8.2E+0	9.0E+0	1.2E+1	8.0E+0	5.8E+0	8.5E+0	6.6E+1	-
SPARSINE.rsa	-	-	-	-	-	-	-	-	-
SPMSRTLS.rsa	1.7E+1	1.0E+1	1.1E+1	1.5E+1	8.7E+0	1.1E+1	1.4E+1	1.7E+1	1.2E+1
stokes128.mat	7.1E+1	4.5E+1	6.0E+1	8.8E+1	8.6E+1	3.5E+1	7.3E+1	2.7E+2	-
stokes64.mat	1.6E+1	1.0E+1	1.4E+1	2.9E+1	1.8E+1	8.5E+0	1.3E+1	5.8E+1	-
stokes64s.mat	1.6E+1	1.0E+1	1.5E+1	2.9E+1	2.1E+1	8.5E+0	1.4E+1	5.9E+1	-
tuma1.mat	1.5E+1	1.2E+1	1.3E+1	2.0E+1	1.2E+1	9.3E+0	1.5E+1	6.7E+1	-
tuma2.mat	9.3E+0	5.8E+0	7.1E+0	9.9E+0	6.5E+0	5.7E+0	7.4E+0	2.5E+1	-
TURON_M.rsa	2.9E+2	2.1E+2	2.0E+2	3.1E+2	2.0E+2	1.4E+2	3.2E+2	2.2E+3	-
vibrobox.RSA	4.3E+1	4.0E+1	4.5E+1	5.7E+1	1.3E+2	2.7E+1	3.4E+1	2.0E+2	3.7E+1

Table 3.2.1.7: Number of integers used for factors

Name	MA57	MUMPS	MUMPS_US	Oblio	SPOOLES	UMFPACK
A0NSDSIL.rsa	2.8E+5	9.7E+5	6.2E+5	3.6E+5	1.3E+6	9.6E+5
A2NNSNSL.rsa	2.8E+5	9.8E+5	5.9E+5	3.3E+5	1.3E+6	9.3E+5
A5ESINDL.rsa	2.0E+5	7.3E+5	4.2E+5	2.1E+5	-	5.9E+5
AUG2D.mat	2.1E+5	-	-	6.4E+5	-	1.6E+5
AUG2DC.mat	2.2E+5	-	-	6.9E+5	-	1.7E+5
AUG3D.mat	2.2E+5	-	-	-	-	1.4E+5
AUG3DCQP.mat	1.7E+5	4.9E+5	4.6E+5	8.8E+5	-	5.4E+6
bcsstk35.RSA	1.6E+5	3.4E+5	3.7E+5	2.6E+5	3.5E+6	5.5E+6
bcsstk37.RSA	1.4E+5	3.1E+5	3.4E+5	2.4E+5	3.8E+6	5.7E+6
bcsstk39.RSA	2.9E+5	6.4E+5	6.8E+5	4.3E+5	8.4E+6	1.3E+7
BLOCKQP1.rsa	3.2E+5	8.8E+5	7.4E+5	5.4E+5	-	1.4E+6
BLOWEYA.rsa	3.8E+4	3.8E+5	2.0E+5	-	-	2.5E+5
bmw3_2.rsa	1.5E+6	3.1E+6	3.3E+6	2.4E+6	6.5E+7	-
BOYD1.RSA	8.4E+5	1.9E+6	-	-	-	2.3E+6
BOYD2.RSA	1.4E+6	5.3E+6	-	-	-	-
BRAINPC2.rsa	3.6E+4	3.9E+5	3.6E+5	2.1E+5	8.5E+5	4.3E+5
BRATU3D.RSA	4.3E+5	5.4E+5	6.2E+5	1.8E+6	1.0E+7	1.9E+7
c-55.RSA	3.8E+5	9.9E+5	5.7E+5	2.2E+6	5.9E+6	1.8E+7
c-58.RSA	3.1E+5	7.5E+5	4.9E+5	2.9E+6	5.2E+6	6.9E+6
c-59.RSA	4.2E+5	1.4E+6	6.7E+5	2.5E+6	5.9E+6	7.4E+6
c-62.RSA	6.0E+5	8.9E+5	7.6E+5	6.4E+6	1.1E+7	3.3E+7
c-63.RSA	3.2E+5	9.3E+5	5.8E+5	1.4E+6	5.3E+6	5.7E+6
c-68.RSA	6.1E+5	2.1E+6	1.0E+6	4.5E+6	1.3E+7	1.8E+7
c-69.RSA	4.6E+5	1.4E+6	8.4E+5	1.9E+6	7.3E+6	9.9E+6
c-70.RSA	5.2E+5	1.4E+6	9.1E+5	2.3E+6	9.9E+6	1.0E+7
c-71.RSA	1.1E+6	2.5E+6	1.4E+6	8.8E+6	2.4E+7	-
c-72.RSA	5.3E+5	1.6E+6	1.0E+6	2.5E+6	9.2E+6	9.2E+6
CONT-201.RSA	3.7E+5	1.3E+6	1.3E+6	1.0E+6	8.8E+6	1.5E+7
CONT-300.RSA	7.9E+5	3.1E+6	2.9E+6	2.3E+6	2.6E+7	4.0E+7
copter2.rsa	4.3E+5	9.6E+5	9.1E+5	9.5E+5	1.2E+7	3.0E+7
crystk02.RSA	1.1E+5	2.3E+5	2.6E+5	1.9E+5	4.4E+6	1.2E+7
crystk03.RSA	2.0E+5	4.4E+5	4.8E+5	3.6E+5	9.6E+6	2.6E+7
DARCY003.rsa	1.1E+6	4.1E+6	3.8E+6	2.3E+6	3.8E+7	3.4E+7
dawson5.rsa	3.1E+5	6.6E+5	6.6E+5	5.8E+5	6.0E+6	9.7E+6
DIXMAANL.rsa	2.0E+5	7.5E+5	4.8E+5	3.7E+5	2.1E+6	8.8E+5

Table 3.2.1.7: Number of integers used for factors (continued)

Name	MA57	MUMPS	MUMPS_US	Oblio	SPOOLES	UMFPACK
DTOC.mat	9.6E+4	-	-	2.2E+5	-	1.4E+5
D_PRETOK.rsa	7.4E+5	2.3E+6	2.3E+6	1.6E+6	2.9E+7	2.0E+8
HELM2D03.rsa	1.8E+6	5.4E+6	4.3E+6	3.4E+6	5.8E+7	5.8E+7
HELM3D01.rsa	2.6E+5	6.0E+5	5.4E+5	5.6E+5	6.0E+6	1.6E+7
K1_SAN.rsa	2.4E+5	-	-	5.2E+5	5.6E+6	2.6E+7
LINVERSE.rsa	1.6E+4	7.6E+4	8.4E+4	4.8E+4	2.3E+5	1.3E+5
mario001.rsa	1.1E+5	4.0E+5	3.7E+5	2.2E+5	1.5E+6	1.9E+6
mario002.rsa	1.1E+6	4.1E+6	3.8E+6	2.3E+6	3.8E+7	3.4E+7
NCVXBQP1.rsa	2.2E+5	7.1E+5	5.3E+5	4.6E+5	3.8E+6	9.7E+6
NCVXQP1.mat	1.1E+5	2.4E+5	2.6E+5	1.2E+6	-	8.5E+6
NCVXQP3.rsa	1.1E+6	1.7E+6	1.9E+6	-	-	1.9E+8
NCVXQP5.rsa	6.7E+5	1.1E+6	1.2E+6	-	-	8.8E+7
NCVXQP7.rsa	1.4E+6	2.3E+6	2.9E+6	-	-	-
NCVXQP9.mat	4.7E+4	1.7E+5	1.5E+5	1.3E+5	5.8E+5	6.5E+5
olesnik0.rsa	3.2E+5	1.0E+6	1.0E+6	6.9E+5	8.1E+6	3.6E+7
qa8fk.RSA	5.6E+5	1.2E+6	1.3E+6	1.1E+6	2.7E+7	8.1E+7
SIT100.rsa	3.7E+4	1.3E+5	1.1E+5	7.8E+4	5.4E+5	2.2E+6
SPARSINE.rsa	-	-	-	-	-	-
SPMSRTLS.rsa	3.9E+4	2.3E+5	1.6E+5	1.2E+5	8.2E+5	3.2E+5
stokes128.mat	2.0E+5	6.2E+5	7.3E+5	6.2E+5	6.4E+6	1.0E+7
stokes64.mat	4.9E+4	1.6E+5	1.8E+5	1.5E+5	8.7E+5	2.0E+6
stokes64s.mat	4.9E+4	1.6E+5	1.8E+5	1.6E+5	1.0E+6	2.0E+6
tuma1.mat	6.1E+4	2.5E+5	2.1E+5	1.4E+5	9.9E+5	1.9E+6
tuma2.mat	3.3E+4	1.4E+5	1.2E+5	7.9E+4	4.2E+5	6.9E+5
TURON_M.rsa	7.5E+5	2.3E+6	2.4E+6	1.5E+6	2.8E+7	1.9E+8
vibrobox.RSA	8.1E+4	2.0E+5	2.0E+5	3.2E+5	2.8E+6	4.2E+6

Table 3.2.1.8: Number of reals used for factors

Name	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	5.4E+5	3.9E+5	1.1E+6	3.6E+5	3.6E+5	1.3E+6	8.0E+5	4.1E+5
A2NNSNSL.rsa	5.1E+5	3.6E+5	1.0E+6	3.3E+5	3.3E+5	1.3E+6	7.7E+5	-
A5ESINDL.rsa	3.1E+5	2.3E+5	6.3E+5	2.4E+5	2.4E+5	-	4.7E+5	2.2E+5
AUG2D.mat	7.5E+6	-	-	5.9E+6	3.1E+5	-	1.1E+5	-
AUG2DC.mat	8.0E+6	-	-	6.8E+6	3.2E+5	-	1.1E+5	-

Table 3.2.1.8: Number of reals used for factors (continued)

Name	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
AUG3D.mat	2.1E+7	-	-	-	6.9E+5	-	9.4E+4	-
AUG3DCQP.mat	1.1E+6	2.6E+6	2.2E+6	1.1E+6	1.1E+6	-	5.3E+6	1.1E+6
bcsstk35.RSA	2.9E+6	3.7E+6	6.3E+6	3.7E+6	3.5E+6	3.5E+6	5.5E+6	2.9E+6
bcsstk37.RSA	3.0E+6	3.7E+6	6.2E+6	5.5E+6	3.4E+6	3.8E+6	5.6E+6	2.9E+6
bcsstk39.RSA	7.1E+6	8.9E+6	1.5E+7	8.4E+6	8.1E+6	8.4E+6	1.3E+7	6.9E+6
BLOCKQP1.rsa	7.8E+5	4.0E+5	1.6E+6	8.4E+5	7.8E+5	-	1.3E+6	3.8E+5
BLOWEYA.rsa	5.0E+5	1.7E+5	3.5E+5	-	1.3E+5	-	1.9E+5	-
bmw3_2.rsa	4.9E+7	5.6E+7	9.3E+7	6.7E+7	4.8E+7	6.5E+7	-	4.6E+7
BOYD1.RSA	6.5E+5	6.5E+5	-	-	6.5E+5	-	2.1E+6	6.5E+5
BOYD2.RSA	1.7E+6	1.3E+6	-	-	1.3E+6	-	-	1.3E+6
BRAINPC2.rsa	6.8E+5	3.2E+5	9.1E+5	3.4E+5	2.3E+5	8.5E+5	3.8E+5	-
BRATU3D.RSA	1.2E+7	7.6E+6	2.0E+7	1.3E+7	5.8E+6	1.0E+7	1.8E+7	-
c-55.RSA	4.0E+6	7.4E+6	7.3E+6	3.9E+6	3.4E+6	5.9E+6	1.7E+7	5.9E+6
c-58.RSA	3.0E+6	5.2E+6	5.8E+6	1.0E+7	2.6E+6	5.2E+6	6.8E+6	4.8E+6
c-59.RSA	4.0E+6	8.8E+6	7.5E+6	5.1E+6	3.6E+6	5.9E+6	7.3E+6	4.8E+6
c-62.RSA	7.3E+6	2.3E+7	1.4E+7	1.6E+7	6.7E+6	1.1E+7	3.3E+7	9.3E+6
c-63.RSA	2.5E+6	4.4E+6	4.8E+6	2.3E+6	2.2E+6	5.3E+6	5.6E+6	2.5E+6
c-68.RSA	6.0E+6	1.5E+7	1.2E+7	8.7E+6	5.5E+6	1.3E+7	1.8E+7	6.4E+6
c-69.RSA	3.2E+6	5.6E+6	5.8E+6	3.6E+6	2.6E+6	7.3E+6	9.8E+6	3.6E+6
c-70.RSA	4.0E+6	6.6E+6	7.3E+6	3.5E+6	3.4E+6	9.9E+6	1.0E+7	3.5E+6
c-71.RSA	1.4E+7	2.4E+7	2.6E+7	1.7E+7	1.3E+7	2.4E+7	-	3.9E+7
c-72.RSA	3.7E+6	6.8E+6	7.2E+6	5.2E+6	3.4E+6	9.2E+6	9.0E+6	3.4E+6
CONT-201.RSA	1.1E+7	4.6E+6	1.7E+7	8.3E+6	4.0E+6	8.8E+6	1.5E+7	-
CONT-300.RSA	2.5E+7	1.2E+7	4.7E+7	1.9E+7	1.0E+7	2.6E+7	3.9E+7	-
copter2.rsa	1.0E+7	1.2E+7	2.0E+7	1.1E+7	1.0E+7	1.2E+7	3.0E+7	9.9E+6
crystk02.RSA	4.4E+6	5.1E+6	8.7E+6	4.9E+6	4.6E+6	4.4E+6	1.2E+7	-
crystk03.RSA	9.8E+6	1.1E+7	2.0E+7	1.1E+7	1.0E+7	9.6E+6	2.6E+7	-
DARCY003.rsa	9.6E+6	1.0E+7	1.6E+7	7.0E+6	5.4E+6	3.8E+7	3.4E+7	-
dawson5.rsa	5.0E+6	4.7E+6	8.2E+6	4.5E+6	4.4E+6	6.0E+6	9.6E+6	3.9E+6
DIXMAANL.rsa	6.4E+5	4.3E+5	9.9E+5	3.9E+5	3.9E+5	2.1E+6	7.6E+5	4.2E+5
DTOC.mat	5.8E+5	-	-	1.6E+7	1.1E+5	-	9.5E+4	-
D_PRETOK.rsa	1.5E+7	1.7E+7	2.9E+7	1.7E+7	1.3E+7	2.9E+7	2.0E+8	-
HELM2D03.rsa	2.2E+7	2.2E+7	4.0E+7	2.1E+7	2.0E+7	5.8E+7	5.7E+7	2.0E+7
HELM3D01.rsa	5.4E+6	6.3E+6	1.0E+7	5.6E+6	5.2E+6	6.0E+6	1.6E+7	5.1E+6
K1_SAN.rsa	3.6E+6	-	-	3.3E+6	2.9E+6	5.6E+6	2.6E+7	-
LINVERSE.rsa	1.4E+5	1.1E+5	2.2E+5	1.0E+5	1.0E+5	2.3E+5	1.1E+5	5.4E+4

Table 3.2.1.8: Number of reals used for factors (continued)

Name	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
mario001.rsa	7.8E+5	8.3E+5	1.3E+6	5.7E+5	4.2E+5	1.5E+6	1.9E+6	-
mario002.rsa	9.6E+6	1.0E+7	1.6E+7	7.0E+6	5.4E+6	3.8E+7	3.4E+7	-
NCVXBQP1.rsa	2.4E+6	2.5E+6	4.5E+6	3.0E+6	2.3E+6	3.8E+6	9.6E+6	2.1E+6
NCVXQP1.mat	2.2E+6	3.9E+6	6.7E+6	1.7E+7	1.3E+6	-	8.5E+6	-
NCVXQP3.rsa	2.6E+7	5.1E+7	5.5E+7	-	1.6E+7	-	1.9E+8	-
NCVXQP5.rsa	1.4E+7	2.4E+7	2.7E+7	-	1.1E+7	-	8.8E+7	-
NCVXQP7.rsa	3.9E+7	6.3E+7	1.0E+8	-	1.9E+7	-	-	-
NCVXQP9.mat	3.8E+5	3.0E+5	8.7E+5	7.1E+5	1.4E+5	5.8E+5	6.2E+5	-
olesnik0.rsa	5.0E+6	5.8E+6	9.0E+6	4.7E+6	3.9E+6	8.1E+6	3.5E+7	-
qa8fk.RSA	2.5E+7	2.6E+7	4.4E+7	2.5E+7	2.3E+7	2.7E+7	8.1E+7	2.3E+7
SIT100.rsa	4.8E+5	5.6E+5	8.6E+5	4.2E+5	3.7E+5	5.4E+5	2.2E+6	-
SPARSINE.rsa	-	-	-	-	-	-	-	-
SPMSRTLS.rsa	3.5E+5	2.7E+5	5.3E+5	2.5E+5	2.5E+5	8.2E+5	2.6E+5	1.3E+5
stokes128.mat	3.2E+6	4.4E+6	6.3E+6	7.4E+6	2.7E+6	6.4E+6	1.0E+7	-
stokes64.mat	6.8E+5	9.2E+5	1.3E+6	1.3E+6	5.5E+5	8.7E+5	1.9E+6	-
stokes64s.mat	6.8E+5	9.8E+5	1.3E+6	1.7E+6	5.5E+5	1.0E+6	2.0E+6	-
tuma1.mat	7.3E+5	6.7E+5	1.1E+6	5.1E+5	4.2E+5	9.9E+5	1.9E+6	-
tuma2.mat	3.2E+5	3.0E+5	5.2E+5	2.3E+5	1.9E+5	4.2E+5	6.6E+5	-
TURON_M.rsa	1.5E+7	1.6E+7	2.8E+7	1.4E+7	1.3E+7	2.8E+7	1.9E+8	-
vibrobox.RSA	2.3E+6	2.8E+6	4.3E+6	7.9E+6	2.3E+6	2.8E+6	4.2E+6	2.0E+6

Table 3.2.1.9: Norm of scaled residuals

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	4.3E-16	1.1E-15	7.9E-16	2.7E-16	1.1E-15	1.8E-15	4.9E-16	4.4E-17	1.9E-14
A2NNSNSL.rsa	1.2E-15	2.6E-16	4.1E-16	2.5E-16	3.4E-16	1.5E-15	3.8E-16	2.3E-17	-
A5ESINDL.rsa	2.2E-16	4.1E-17	1.4E-16	1.2E-16	1.1E-16	5.7E-15	-	1.7E-16	3.3E-15
AUG2D.mat	-	0.0E+0	-	-	0.0E+0	1.9E-21	-	0.0E+0	-
AUG2DC.mat	-	0.0E+0	-	-	0.0E+0	5.6E-17	-	0.0E+0	-
AUG3D.mat	-	0.0E+0	-	-	-	2.7E-22	-	0.0E+0	-
AUG3DCQP.mat	3.6E-6	1.2E-16	1.2E-16	1.2E-16	5.9E-17	1.2E-16	-	5.9E-17	1.2E-16
bcsstk35.RSA	5.4E-16	1.3E-16	1.1E-16	9.8E-17	2.0E-16	2.9E-16	9.9E-17	1.3E-16	2.6E-16
bcsstk37.RSA	1.8E-16	1.8E-16	8.4E-17	1.0E-16	2.5E-16	1.9E-16	1.5E-16	2.2E-16	4.9E-16
bcsstk39.RSA	7.4E-16	6.0E-16	3.8E-16	2.1E-16	1.2E-15	1.4E-15	7.1E-16	3.9E-16	4.5E-16
BLOCKQP1.rsa	5.6E-13	2.2E-12	7.9E-13	1.9E-13	9.2E-14	3.6E-16	-	2.2E-14	7.7E-13

Table 3.2.1.9: Norm of scaled residuals (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
BLOWEYA.rsa	-	8.8E-14	4.7E-14	3.1E-19	-	3.2E-15	-	2.2E-14	-
bmw3_2.rsa	1.7E-16	4.0E-16	4.8E-16	2.9E-16	2.8E-15	9.6E-16	9.3E-16	-	7.8E-16
BOYD1.RSA	-	2.2E-9	7.2E-10	-	-	2.9E-9	-	5.6E-14	1.4E-9
BOYD2.RSA	-	6.1E-7	4.2E-7	-	-	7.6E-7	-	-	4.9E-7
BRAINPC2.rsa	1.2E-14	2.6E-15	1.1E-14	2.2E-14	3.2E-15	2.9E-7	5.9E-15	1.6E-14	-
BRATU3D.RSA	2.4E-9	6.9E-10	5.3E-11	1.2E-7	5.2E-13	7.1E-14	3.2E-11	1.5E-16	-
c-55.RSA	6.7E-18	1.9E-17	5.2E-17	6.2E-18	3.4E-17	1.7E-10	1.0E-17	1.9E-17	2.6E-11
c-58.RSA	4.5E-16	1.8E-16	3.5E-15	6.1E-16	9.8E-16	3.1E-10	1.6E-15	5.0E-16	8.5E-10
c-59.RSA	9.4E-16	2.2E-16	2.7E-15	2.7E-16	2.4E-15	7.7E-10	2.7E-16	2.2E-16	6.8E-10
c-62.RSA	2.4E-16	3.7E-16	3.4E-16	7.7E-16	1.4E-15	3.3E-10	2.2E-15	1.5E-16	6.0E-10
c-63.RSA	9.4E-17	3.2E-17	3.7E-17	6.6E-17	3.3E-16	7.2E-10	2.8E-17	2.2E-17	2.3E-10
c-68.RSA	1.8E-16	4.0E-16	1.2E-16	2.6E-16	5.8E-16	9.9E-14	5.8E-16	8.0E-16	5.3E-14
c-69.RSA	1.8E-17	1.8E-17	5.0E-17	9.4E-18	7.4E-17	1.2E-10	7.4E-17	6.9E-18	2.0E-11
c-70.RSA	9.0E-18	7.2E-17	9.7E-17	6.0E-18	9.0E-18	2.4E-11	9.0E-18	2.3E-18	3.2E-11
c-71.RSA	3.1E-17	6.3E-17	3.2E-17	9.3E-17	4.5E-16	2.0E-10	5.9E-16	-	4.6E-10
c-72.RSA	1.6E-17	1.3E-16	8.8E-17	6.8E-15	2.9E-17	8.6E-11	3.7E-17	1.5E-16	1.4E-11
CONT-201.RSA	-	2.3E-11	4.4E-13	1.1E-8	1.5E-13	2.2E-10	1.0E-12	1.2E-16	-
CONT-300.RSA	-	5.8E-11	3.8E-12	1.4E-7	2.1E-13	1.5E-9	6.2E-12	1.2E-16	-
copter2.rsa	9.1E-13	1.1E-12	1.3E-12	1.7E-12	2.0E-13	2.6E-12	2.0E-13	1.6E-16	9.9E-11
crystk02.RSA	1.7E-16	1.9E-16	9.3E-17	9.7E-17	4.5E-16	6.6E-7	1.6E-16	1.4E-16	-
crystk03.RSA	2.0E-16	1.7E-16	1.2E-16	1.3E-16	5.0E-16	3.8E-6	2.0E-16	1.4E-16	-
DARCY003.rsa	2.1E-14	1.7E-14	1.4E-14	2.7E-14	1.2E-13	1.0E-15	3.2E-14	1.3E-16	-
dawson5.rsa	3.1E-13	7.1E-13	1.9E-13	2.5E-13	6.7E-14	1.6E-12	7.0E-14	1.7E-16	8.6E-11
DIXMAANL.rsa	1.7E-13	9.5E-14	7.8E-15	7.8E-15	2.8E-15	1.5E-13	5.6E-15	1.6E-16	7.3E-14
DTOC.mat	-	1.4E-16	-	-	7.8E-16	7.2E-16	-	8.6E-21	-
D_PRETOK.rsa	1.6E-15	2.7E-16	2.0E-16	6.5E-16	5.1E-16	1.0E-16	2.4E-16	9.5E-16	-
HELM2D03.rsa	2.9E-12	1.4E-12	4.7E-13	4.1E-13	2.8E-13	4.2E-12	3.5E-14	1.8E-16	4.9E-12
HELM3D01.rsa	4.4E-13	5.8E-13	1.2E-12	1.1E-12	1.7E-13	4.5E-12	8.4E-14	2.6E-16	4.8E-11
K1_SAN.rsa	-	6.3E-16	-	-	2.7E-15	6.6E-17	2.6E-15	4.9E-11	-
LINVERSE.rsa	3.0E-14	7.3E-15	4.8E-15	5.9E-15	6.7E-16	2.1E-15	1.5E-15	2.5E-16	1.5E-15
mario001.rsa	4.9E-15	5.9E-15	4.3E-15	3.7E-15	2.7E-14	1.3E-16	7.4E-15	1.3E-16	-
mario002.rsa	2.1E-14	1.7E-14	1.4E-14	2.7E-14	1.2E-13	1.0E-15	3.2E-14	1.3E-16	-
NCVXBQP1.rsa	1.3E-13	1.1E-13	5.7E-13	5.9E-14	2.3E-14	1.2E-12	1.1E-14	1.7E-16	1.1E-12
NCVXQP1.mat	-	5.9E-14	2.6E-14	6.1E-24	2.5E-16	1.6E-23	-	3.1E-17	-
NCVXQP3.rsa	-	2.8E-9	1.2E-8	5.0E-12	-	1.3E-16	-	2.1E-16	-
NCVXQP5.rsa	-	1.5E-11	7.6E-11	3.6E-11	-	4.3E-16	-	2.1E-16	-

Table 3.2.1.9: Norm of scaled residuals (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
NCVXQP7.rsa	-	1.5E-9	9.3E-9	2.6E-11	-	1.8E-16	-	-	-
NCVXQP9.mat	1.2E-16	4.3E-20	1.3E-19	8.0E-17	6.0E-17	8.6E-18	6.0E-17	1.4E-23	-
olesnik0.rsa	7.0E-16	7.0E-16	3.1E-16	5.3E-16	3.5E-15	5.4E-17	1.6E-16	1.0E-15	-
qa8fk.RSA	1.4E-15	1.5E-15	5.7E-16	4.0E-16	9.9E-16	5.7E-10	1.5E-15	3.4E-16	2.5E-15
SIT100.rsa	5.0E-15	9.8E-15	5.8E-15	4.5E-15	1.6E-14	1.3E-16	1.4E-14	6.0E-16	-
SPARSINE.rsa	-	-	-	-	-	-	-	-	-
SPMSRTLS.rsa	1.0E-13	6.4E-15	6.6E-15	1.6E-14	3.4E-15	7.6E-13	1.1E-15	1.2E-16	4.8E-13
stokes128.mat	1.1E-15	1.0E-14	1.0E-13	7.0E-15	1.1E-15	2.0E-16	1.4E-15	6.6E-14	-
stokes64.mat	2.4E-15	5.6E-15	5.5E-14	4.1E-15	1.2E-15	2.3E-16	1.6E-15	7.4E-14	-
stokes64s.mat	4.6E-16	2.6E-15	2.9E-15	1.1E-15	7.3E-16	3.1E-15	6.4E-16	1.1E-13	-
tuma1.mat	2.0E-14	5.2E-14	7.1E-14	6.4E-15	1.7E-14	1.0E-16	2.2E-14	1.4E-16	-
tuma2.mat	9.4E-15	4.0E-14	7.1E-14	1.6E-14	1.9E-14	1.2E-16	1.3E-14	1.4E-16	-
TURON_M.rsa	1.4E-15	4.2E-15	8.2E-16	7.5E-15	1.8E-14	7.2E-17	5.4E-15	3.3E-16	-
vibrobox.RSA	5.9E-17	1.6E-16	8.6E-17	5.1E-18	8.3E-16	1.6E-16	1.3E-16	2.5E-17	1.1E-16

Table 3.2.1.10: Norm of scaled residuals following a single refinement

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	1.0E-16	1.3E-16	2.9E-17	1.4E-17	5.5E-17	1.9E-17	2.7E-17	4.4E-17	1.0E-16
A2NNSNSL.rsa	5.4E-17	3.0E-17	1.0E-17	6.4E-17	3.8E-17	1.3E-16	4.9E-17	3.8E-17	-
A5ESINDL.rsa	4.0E-17	9.7E-17	6.5E-17	5.5E-17	4.4E-17	4.3E-17	-	2.8E-17	8.5E-17
AUG2D.mat	-	0.0E+0	-	-	0.0E+0	1.3E-24	-	0.0E+0	-
AUG2DC.mat	-	0.0E+0	-	-	0.0E+0	5.6E-17	-	0.0E+0	-
AUG3D.mat	-	0.0E+0	-	-	-	2.8E-24	-	0.0E+0	-
AUG3DCQP.mat	1.6E-7	5.9E-17	4.0E-17	3.8E-17	3.0E-17	5.7E-17	-	1.5E-17	5.8E-17
bcsstk35.RSA	5.7E-16	1.8E-16	1.2E-16	1.1E-16	2.0E-16	6.9E-16	1.3E-16	1.3E-16	2.6E-16
bcsstk37.RSA	1.3E-16	1.5E-16	8.9E-17	9.0E-17	1.4E-16	2.0E-16	2.1E-16	2.3E-16	1.7E-16
bcsstk39.RSA	2.7E-16	3.8E-16	2.4E-16	2.1E-16	3.9E-16	4.4E-16	3.1E-16	3.9E-16	2.7E-16
BLOCKQP1.rsa	1.1E-15	1.9E-14	1.3E-14	3.7E-15	2.3E-14	3.6E-16	-	1.9E-14	4.7E-15
BLOWEYA.rsa	-	2.2E-14	3.7E-15	4.2E-19	-	5.4E-16	-	1.8E-14	-
bmw3_2.rsa	1.3E-16	2.0E-16	4.0E-16	1.8E-16	2.7E-16	2.5E-16	2.7E-16	-	1.7E-16
BOYD1.RSA	-	4.7E-14	1.1E-14	-	-	5.1E-15	-	2.1E-14	2.7E-14
BOYD2.RSA	-	1.8E-15	1.4E-15	-	-	2.9E-15	-	-	2.1E-15
BRAINPC2.rsa	2.1E-15	3.5E-15	3.0E-16	2.4E-15	6.0E-15	7.8E-12	2.3E-15	6.6E-15	-
BRATU3D.RSA	1.8E-16	1.8E-16	9.9E-17	2.8E-16	1.5E-16	1.5E-16	1.8E-16	1.3E-16	-

Table 3.2.1.10: Norm of scaled residuals following a single refinement (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
c-55.RSA	2.3E-18	7.9E-18	3.1E-18	4.8E-18	1.5E-17	4.9E-18	4.8E-18	9.7E-18	4.9E-18
c-58.RSA	1.0E-16	1.3E-17	7.4E-16	2.9E-16	3.9E-16	1.1E-15	1.3E-16	3.2E-16	2.2E-15
c-59.RSA	2.4E-16	5.3E-16	1.0E-15	1.2E-16	6.5E-16	7.9E-15	5.4E-17	2.7E-16	2.6E-15
c-62.RSA	2.0E-16	1.1E-16	2.8E-17	4.6E-16	2.5E-16	1.7E-15	5.6E-16	2.1E-16	2.0E-15
c-63.RSA	6.8E-18	6.8E-18	8.7E-18	4.4E-18	1.1E-16	3.0E-16	1.3E-17	1.3E-18	1.5E-16
c-68.RSA	3.9E-17	3.9E-17	2.6E-17	2.6E-17	7.3E-17	3.9E-17	7.3E-17	7.1E-20	3.3E-17
c-69.RSA	1.1E-18	9.4E-18	1.7E-18	2.2E-18	2.8E-17	1.4E-16	1.8E-17	2.3E-18	1.8E-17
c-70.RSA	1.5E-18	1.4E-18	4.8E-17	6.0E-18	2.3E-18	3.0E-18	2.8E-19	2.3E-18	7.2E-17
c-71.RSA	3.0E-17	3.4E-17	3.3E-17	4.7E-17	1.2E-16	5.6E-16	3.5E-16	-	4.4E-16
c-72.RSA	1.3E-18	1.7E-17	1.9E-17	1.8E-16	4.1E-18	8.2E-17	2.1E-17	6.2E-17	5.2E-18
CONT-201.RSA	-	1.9E-16	1.0E-16	2.0E-16	1.2E-16	3.1E-13	1.7E-16	1.4E-16	-
CONT-300.RSA	-	1.9E-16	1.1E-16	5.1E-14	1.7E-16	3.1E-9	2.2E-16	1.4E-16	-
copter2.rsa	1.6E-16	1.1E-16	1.3E-16	9.5E-17	1.6E-16	1.3E-16	1.6E-16	1.3E-16	1.1E-16
crystk02.RSA	1.1E-16	1.2E-16	7.9E-17	6.8E-17	1.1E-16	3.9E-7	1.2E-16	1.2E-16	-
crystk03.RSA	1.2E-16	1.3E-16	8.4E-17	8.5E-17	1.2E-16	2.3E-6	1.0E-16	1.2E-16	-
DARCY003.rsa	9.7E-17	1.3E-16	9.9E-17	8.6E-17	1.3E-16	9.7E-17	1.3E-16	1.3E-16	-
dawson5.rsa	1.7E-16	1.9E-16	1.3E-16	1.2E-16	1.7E-16	1.5E-16	2.2E-16	2.8E-16	1.8E-16
DIXMAANL.rsa	2.2E-16	2.1E-16	1.5E-16	1.6E-16	1.6E-16	2.3E-16	1.6E-16	1.6E-16	2.2E-16
DTOC.mat	-	2.2E-20	-	-	7.4E-17	1.1E-16	-	1.0E-20	-
D_PRETOK.rsa	8.1E-17	8.6E-17	4.5E-17	2.3E-17	1.1E-16	8.4E-17	2.9E-17	1.2E-14	-
HELM2D03.rsa	2.0E-16	2.0E-16	1.1E-16	1.3E-16	2.2E-16	2.0E-16	2.0E-16	2.0E-16	2.2E-16
HELM3D01.rsa	2.6E-16	2.6E-16	2.4E-16	2.4E-16	2.6E-16	2.5E-16	2.1E-16	2.6E-16	2.6E-16
K1_SAN.rsa	-	6.3E-17	-	-	8.5E-17	3.4E-17	8.5E-17	8.5E-17	-
LINVERSE.rsa	1.7E-16	1.9E-16	1.1E-16	1.2E-16	2.5E-16	1.7E-16	2.5E-16	1.7E-16	1.7E-16
mario001.rsa	9.8E-17	9.8E-17	7.4E-17	8.6E-17	1.3E-16	9.8E-17	1.3E-16	1.3E-16	-
mario002.rsa	9.7E-17	1.3E-16	9.9E-17	8.6E-17	1.3E-16	9.7E-17	1.3E-16	1.3E-16	-
NCVXBQP1.rsa	2.2E-16	2.0E-16	1.5E-16	1.3E-16	1.7E-16	1.9E-16	1.7E-16	1.7E-16	2.1E-16
NCVXQP1.mat	-	3.2E-17	2.9E-17	2.5E-23	1.3E-16	1.6E-23	-	3.2E-17	-
NCVXQP3.rsa	-	2.4E-16	1.7E-16	1.8E-16	-	1.4E-16	-	2.1E-16	-
NCVXQP5.rsa	-	2.6E-16	1.6E-16	1.6E-16	-	2.2E-16	-	2.1E-16	-
NCVXQP7.rsa	-	2.4E-16	1.5E-16	1.4E-16	-	2.0E-16	-	-	-
NCVXQP9.mat	2.4E-24	3.6E-24	2.4E-24	3.7E-24	1.4E-23	7.9E-19	7.2E-24	7.2E-24	-
olesnik0.rsa	5.0E-17	7.0E-17	3.9E-17	4.1E-17	5.0E-17	2.8E-17	5.1E-18	2.2E-15	-
qa8fk.RSA	6.3E-16	4.7E-16	1.6E-16	1.6E-16	9.2E-17	3.4E-10	2.9E-16	3.5E-16	3.3E-16
SIT100.rsa	1.0E-16	2.5E-16	5.1E-16	2.0E-16	2.2E-16	1.3E-16	2.1E-16	3.0E-14	-
SPARSINE.rsa	-	-	-	-	-	-	-	-	-

Table 3.2.1.10: Norm of scaled residuals following a single refinement (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
SPMSRTLS.rsa	1.6E-16	1.3E-16	7.7E-17	7.4E-17	1.2E-16	1.2E-16	1.7E-16	1.2E-16	1.4E-16
stokes128.mat	8.3E-16	1.1E-14	1.2E-13	6.2E-15	1.9E-16	2.1E-16	2.0E-16	6.1E-14	-
stokes64.mat	2.9E-16	5.1E-15	4.9E-14	2.0E-15	3.2E-16	2.8E-16	2.3E-15	2.1E-13	-
stokes64s.mat	7.6E-16	2.1E-15	2.2E-15	1.8E-15	1.3E-16	3.0E-15	4.8E-16	1.4E-13	-
tuma1.mat	9.6E-17	1.0E-16	7.9E-17	6.8E-17	1.4E-16	1.0E-16	2.1E-16	1.4E-16	-
tuma2.mat	9.6E-17	1.0E-16	6.8E-17	6.2E-17	1.4E-16	1.1E-16	2.1E-16	1.4E-16	-
TURON_M.rsa	3.1E-17	3.5E-16	3.0E-16	4.4E-17	1.4E-16	3.1E-17	2.4E-17	8.9E-15	-
vibrobox.RSA	1.1E-17	3.7E-17	2.2E-17	7.4E-19	2.5E-16	8.9E-18	1.5E-17	8.5E-18	1.6E-17

3.2.2 Runs with small threshold pivot tolerance

Here are the results obtained with small ($u = 10^{-10}$) threshold pivoting parameter.

Table 3.2.2.1: Return code

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	0	0	0	0	0	0	0	0	0
A2NNSNSL.rsa	0	0	0	0	0	0	0	0	-14
A5ESINDL.rsa	0	0	0	0	0	0	-2	0	0
AUG2D.mat	-6	6	-5	-6	0	7	-2	0	-14
AUG2DC.mat	-6	20	-5	-6	20	20	-2	20	-14
AUG3D.mat	-6	6	-5	-6	-99	7	-2	0	-14
AUG3DCQP.mat	20	0	0	0	0	0	-2	20	0
bcsstk35.RSA	0	0	0	0	0	0	0	0	0
bcsstk37.RSA	0	0	0	0	0	0	0	0	0
bcsstk39.RSA	0	0	0	0	0	0	0	0	0
BLOCKQP1.rsa	0	0	0	0	0	7	-2	0	0
BLOWEYA.rsa	0	0	0	0	0	7	0	0	-14
bmw3_2.rsa	0	0	0	0	0	0	0	-99	0
BOYD1.RSA	0	0	0	0	0	0	-99	0	0
BOYD2.RSA	0	0	0	0	0	0	-99	0	0
BRAINPC2.rsa	-13	0	0	0	0	7	0	0	-14
BRATU3D.RSA	-13	-13	0	-13	-13	7	-13	0	-14
c-55.RSA	0	0	0	0	0	0	0	0	0
c-58.RSA	20	0	0	0	0	0	0	0	0
c-59.RSA	-13	0	0	0	0	0	0	0	0
c-62.RSA	20	0	0	0	0	0	0	0	0
c-63.RSA	20	0	0	0	0	0	0	0	0
c-68.RSA	0	0	0	0	0	0	0	0	0
c-69.RSA	20	0	0	0	0	0	0	0	0
c-70.RSA	0	0	0	0	0	0	0	0	0
c-71.RSA	20	0	0	0	0	0	0	0	0
c-72.RSA	20	0	0	0	0	0	0	0	0
CONT-201.RSA	-17	-13	-13	-13	-13	7	-13	-13	-14
CONT-300.RSA	-17	-13	-13	-13	-13	7	-13	-13	-14
copter2.rsa	0	0	0	0	0	0	0	0	0
crystk02.RSA	20	0	0	0	0	7	0	0	-14
crystk03.RSA	20	0	0	0	0	7	0	0	-14
DARCY003.rsa	0	0	0	0	0	7	0	-13	-14

Table 3.2.2.1: Return code (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
dawson5.rsa	0	0	0	0	0	0	0	0	0
DIXMAANL.rsa	0	0	0	0	0	0	0	0	0
DTOC.mat	-6	20	-5	-6	20	20	20	20	-14
D_PRETOK.rsa	20	20	20	0	20	7	0	20	-14
HELM2D03.rsa	0	0	0	0	0	0	0	0	0
HELM3D01.rsa	0	0	0	0	0	0	0	0	0
K1_SAN.rsa	-6	6	-5	-6	0	7	0	-13	-14
LINVERSE.rsa	0	0	0	0	0	0	0	0	0
mario001.rsa	0	0	0	0	0	7	0	-13	-14
mario002.rsa	0	0	0	0	0	7	0	-13	-14
NCVXBQP1.rsa	0	0	0	0	0	0	0	0	0
NCVXQP1.mat	20	20	20	20	0	20	20	20	-14
NCVXQP3.rsa	20	20	20	20	0	20	-2	20	-14
NCVXQP5.rsa	0	0	0	-99	0	7	0	20	-14
NCVXQP7.rsa	0	20	20	20	0	7	-2	-2	-14
NCVXQP9.mat	0	0	0	0	0	7	0	0	-14
olesnik0.rsa	0	20	20	20	0	7	20	-13	-14
qa8fk.RSA	0	0	0	0	0	7	0	0	0
SIT100.rsa	0	0	0	0	0	7	0	-13	-14
SPARSINE.rsa	-99	-99	-99	-99	-99	-99	-2	-99	-99
SPMSRTLS.rsa	0	0	0	0	0	0	0	0	0
stokes128.mat	0	20	0	20	0	7	20	-13	-14
stokes64.mat	0	20	20	20	20	7	20	-13	-14
stokes64s.mat	20	20	0	0	0	7	20	-13	-14
tuma1.mat	0	0	0	0	0	7	0	-13	-14
tuma2.mat	0	0	0	0	0	7	0	-13	-14
TURON_M.rsa	0	0	20	0	0	7	0	-13	-14
vibrobox.RSA	20	20	20	20	20	20	20	20	20

Table 3.2.2.2: Total time (CPU seconds)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	4.93	0.78	2.59	5.53	4.27	2.72	49.50	20.40	3.93
A2NNSNSL.rsa	5.72	0.85	2.65	4.79	4.13	2.65	44.40	19.60	-
A5ESINDL.rsa	3.35	0.49	1.78	3.57	2.22	1.29	-	10.30	2.88

Table 3.2.2.2: Total time (CPU seconds) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
AUG2D.mat	-	274.46	-	-	56.70	0.98	-	0.09	-
AUG2DC.mat	-	325.74	-	-	75.90	1.03	-	0.09	-
AUG3D.mat	-	996.11	-	-	-	1.60	-	0.08	-
AUG3DCQP.mat	19.64	2.72	4.89	3.68	11.30	2.59	-	9.54	4.79
bcsstk35.RSA	3.06	2.48	3.61	4.54	3.80	2.94	4.48	5.73	5.75
bcsstk37.RSA	3.01	2.55	3.67	4.54	4.23	3.20	4.36	5.26	4.98
bcsstk39.RSA	8.16	6.32	8.73	10.83	10.90	7.60	10.70	12.60	10.90
BLOCKQP1.rsa	26.41	1.06	3.75	24.55	21.00	4.07	-	34.90	85.06
BLOWEYA.rsa	1.30	0.32	1.44	1.16	1.17	0.72	6.86	2.02	-
bmw3_2.rsa	72.91	82.98	85.65	106.04	124.00	71.33	131.00	-	91.83
BOYD1.RSA	255.34	59.56	35.96	363.27	226.00	64.94	-	128.00	379.20
BOYD2.RSA	351.19	7.08	50.20	341.28	395.00	74.30	-	1180.00	421.62
BRAINPC2.rsa	-	0.28	0.67	1.28	0.93	0.69	13.90	2.48	-
BRATU3D.RSA	-	-	13.98	-	-	11.72	-	40.50	-
c-55.RSA	9.30	16.89	20.30	13.05	82.00	8.16	72.80	26.30	49.81
c-58.RSA	8.53	12.49	13.29	11.01	74.00	6.54	88.70	17.40	51.13
c-59.RSA	-	18.29	36.67	16.79	104.00	9.78	73.30	17.40	48.19
c-62.RSA	18.27	37.55	71.11	30.13	254.00	18.29	205.00	68.50	93.31
c-63.RSA	6.68	7.30	10.63	7.50	29.70	5.12	43.60	10.10	18.92
c-68.RSA	17.72	31.52	61.29	30.49	226.00	18.89	404.00	55.80	106.89
c-69.RSA	10.03	10.30	14.57	10.07	30.70	7.03	52.30	13.60	29.49
c-70.RSA	11.56	15.50	17.75	13.24	68.30	9.07	169.00	23.00	32.41
c-71.RSA	43.04	101.43	108.33	76.49	717.00	47.54	680.00	200.00	846.34
c-72.RSA	11.87	13.06	19.70	13.69	57.90	9.23	62.80	17.60	42.71
CONT-201.RSA	-	-	-	-	-	5.90	-	-	-
CONT-300.RSA	-	-	-	-	-	16.08	-	-	-
copter2.rsa	17.81	18.84	20.72	22.55	25.70	16.74	30.10	53.40	16.52
crystk02.RSA	5.57	5.96	6.40	8.09	8.62	5.91	8.03	19.30	-
crystk03.RSA	14.44	15.76	17.01	21.08	23.00	14.45	19.70	50.00	-
DARCY003.rsa	40.10	9.84	29.56	27.48	26.90	21.94	78.00	-	-
dawson5.rsa	6.73	5.07	6.73	7.08	7.65	5.54	11.60	10.30	6.80
DIXMAANL.rsa	2.37	0.64	2.48	2.05	2.05	1.51	4.40	6.32	1.73
DTOC.mat	-	9.78	-	-	0.88	0.49	21.50	0.07	-
D_PRETOK.rsa	29.68	21.95	27.57	28.43	32.20	22.48	54.10	664.00	-
HELM2D03.rsa	48.52	31.06	37.59	39.54	42.00	29.86	108.00	79.50	36.16
HELM3D01.rsa	9.51	10.51	10.83	12.40	14.00	8.61	17.40	35.30	9.32

Table 3.2.2.2: Total time (CPU seconds) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
K1_SAN.rsa	-	5.61	-	-	6.37	5.07	10.20	-	-
LINVERSE.rsa	0.37	0.11	0.35	0.35	0.32	0.24	0.67	0.25	0.33
mario001.rsa	2.45	0.64	2.00	1.99	1.85	1.53	3.32	-	-
mario002.rsa	40.22	9.84	29.54	27.52	26.90	22.00	78.10	-	-
NCVXBQP1.rsa	4.78	4.10	5.11	5.03	5.15	3.50	8.84	16.30	3.97
NCVXQP1.mat	12.59	4.96	13.68	6.63	80.00	2.89	37.60	19.90	-
NCVXQP3.rsa	80.88	189.38	490.34	137.74	455.00	60.20	-	1260.00	-
NCVXQP5.rsa	31.65	51.10	73.48	-	92.30	28.68	63.20	450.00	-
NCVXQP7.rsa	182.17	396.82	1013.32	337.28	1180.00	99.40	-	-	-
NCVXQP9.mat	1.08	0.48	1.50	0.73	0.75	0.53	1.58	0.80	-
olesnik0.rsa	9.81	7.31	9.13	8.33	8.80	6.78	15.00	-	-
qa8fk.RSA	45.53	56.55	46.25	59.43	90.00	43.52	84.20	219.00	45.87
SIT100.rsa	0.77	0.59	0.73	0.68	0.67	0.52	1.11	-	-
SPARSINE.rsa	-	-	-	-	-	-	-	-	-
SPMSRTLS.rsa	0.73	0.30	0.82	0.76	0.60	0.49	1.42	0.73	0.95
stokes128.mat	5.65	2.92	5.96	4.79	5.38	3.92	7.76	-	-
stokes64.mat	1.06	0.42	1.14	0.98	1.00	0.74	1.39	-	-
stokes64s.mat	1.05	0.47	1.08	0.98	1.03	0.74	1.40	-	-
tuma1.mat	1.30	0.51	1.23	1.12	1.15	0.89	2.05	-	-
tuma2.mat	0.65	0.22	0.61	0.54	0.53	0.43	1.00	-	-
TURON_M.rsa	29.68	21.53	26.66	28.15	30.80	21.84	54.80	-	-
vibrobox.RSA	3.97	3.79	3.84	4.50	5.78	3.44	9.30	6.21	3.64

Table 3.2.2.3: Factorize time (CPU seconds)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	0.48	0.46	1.30	0.99	0.77	0.15	1.12	5.05	0.37
A2NNSNSL.rsa	0.48	0.45	1.36	0.96	0.80	0.15	1.15	5.81	-
A5ESINDL.rsa	0.30	0.29	0.95	0.67	0.47	0.09	-	4.06	0.25
AUG2D.mat	-	274.18	-	-	55.40	0.11	-	0.05	-
AUG2DC.mat	-	325.44	-	-	74.50	0.12	-	0.05	-
AUG3D.mat	-	995.35	-	-	-	0.61	-	0.05	-
AUG3DCQP.mat	1.17	1.12	2.71	1.65	9.52	1.04	-	8.77	1.60
bcsstk35.RSA	2.13	2.08	2.17	3.18	2.82	1.76	2.46	4.06	1.28
bcsstk37.RSA	2.13	2.21	2.37	3.31	3.27	2.14	2.53	3.81	1.40

Table 3.2.2.3: Factorize time (CPU seconds) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
bcsstk39.RSA	6.47	5.63	6.59	8.81	9.28	5.81	7.59	9.63	3.92
BLOCKQP1.rsa	0.92	0.66	1.08	3.40	2.77	0.22	-	12.30	0.43
BLOWEYA.rsa	0.18	0.21	0.43	0.26	0.28	0.05	0.38	0.42	-
bmw3_2.rsa	60.93	71.85	71.33	92.84	112.00	58.88	110.00	-	51.06
BOYD1.RSA	2.38	1.71	1.73	53.92	1.92	0.23	-	74.40	0.54
BOYD2.RSA	3.01	2.21	8.08	26.54	3.43	0.68	-	428.00	1.96
BRAINPC2.rsa	-	0.18	0.34	0.35	0.33	0.08	0.38	0.49	-
BRATU3D.RSA	-	-	12.38	-	-	10.02	-	37.90	-
c-55.RSA	5.52	13.84	16.62	9.73	79.10	5.89	25.30	23.10	40.77
c-58.RSA	4.33	9.32	11.67	7.53	70.90	4.03	15.40	14.30	42.10
c-59.RSA	-	14.47	31.39	12.03	101.00	6.99	24.10	14.20	32.27
c-62.RSA	13.20	33.25	68.54	24.63	249.00	15.21	76.50	62.60	81.60
c-63.RSA	2.47	4.29	6.88	4.15	26.70	2.54	16.30	7.50	7.47
c-68.RSA	11.20	25.23	54.20	24.17	221.00	14.91	96.10	47.90	60.63
c-69.RSA	3.23	5.71	8.53	4.70	25.90	2.89	14.00	8.76	10.74
c-70.RSA	4.45	10.64	11.56	7.72	63.30	4.82	50.00	17.30	12.08
c-71.RSA	33.53	93.50	97.75	67.06	708.00	41.85	278.00	186.00	813.58
c-72.RSA	3.94	7.51	12.63	7.39	52.20	4.43	16.50	11.60	10.55
CONT-201.RSA	-	-	-	-	-	2.50	-	-	-
CONT-300.RSA	-	-	-	-	-	7.92	-	-	-
copter2.rsa	11.94	14.27	15.56	18.15	21.30	12.95	18.00	48.10	9.99
crystk02.RSA	4.74	4.89	5.32	7.03	7.63	4.70	6.22	17.40	-
crystk03.RSA	12.72	13.56	14.91	19.08	21.00	12.05	16.30	46.10	-
DARCY003.rsa	9.12	6.35	8.40	7.11	7.32	2.40	18.10	-	-
dawson5.rsa	2.77	4.42	2.65	3.57	3.90	2.23	4.34	8.06	1.94
DIXMAANL.rsa	0.41	0.35	0.74	0.49	0.65	0.14	0.81	1.07	0.16
DTOC.mat	-	9.44	-	-	0.45	0.04	20.30	0.04	-
D_PRETOK.rsa	12.88	12.83	14.72	17.37	20.30	10.92	28.00	647.00	-
HELM2D03.rsa	20.46	14.74	17.32	20.40	23.00	12.63	41.40	63.00	12.18
HELM3D01.rsa	6.30	7.86	8.11	9.81	11.60	6.56	9.19	32.20	5.34
K1_SAN.rsa	-	2.37	-	-	2.82	1.44	3.33	-	-
LINVERSE.rsa	0.07	0.08	0.10	0.11	0.08	0.03	0.13	0.17	0.03
mario001.rsa	0.39	0.44	0.62	0.56	0.50	0.14	0.71	-	-
mario002.rsa	9.15	6.36	8.40	7.14	7.32	2.41	18.10	-	-
NCVXBQP1.rsa	1.67	1.73	2.28	2.46	3.12	1.58	2.72	14.00	1.28
NCVXQP1.mat	11.32	4.23	11.80	5.81	79.10	2.22	34.50	19.10	-

Table 3.2.2.3: Factorize time (CPU seconds) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
NCVXQP3.rsa	71.27	180.09	399.06	127.46	447.00	54.04	-	1250.00	-
NCVXQP5.rsa	24.50	45.58	59.05	-	87.80	24.41	40.60	441.00	-
NCVXQP7.rsa	164.51	385.18	948.23	321.61	1170.00	91.64	-	-	-
NCVXQP9.mat	0.38	0.40	0.29	0.22	0.32	0.07	0.28	0.56	-
olesnik0.rsa	2.99	3.05	3.76	3.72	4.05	2.04	5.17	-	-
qa8fk.RSA	36.01	48.42	39.62	52.86	82.10	36.10	62.60	208.00	33.87
SIT100.rsa	0.22	0.22	0.31	0.28	0.30	0.14	0.32	-	-
SPARSINE.rsa	-	-	-	-	-	-	-	-	-
SPMSRTLS.rsa	0.20	0.21	0.28	0.27	0.22	0.07	0.36	0.44	0.08
stokes128.mat	1.79	2.56	2.41	2.12	2.57	1.19	2.81	-	-
stokes64.mat	0.33	0.34	0.44	0.42	0.47	0.19	0.42	-	-
stokes64s.mat	0.33	0.39	0.47	0.43	0.48	0.20	0.43	-	-
tuma1.mat	0.28	0.41	0.47	0.39	0.45	0.17	0.57	-	-
tuma2.mat	0.15	0.17	0.22	0.17	0.18	0.07	0.23	-	-
TURON_M.rsa	12.54	12.08	13.14	16.63	18.60	9.96	27.40	-	-
vibrobox.RSA	2.49	2.41	2.65	3.33	4.63	2.38	4.26	5.32	1.62

Table 3.2.2.4: Solution time given factors (CPU seconds)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	0.06	0.05	0.38	0.30	0.08	0.07	0.72	0.36	0.20
A2NNSNSL.rsa	0.06	0.05	0.38	0.27	0.10	0.08	0.71	0.36	-
A5ESINDL.rsa	0.04	0.03	0.22	0.24	0.05	0.05	-	0.16	0.14
AUG2D.mat	-	0.20	-	-	0.43	0.10	-	0.00	-
AUG2DC.mat	-	0.21	-	-	0.52	0.10	-	0.01	-
AUG3D.mat	-	0.68	-	-	-	0.11	-	0.00	-
AUG3DCQP.mat	0.06	0.04	0.18	0.15	0.12	0.06	-	0.43	0.14
bcsstk35.RSA	0.09	0.09	0.13	0.13	0.25	0.10	0.20	1.05	0.11
bcsstk37.RSA	0.08	0.09	0.13	0.12	0.25	0.09	0.18	0.97	0.10
bcsstk39.RSA	0.21	0.20	0.29	0.28	0.57	0.21	0.43	2.08	0.23
BLOCKQP1.rsa	0.07	0.05	0.20	2.43	0.08	0.25	-	0.41	0.13
BLOWEYA.rsa	0.02	0.02	0.08	0.05	0.03	0.10	0.08	0.11	-
bmw3_2.rsa	1.28	1.29	1.73	1.57	3.48	1.26	3.34	-	1.44
BOYD1.RSA	0.19	0.07	0.47	51.10	0.12	0.10	-	0.68	0.24
BOYD2.RSA	0.35	0.26	1.95	22.57	0.48	0.50	-	1.86	1.08

Table 3.2.2.4: Solution time given factors (CPU seconds) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
BRAINPC2.rsa	-	0.02	0.09	0.06	0.03	0.10	0.06	0.13	-
BRATU3D.RSA	-	-	0.25	-	-	0.48	-	1.75	-
c-55.RSA	0.11	0.13	0.33	0.19	0.30	0.11	2.07	1.16	0.45
c-58.RSA	0.10	0.10	0.26	0.17	0.23	0.09	0.81	0.72	0.39
c-59.RSA	-	0.13	0.43	0.21	0.30	0.12	1.64	0.89	0.40
c-62.RSA	0.20	0.23	0.55	0.31	0.55	0.19	6.54	2.31	0.67
c-63.RSA	0.09	0.09	0.29	0.18	0.20	0.09	2.17	0.69	0.26
c-68.RSA	0.19	0.20	0.73	0.35	0.48	0.20	7.43	1.68	0.56
c-69.RSA	0.13	0.12	0.43	0.25	0.25	0.13	1.29	0.93	0.40
c-70.RSA	0.15	0.14	0.47	0.28	0.33	0.15	3.70	1.18	0.40
c-71.RSA	0.38	0.43	0.99	0.58	1.08	0.38	27.20	4.62	2.41
c-72.RSA	0.16	0.14	0.53	0.32	0.32	0.16	1.34	1.08	0.42
CONT-201.RSA	-	-	-	-	-	0.61	-	-	-
CONT-300.RSA	-	-	-	-	-	1.45	-	-	-
copter2.rsa	0.27	0.29	0.43	0.41	0.75	0.28	0.68	3.23	0.38
crystk02.RSA	0.11	0.11	0.14	0.14	0.33	0.33	0.22	1.53	-
crystk03.RSA	0.24	0.24	0.30	0.29	0.70	0.71	0.48	3.12	-
DARCY003.rsa	0.60	0.49	1.38	1.09	0.78	2.05	2.38	-	-
dawson5.rsa	0.13	0.15	0.22	0.20	0.33	0.15	0.33	1.37	0.18
DIXMAANL.rsa	0.05	0.05	0.19	0.13	0.08	0.08	0.17	0.29	0.10
DTOC.mat	-	0.02	-	-	0.03	0.06	0.04	0.00	-
D_PRETOK.rsa	0.48	0.48	0.81	0.73	1.12	1.53	1.59	14.30	-
HELM2D03.rsa	0.96	0.80	1.60	1.34	1.72	0.96	3.19	7.56	1.34
HELM3D01.rsa	0.15	0.16	0.25	0.23	0.40	0.15	0.35	1.78	0.21
K1_SAN.rsa	-	0.13	-	-	0.25	0.42	0.33	-	-
LINVERSE.rsa	0.01	0.01	0.02	0.02	0.02	0.01	0.02	0.03	0.02
mario001.rsa	0.04	0.04	0.11	0.09	0.07	0.15	0.11	-	-
mario002.rsa	0.60	0.49	1.38	1.10	0.77	2.05	2.39	-	-
NCVXBQP1.rsa	0.09	0.09	0.28	0.20	0.18	0.11	0.23	1.12	0.15
NCVXQP1.mat	0.40	0.06	0.12	0.09	0.28	0.12	0.28	0.51	-
NCVXQP3.rsa	0.64	0.77	1.36	0.95	1.90	1.42	-	11.50	-
NCVXQP5.rsa	0.35	0.44	0.78	-	0.98	0.98	1.08	5.83	-
NCVXQP7.rsa	6.43	1.14	1.69	1.42	2.88	1.70	-	-	-
NCVXQP9.mat	0.02	0.01	0.05	0.04	0.02	0.05	0.05	0.08	-
olesnik0.rsa	0.17	0.17	0.33	0.28	0.35	0.58	0.48	-	-
qa8fk.RSA	0.57	0.62	0.74	0.69	1.65	1.68	1.57	8.88	0.68

Table 3.2.2.4: Solution time given factors (CPU seconds) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
SIT100.rsa	0.01	0.01	0.03	0.03	0.02	0.04	0.04	-	-
SPARSINE.rsa	-	-	-	-	-	-	-	-	-
SPMSRTLS.rsa	0.02	0.02	0.06	0.04	0.02	0.03	0.06	0.14	0.06
stokes128.mat	0.10	0.11	0.21	0.18	0.25	0.35	0.25	-	-
stokes64.mat	0.02	0.02	0.05	0.04	0.05	0.06	0.05	-	-
stokes64s.mat	0.02	0.02	0.05	0.04	0.05	0.06	0.05	-	-
tuma1.mat	0.02	0.03	0.07	0.05	0.05	0.08	0.08	-	-
tuma2.mat	0.01	0.01	0.03	0.03	0.02	0.04	0.03	-	-
TURON_M.rsa	0.49	0.47	0.81	0.73	1.07	1.51	1.60	-	-
vibrobox.RSA	0.06	0.06	0.08	0.08	0.17	0.06	0.18	0.55	0.07

Table 3.2.2.5: Actual memory used (Mbytes)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	3.7E+1	2.1E+1	2.7E+1	3.3E+1	2.5E+1	2.8E+1	3.0E+1	4.1E+1	2.6E+1
A2NNSNSL.rsa	3.6E+1	2.1E+1	2.5E+1	3.2E+1	2.5E+1	2.8E+1	3.0E+1	4.1E+1	-
A5ESINDL.rsa	2.4E+1	1.5E+1	1.8E+1	2.2E+1	1.7E+1	1.9E+1	-	2.8E+1	1.8E+1
AUG2D.mat	-	1.6E+3	-	-	8.4E+1	1.1E+1	-	6.0E+0	-
AUG2DC.mat	-	1.8E+3	-	-	9.7E+1	1.1E+1	-	6.2E+0	-
AUG3D.mat	-	2.4E+3	-	-	-	1.3E+1	-	6.3E+0	-
AUG3DCQP.mat	3.4E+1	2.4E+1	3.5E+1	3.4E+1	3.5E+1	1.9E+1	-	1.5E+2	2.9E+1
bcsstk35.RSA	5.8E+1	6.1E+1	5.8E+1	9.9E+1	4.8E+1	4.8E+1	5.3E+1	1.6E+2	7.1E+1
bcsstk37.RSA	5.3E+1	5.5E+1	5.5E+1	9.0E+1	4.9E+1	4.5E+1	4.6E+1	7.8E+1	6.3E+1
bcsstk39.RSA	1.1E+2	1.2E+2	1.1E+2	1.9E+2	1.0E+2	9.5E+1	1.1E+2	1.8E+2	1.3E+2
BLOCKQP1.rsa	5.1E+1	3.8E+1	4.3E+1	5.5E+1	5.4E+1	2.8E+1	-	4.9E+1	3.4E+1
BLOWEYA.rsa	1.8E+1	9.5E+0	1.1E+1	1.2E+1	1.0E+1	1.1E+1	1.4E+1	1.4E+1	-
bmw3_2.rsa	7.4E+2	7.2E+2	7.4E+2	1.2E+3	6.2E+2	6.1E+2	7.0E+2	-	7.8E+2
BOYD1.RSA	9.0E+1	6.0E+1	6.8E+1	7.9E+1	6.7E+1	4.7E+1	-	7.2E+1	9.6E+1
BOYD2.RSA	1.4E+2	9.8E+1	1.3E+2	1.5E+2	1.2E+2	1.3E+2	-	1.8E+2	1.4E+2
BRAINPC2.rsa	-	9.4E+0	9.2E+0	2.4E+1	1.2E+1	1.1E+1	1.4E+1	1.7E+1	-
BRATU3D.RSA	-	-	9.8E+1	-	-	6.5E+1	-	9.0E+2	-
c-55.RSA	7.1E+1	6.8E+1	9.2E+1	9.2E+1	9.7E+1	4.0E+1	1.0E+2	5.5E+2	1.3E+2
c-58.RSA	7.8E+1	5.5E+1	1.5E+2	8.7E+1	9.0E+1	3.8E+1	7.3E+1	4.7E+2	1.2E+2
c-59.RSA	-	7.2E+1	1.1E+2	1.0E+2	1.2E+2	4.3E+1	1.1E+2	3.9E+2	1.2E+2
c-62.RSA	1.2E+2	1.1E+2	3.5E+2	1.6E+2	1.9E+2	7.1E+1	2.0E+2	1.1E+3	1.9E+2

Table 3.2.2.5: Actual memory used (Mbytes) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
c-63.RSA	5.7E+1	4.3E+1	6.0E+1	6.4E+1	6.4E+1	3.2E+1	1.0E+2	2.6E+2	7.1E+1
c-68.RSA	1.2E+2	9.5E+1	1.7E+2	1.5E+2	1.7E+2	6.2E+1	2.2E+2	1.2E+3	1.6E+2
c-69.RSA	9.4E+1	5.4E+1	9.4E+1	7.9E+1	7.1E+1	4.6E+1	1.2E+2	1.9E+2	9.6E+1
c-70.RSA	9.2E+1	7.3E+1	9.1E+1	1.0E+2	1.2E+2	5.0E+1	1.8E+2	4.8E+2	1.0E+2
c-71.RSA	2.3E+2	2.1E+2	2.8E+2	3.1E+2	3.7E+2	1.3E+2	4.4E+2	2.3E+3	9.5E+2
c-72.RSA	9.4E+1	6.5E+1	9.3E+1	1.0E+2	1.0E+2	5.3E+1	1.4E+2	3.5E+2	1.0E+2
CONT-201.RSA	-	-	-	-	-	4.9E+1	-	-	-
CONT-300.RSA	-	-	-	-	-	1.2E+2	-	-	-
copter2.rsa	1.5E+2	1.3E+2	1.4E+2	2.1E+2	1.5E+2	1.0E+2	1.3E+2	6.7E+2	1.4E+2
crystk02.RSA	6.4E+1	6.7E+1	6.7E+1	1.1E+2	6.4E+1	5.1E+1	5.2E+1	1.7E+2	-
crystk03.RSA	1.3E+2	1.4E+2	1.4E+2	2.3E+2	1.3E+2	1.1E+2	1.1E+2	6.9E+2	-
DARCY003.rsa	3.8E+2	1.6E+2	1.8E+2	2.6E+2	1.7E+2	1.7E+2	4.4E+2	-	-
dawson5.rsa	9.4E+1	7.8E+1	6.9E+1	1.2E+2	6.0E+1	5.6E+1	7.7E+1	2.5E+2	7.3E+1
DIXMAANL.rsa	3.7E+1	1.9E+1	2.1E+1	2.5E+1	1.9E+1	2.1E+1	3.1E+1	4.7E+1	2.2E+1
DTOC.mat	-	4.1E+2	-	-	1.1E+1	8.3E+0	5.0E+2	4.7E+0	-
D_PRETOK.rsa	2.5E+2	1.9E+2	2.1E+2	3.2E+2	2.1E+2	1.5E+2	3.2E+2	2.2E+3	-
HELM2D03.rsa	5.2E+2	2.9E+2	3.4E+2	4.7E+2	2.9E+2	2.4E+2	6.3E+2	7.0E+2	3.2E+2
HELM3D01.rsa	8.7E+1	7.6E+1	8.5E+1	1.2E+2	8.4E+1	5.4E+1	6.9E+1	6.8E+2	8.5E+1
K1_SAN.rsa	-	5.8E+1	-	-	5.2E+1	3.9E+1	7.2E+1	-	-
LINVERSE.rsa	8.3E+0	4.5E+0	5.3E+0	7.2E+0	4.1E+0	5.3E+0	4.4E+0	6.7E+0	5.6E+0
mario001.rsa	3.0E+1	1.4E+1	1.8E+1	3.0E+1	1.6E+1	1.7E+1	2.3E+1	-	-
mario002.rsa	3.8E+2	1.6E+2	1.8E+2	2.6E+2	1.7E+2	1.7E+2	4.4E+2	-	-
NCVXBQP1.rsa	5.6E+1	4.5E+1	4.5E+1	6.5E+1	4.1E+1	2.9E+1	4.6E+1	2.6E+2	4.3E+1
NCVXQP1.mat	2.7E+1	3.4E+1	5.1E+1	9.6E+1	6.9E+1	1.9E+1	8.9E+1	2.0E+2	-
NCVXQP3.rsa	2.4E+2	3.5E+2	6.0E+2	5.6E+2	4.4E+2	1.9E+2	-	2.2E+3	-
NCVXQP5.rsa	1.7E+2	1.8E+2	2.7E+2	-	2.2E+2	1.3E+2	1.7E+2	2.4E+3	-
NCVXQP7.rsa	3.2E+2	5.0E+2	8.4E+2	8.2E+2	6.7E+2	2.3E+2	-	-	-
NCVXQP9.mat	9.7E+0	7.4E+0	7.9E+0	9.7E+0	7.8E+0	6.0E+0	8.1E+0	2.3E+1	-
olesnik0.rsa	1.1E+2	7.1E+1	8.4E+1	1.1E+2	7.0E+1	5.1E+1	1.0E+2	-	-
qa8fk.RSA	3.0E+2	3.1E+2	2.9E+2	4.5E+2	3.1E+2	2.2E+2	2.9E+2	2.0E+3	3.0E+2
SIT100.rsa	8.6E+0	8.1E+0	9.0E+0	1.2E+1	7.9E+0	5.8E+0	8.3E+0	-	-
SPARSINE.rsa	-	-	-	-	-	-	-	-	-
SPMSRTLS.rsa	1.7E+1	1.0E+1	1.1E+1	1.5E+1	8.7E+0	1.1E+1	1.4E+1	1.7E+1	1.2E+1
stokes128.mat	7.1E+1	4.5E+1	6.0E+1	8.8E+1	5.0E+1	3.5E+1	5.7E+1	-	-
stokes64.mat	1.6E+1	1.0E+1	1.4E+1	2.9E+1	1.2E+1	8.5E+0	1.1E+1	-	-
stokes64s.mat	1.6E+1	1.0E+1	1.5E+1	2.9E+1	1.2E+1	8.5E+0	1.1E+1	-	-

Table 3.2.2.5: Actual memory used (Mbytes) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
tuma1.mat	1.5E+1	1.2E+1	1.3E+1	2.0E+1	1.2E+1	9.3E+0	1.5E+1	-	-
tuma2.mat	9.3E+0	5.8E+0	7.1E+0	9.9E+0	6.5E+0	5.7E+0	7.3E+0	-	-
TURON_M.rsa	2.9E+2	2.1E+2	2.0E+2	3.1E+2	2.0E+2	1.4E+2	3.2E+2	-	-
vibrobox.RSA	4.3E+1	4.0E+1	4.5E+1	5.7E+1	4.4E+1	2.7E+1	3.2E+1	2.0E+2	3.7E+1

Table 3.2.2.6: Number of integers used for factors

Name	MA57	MUMPS	MUMPS_US	Oblio	SPOOLES	UMFPACK
A0NSDSIL.rsa	2.8E+5	9.7E+5	6.1E+5	3.6E+5	1.3E+6	9.6E+5
A2NNSNSL.rsa	2.8E+5	9.8E+5	5.9E+5	3.3E+5	1.3E+6	9.3E+5
A5ESINDL.rsa	2.0E+5	7.3E+5	4.1E+5	2.1E+5	-	5.9E+5
AUG2D.mat	2.1E+5	-	-	6.4E+5	-	1.6E+5
AUG2DC.mat	2.2E+5	-	-	6.9E+5	-	1.7E+5
AUG3D.mat	2.2E+5	-	-	-	-	1.4E+5
AUG3DCQP.mat	1.7E+5	4.9E+5	4.6E+5	8.8E+5	-	4.8E+6
bcsstk35.RSA	1.6E+5	3.4E+5	3.7E+5	2.6E+5	3.5E+6	5.5E+6
bcsstk37.RSA	1.4E+5	3.1E+5	3.4E+5	2.3E+5	3.3E+6	5.7E+6
bcsstk39.RSA	2.9E+5	6.4E+5	6.8E+5	4.3E+5	8.4E+6	1.3E+7
BLOCKQP1.rsa	3.2E+5	8.8E+5	7.4E+5	5.4E+5	-	1.4E+6
BLOWEYA.rsa	3.8E+4	3.8E+5	2.0E+5	1.4E+5	7.8E+5	2.5E+5
bmw3_2.rsa	1.5E+6	3.1E+6	3.3E+6	2.3E+6	6.1E+7	-
BOYD1.RSA	8.4E+5	1.9E+6	1.6E+6	6.5E+5	-	1.5E+6
BOYD2.RSA	1.4E+6	5.3E+6	2.9E+6	1.3E+6	-	3.6E+6
BRAINPC2.rsa	1.0E+5	3.4E+5	3.6E+5	2.1E+5	7.8E+5	4.7E+5
BRATU3D.RSA	-	5.4E+5	-	-	-	1.6E+7
c-55.RSA	3.9E+5	9.9E+5	5.7E+5	2.2E+6	5.7E+6	9.2E+6
c-58.RSA	3.2E+5	7.5E+5	4.9E+5	1.9E+6	4.3E+6	4.7E+6
c-59.RSA	4.2E+5	1.4E+6	6.7E+5	2.3E+6	5.9E+6	6.4E+6
c-62.RSA	6.0E+5	8.8E+5	7.6E+5	4.5E+6	1.1E+7	2.0E+7
c-63.RSA	3.3E+5	9.2E+5	5.8E+5	1.4E+6	5.2E+6	4.6E+6
c-68.RSA	6.2E+5	2.1E+6	1.0E+6	3.9E+6	1.2E+7	1.3E+7
c-69.RSA	4.7E+5	1.4E+6	8.4E+5	1.7E+6	7.3E+6	5.7E+6
c-70.RSA	5.3E+5	1.4E+6	9.1E+5	2.2E+6	9.8E+6	8.2E+6
c-71.RSA	1.2E+6	2.5E+6	1.4E+6	8.4E+6	2.4E+7	4.0E+7
c-72.RSA	5.4E+5	1.6E+6	1.0E+6	2.2E+6	9.1E+6	6.6E+6

Table 3.2.2.6: Number of integers used for factors (continued)

Name	MA57	MUMPS	MUMPS_US	Oblio	SPOOLES	UMFPACK
CONT-201.RSA	-	1.3E+6	-	-	-	-
CONT-300.RSA	-	3.1E+6	-	-	-	-
copter2.rsa	4.3E+5	9.6E+5	9.1E+5	9.5E+5	1.2E+7	2.8E+7
crystk02.RSA	1.1E+5	2.3E+5	2.6E+5	1.9E+5	4.4E+6	1.2E+7
crystk03.RSA	2.0E+5	4.4E+5	4.8E+5	3.6E+5	9.6E+6	2.6E+7
DARCY003.rsa	1.1E+6	4.1E+6	3.8E+6	2.3E+6	3.8E+7	-
dawson5.rsa	3.1E+5	6.6E+5	6.6E+5	5.7E+5	6.0E+6	9.4E+6
DIXMAANL.rsa	2.0E+5	7.5E+5	4.8E+5	3.7E+5	2.1E+6	8.2E+5
DTOC.mat	9.6E+4	-	-	1.5E+5	1.7E+6	1.4E+5
D_PRETOK.rsa	7.4E+5	2.3E+6	2.3E+6	1.5E+6	2.8E+7	1.8E+8
HELM2D03.rsa	1.8E+6	5.4E+6	4.3E+6	3.4E+6	5.8E+7	5.8E+7
HELM3D01.rsa	2.6E+5	6.0E+5	5.4E+5	5.6E+5	6.0E+6	1.5E+7
K1_SAN.rsa	2.4E+5	-	-	5.2E+5	5.6E+6	-
LINVERSE.rsa	1.6E+4	7.6E+4	8.4E+4	4.8E+4	2.3E+5	1.3E+5
mario001.rsa	1.1E+5	4.0E+5	3.7E+5	2.2E+5	1.5E+6	-
mario002.rsa	1.1E+6	4.1E+6	3.8E+6	2.3E+6	3.8E+7	-
NCVXBQP1.rsa	2.2E+5	7.1E+5	5.3E+5	4.5E+5	3.8E+6	8.6E+6
NCVXQP1.mat	1.0E+5	2.4E+5	2.4E+5	6.6E+5	3.8E+6	6.7E+6
NCVXQP3.rsa	1.1E+6	1.7E+6	-	4.4E+6	-	1.4E+8
NCVXQP5.rsa	6.7E+5	1.1E+6	1.2E+6	2.1E+6	1.5E+7	7.4E+7
NCVXQP7.rsa	1.4E+6	2.3E+6	-	7.2E+6	-	-
NCVXQP9.mat	4.7E+4	1.7E+5	1.4E+5	9.2E+4	4.2E+5	4.1E+5
olesnik0.rsa	3.2E+5	1.0E+6	1.0E+6	6.8E+5	8.1E+6	-
qa8fk.RSA	5.6E+5	1.2E+6	1.3E+6	1.1E+6	2.7E+7	8.1E+7
SIT100.rsa	3.8E+4	1.3E+5	1.1E+5	7.7E+4	5.3E+5	-
SPARSINE.rsa	-	-	-	-	-	-
SPMSRTLS.rsa	3.9E+4	2.3E+5	1.6E+5	1.2E+5	8.2E+5	3.2E+5
stokes128.mat	2.0E+5	6.2E+5	7.3E+5	5.1E+5	4.4E+6	-
stokes64.mat	4.9E+4	1.6E+5	1.8E+5	1.3E+5	7.4E+5	-
stokes64s.mat	4.9E+4	1.6E+5	1.8E+5	1.3E+5	7.4E+5	-
tuma1.mat	6.1E+4	2.5E+5	2.1E+5	1.4E+5	9.8E+5	-
tuma2.mat	3.3E+4	1.4E+5	1.2E+5	7.9E+4	4.1E+5	-
TURON_M.rsa	7.5E+5	2.3E+6	2.4E+6	1.5E+6	2.8E+7	-
vibrobox.RSA	8.1E+4	2.0E+5	2.0E+5	2.8E+5	2.7E+6	4.2E+6

Table 3.2.2.7: Number of reals used for factors

Name	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	5.4E+5	3.9E+5	1.0E+6	3.6E+5	3.6E+5	1.3E+6	8.0E+5	4.1E+5
A2NNSNSL.rsa	5.1E+5	3.6E+5	9.9E+5	3.3E+5	3.3E+5	1.3E+6	7.7E+5	-
A5ESINDL.rsa	3.1E+5	2.3E+5	5.9E+5	2.4E+5	2.4E+5	-	4.7E+5	2.2E+5
AUG2D.mat	7.5E+6	-	-	5.9E+6	3.1E+5	-	1.1E+5	-
AUG2DC.mat	8.0E+6	-	-	6.8E+6	3.2E+5	-	1.1E+5	-
AUG3D.mat	2.1E+7	-	-	-	6.9E+5	-	9.4E+4	-
AUG3DCQP.mat	1.1E+6	2.6E+6	2.2E+6	1.0E+6	1.1E+6	-	4.8E+6	1.1E+6
bcsstk35.RSA	2.9E+6	3.7E+6	6.3E+6	3.5E+6	3.5E+6	3.5E+6	5.5E+6	2.9E+6
bcsstk37.RSA	3.0E+6	3.7E+6	6.2E+6	3.5E+6	3.4E+6	3.3E+6	5.6E+6	2.9E+6
bcsstk39.RSA	7.1E+6	8.9E+6	1.5E+7	8.4E+6	8.1E+6	8.4E+6	1.3E+7	6.9E+6
BLOCKQP1.rsa	7.8E+5	4.0E+5	1.6E+6	8.4E+5	7.8E+5	-	1.3E+6	3.8E+5
BLOWEYA.rsa	4.9E+5	1.7E+5	3.5E+5	1.6E+5	1.3E+5	7.8E+5	1.9E+5	-
bmw3_2.rsa	4.8E+7	5.5E+7	9.3E+7	5.1E+7	4.8E+7	6.1E+7	-	4.6E+7
BOYD1.RSA	6.5E+5	6.5E+5	1.3E+6	6.5E+5	6.5E+5	-	1.3E+6	6.5E+5
BOYD2.RSA	1.7E+6	1.3E+6	3.4E+6	1.3E+6	1.3E+6	-	2.7E+6	1.3E+6
BRAINPC2.rsa	2.6E+5	1.7E+5	8.9E+5	3.4E+5	2.3E+5	7.8E+5	4.1E+5	-
BRATU3D.RSA	-	7.6E+6	-	-	5.8E+6	-	1.6E+7	-
c-55.RSA	3.9E+6	7.2E+6	7.0E+6	3.3E+6	3.4E+6	5.7E+6	9.2E+6	5.9E+6
c-58.RSA	2.9E+6	4.9E+6	5.5E+6	2.6E+6	2.6E+6	4.3E+6	4.6E+6	4.8E+6
c-59.RSA	3.8E+6	8.8E+6	7.2E+6	3.4E+6	3.6E+6	5.9E+6	6.3E+6	4.8E+6
c-62.RSA	7.1E+6	2.1E+7	1.4E+7	6.6E+6	6.7E+6	1.1E+7	2.0E+7	9.3E+6
c-63.RSA	2.3E+6	4.3E+6	4.6E+6	2.1E+6	2.2E+6	5.2E+6	4.5E+6	2.5E+6
c-68.RSA	5.6E+6	1.5E+7	1.1E+7	5.4E+6	5.5E+6	1.2E+7	1.3E+7	6.4E+6
c-69.RSA	3.1E+6	5.4E+6	5.5E+6	2.5E+6	2.6E+6	7.3E+6	5.6E+6	3.6E+6
c-70.RSA	3.8E+6	6.5E+6	7.1E+6	3.3E+6	3.4E+6	9.8E+6	8.1E+6	3.5E+6
c-71.RSA	1.4E+7	2.3E+7	2.6E+7	1.3E+7	1.3E+7	2.4E+7	4.0E+7	3.9E+7
c-72.RSA	3.5E+6	6.6E+6	7.0E+6	3.2E+6	3.4E+6	9.1E+6	6.5E+6	3.4E+6
CONT-201.RSA	-	4.6E+6	-	-	4.0E+6	-	-	-
CONT-300.RSA	-	1.2E+7	-	-	1.0E+7	-	-	-
copter2.rsa	1.0E+7	1.2E+7	2.0E+7	1.1E+7	1.0E+7	1.2E+7	2.8E+7	9.9E+6
crystk02.RSA	4.4E+6	5.1E+6	8.7E+6	4.9E+6	4.6E+6	4.4E+6	1.2E+7	-
crystk03.RSA	9.8E+6	1.1E+7	2.0E+7	1.1E+7	1.0E+7	9.6E+6	2.6E+7	-
DARCY003.rsa	9.6E+6	1.0E+7	1.6E+7	7.0E+6	5.4E+6	3.8E+7	-	-
dawson5.rsa	5.0E+6	4.7E+6	8.2E+6	4.4E+6	4.4E+6	6.0E+6	9.3E+6	3.9E+6
DIXMAANL.rsa	6.4E+5	4.3E+5	9.9E+5	3.9E+5	3.9E+5	2.1E+6	7.0E+5	4.2E+5

Table 3.2.2.7: Number of reals used for factors (continued)

Name	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
DTOC.mat	5.0E+5	-	-	5.0E+5	1.1E+5	1.7E+6	9.5E+4	-
D_PRETOK.rsa	1.5E+7	1.7E+7	2.9E+7	1.5E+7	1.3E+7	2.8E+7	1.8E+8	-
HELM2D03.rsa	2.2E+7	2.2E+7	4.0E+7	2.1E+7	2.0E+7	5.8E+7	5.7E+7	2.0E+7
HELM3D01.rsa	5.4E+6	6.3E+6	1.0E+7	5.5E+6	5.2E+6	6.0E+6	1.5E+7	5.1E+6
K1_SAN.rsa	3.6E+6	-	-	3.3E+6	2.9E+6	5.6E+6	-	-
LINVERSE.rsa	1.4E+5	1.1E+5	2.2E+5	1.0E+5	1.0E+5	2.3E+5	1.1E+5	5.4E+4
mario001.rsa	7.8E+5	8.3E+5	1.3E+6	5.7E+5	4.2E+5	1.5E+6	-	-
mario002.rsa	9.6E+6	1.0E+7	1.6E+7	7.0E+6	5.4E+6	3.8E+7	-	-
NCVXBQP1.rsa	2.4E+6	2.5E+6	4.5E+6	2.4E+6	2.3E+6	3.8E+6	8.5E+6	2.1E+6
NCVXQP1.mat	2.1E+6	3.7E+6	4.6E+6	3.8E+6	1.3E+6	3.8E+6	6.6E+6	-
NCVXQP3.rsa	2.6E+7	5.1E+7	-	2.4E+7	1.6E+7	-	1.4E+8	-
NCVXQP5.rsa	1.4E+7	2.4E+7	2.7E+7	1.3E+7	1.1E+7	1.5E+7	7.4E+7	-
NCVXQP7.rsa	3.9E+7	6.2E+7	-	3.7E+7	1.9E+7	-	-	-
NCVXQP9.mat	3.8E+5	3.0E+5	4.9E+5	2.1E+5	1.4E+5	4.2E+5	3.8E+5	-
olesnik0.rsa	5.0E+6	5.8E+6	9.0E+6	4.5E+6	3.9E+6	8.1E+6	-	-
qa8fk.RSA	2.5E+7	2.6E+7	4.4E+7	2.5E+7	2.3E+7	2.7E+7	8.1E+7	2.3E+7
SIT100.rsa	4.6E+5	5.6E+5	8.4E+5	4.1E+5	3.7E+5	5.3E+5	-	-
SPARSINE.rsa	-	-	-	-	-	-	-	-
SPMSRTLS.rsa	3.5E+5	2.7E+5	5.3E+5	2.5E+5	2.5E+5	8.2E+5	2.6E+5	1.3E+5
stokes128.mat	3.2E+6	4.4E+6	6.3E+6	3.2E+6	2.7E+6	4.4E+6	-	-
stokes64.mat	6.8E+5	9.2E+5	1.3E+6	6.7E+5	5.5E+5	7.4E+5	-	-
stokes64s.mat	6.8E+5	9.8E+5	1.3E+6	6.7E+5	5.5E+5	7.4E+5	-	-
tuma1.mat	7.3E+5	6.7E+5	1.1E+6	5.0E+5	4.2E+5	9.8E+5	-	-
tuma2.mat	3.2E+5	3.0E+5	5.2E+5	2.3E+5	1.9E+5	4.1E+5	-	-
TURON_M.rsa	1.5E+7	1.6E+7	2.8E+7	1.4E+7	1.3E+7	2.8E+7	-	-
vibrobox.RSA	2.3E+6	2.8E+6	4.3E+6	2.5E+6	2.3E+6	2.7E+6	4.2E+6	2.0E+6

Table 3.2.2.8: Norm of scaled residuals

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	6.7E-15	1.3E-15	1.1E-15	9.2E-16	1.4E-15	1.8E-15	2.9E-16	3.1E-17	1.9E-14
A2NNSNSL.rsa	8.4E-13	1.9E-15	7.5E-16	1.3E-15	1.7E-15	1.5E-15	1.3E-15	6.0E-17	-
A5ESINDL.rsa	2.1E-13	2.3E-15	1.3E-15	7.2E-15	7.2E-15	5.7E-15	-	1.7E-16	3.3E-15
AUG2D.mat	-	0.0E+0	-	-	0.0E+0	1.9E-21	-	0.0E+0	-
AUG2DC.mat	-	0.0E+0	-	-	0.0E+0	5.6E-17	-	0.0E+0	-

Table 3.2.2.8: Norm of scaled residuals (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
AUG3D.mat	-	0.0E+0	-	-	-	2.7E-22	-	0.0E+0	-
AUG3DCQP.mat	3.6E-6	1.2E-16	1.2E-16	1.2E-16	5.9E-17	1.2E-16	-	8.1E-8	1.2E-16
bcsstk35.RSA	4.9E-15	1.3E-16	3.7E-17	1.9E-16	3.6E-16	2.9E-16	1.3E-16	1.3E-16	2.6E-16
bcsstk37.RSA	2.3E-12	1.7E-16	8.4E-17	1.1E-16	2.2E-16	1.9E-16	2.0E-16	1.2E-16	4.9E-16
bcsstk39.RSA	6.5E-16	6.3E-16	3.8E-16	2.1E-16	1.2E-15	1.4E-15	7.1E-16	3.9E-16	4.5E-16
BLOCKQP1.rsa	8.4E-7	2.2E-12	7.9E-13	1.5E-13	9.2E-14	3.6E-16	-	2.2E-14	7.7E-13
BLOWEYA.rsa	3.7E-16	8.8E-15	4.7E-14	3.1E-19	1.8E-14	3.2E-15	4.5E-16	2.2E-14	-
bmw3_2.rsa	5.7E-15	2.4E-16	9.5E-17	9.9E-17	1.3E-15	9.6E-16	4.9E-16	-	7.8E-16
BOYD1.RSA	1.6E-9	2.2E-9	7.2E-10	1.5E-9	1.8E-9	2.9E-9	-	3.9E-15	1.4E-9
BOYD2.RSA	9.6E-7	6.1E-7	4.2E-7	1.5E-7	1.1E-6	7.6E-7	-	4.3E-15	4.9E-7
BRAINPC2.rsa	-	8.1E-13	6.2E-13	6.1E-6	4.9E-6	2.9E-7	2.5E-13	1.7E-15	-
BRATU3D.RSA	-	-	1.3E-1	-	-	7.1E-14	-	2.8E-2	-
c-55.RSA	3.1E-5	5.9E-11	5.3E-11	1.2E-10	1.2E-10	1.7E-10	3.2E-11	9.7E-18	2.6E-11
c-58.RSA	4.9E-6	2.1E-10	2.3E-10	7.6E-11	1.4E-10	3.1E-10	2.1E-12	6.7E-17	8.5E-10
c-59.RSA	-	1.8E-9	4.9E-10	1.1E-9	4.2E-10	7.7E-10	1.4E-10	4.9E-16	6.8E-10
c-62.RSA	2.1E-6	6.7E-10	6.5E-11	2.5E-10	6.0E-10	3.3E-10	2.0E-11	4.2E-16	6.0E-10
c-63.RSA	1.6E-4	1.2E-10	1.7E-10	1.6E-10	1.3E-10	7.2E-10	1.4E-10	2.3E-17	2.3E-10
c-68.RSA	9.6E-9	6.2E-14	8.3E-14	5.3E-14	8.6E-14	9.9E-14	5.2E-15	7.3E-16	5.3E-14
c-69.RSA	1.2E-5	6.1E-11	3.2E-11	1.2E-11	4.1E-11	1.2E-10	1.2E-11	6.9E-18	2.0E-11
c-70.RSA	1.6E-6	3.7E-11	1.4E-11	1.1E-11	3.5E-11	2.4E-11	2.0E-11	2.3E-18	3.2E-11
c-71.RSA	3.6E-5	1.5E-10	8.3E-11	1.9E-10	2.8E-10	2.0E-10	1.3E-11	3.5E-17	4.6E-10
c-72.RSA	4.5E-7	5.6E-11	2.1E-11	5.2E-11	9.0E-11	8.6E-11	2.2E-11	8.2E-18	1.4E-11
CONT-201.RSA	-	-	-	-	-	2.2E-10	-	-	-
CONT-300.RSA	-	-	-	-	-	1.5E-9	-	-	-
copter2.rsa	2.2E-8	1.2E-11	3.2E-11	5.3E-10	1.5E-11	2.6E-12	1.8E-12	1.3E-16	9.9E-11
crystk02.RSA	2.8E-14	1.9E-16	9.3E-17	9.7E-17	4.5E-16	6.6E-7	1.6E-16	1.1E-16	-
crystk03.RSA	1.1E-13	1.7E-16	1.2E-16	1.3E-16	5.0E-16	3.8E-6	2.0E-16	1.4E-16	-
DARCY003.rsa	2.0E-14	1.7E-14	1.4E-14	2.7E-14	9.2E-14	1.0E-15	3.2E-14	-	-
dawson5.rsa	6.1E-8	1.2E-10	2.6E-12	3.3E-11	1.0E-11	1.6E-12	5.6E-13	1.7E-16	8.6E-11
DIXMAANL.rsa	2.0E-11	1.5E-12	2.1E-14	5.1E-14	1.7E-13	1.5E-13	4.8E-14	1.6E-16	7.3E-14
DTOC.mat	-	5.2E-20	-	-	6.1E-13	7.2E-16	2.4E-6	8.6E-21	-
D_PRETOK.rsa	6.4E-8	1.4E-15	1.2E-15	9.0E-16	8.5E-15	1.0E-16	1.0E-14	8.5E-7	-
HELM2D03.rsa	3.5E-9	1.0E-11	2.8E-12	3.5E-12	4.7E-11	4.2E-12	3.4E-13	2.0E-16	4.9E-12
HELM3D01.rsa	7.2E-10	9.9E-12	1.3E-11	1.9E-11	7.7E-12	4.5E-12	4.4E-13	2.6E-16	4.8E-11
K1_SAN.rsa	-	7.0E-16	-	-	7.5E-15	6.6E-17	2.6E-15	-	-
LINVERSE.rsa	5.6E-13	1.5E-14	4.8E-15	5.9E-15	2.8E-14	2.1E-15	1.5E-15	2.5E-16	1.5E-15

Table 3.2.2.8: Norm of scaled residuals (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
mario001.rsa	4.3E-15	5.9E-15	4.3E-15	3.7E-15	1.7E-14	1.3E-16	7.4E-15	-	-
mario002.rsa	2.0E-14	1.7E-14	1.4E-14	2.7E-14	9.2E-14	1.0E-15	3.2E-14	-	-
NCVXBQP1.rsa	1.5E-9	6.9E-12	7.6E-12	2.3E-12	2.7E-12	1.2E-12	1.9E-12	1.7E-16	1.1E-12
NCVXQP1.mat	6.8E-13	2.9E-14	2.0E-14	2.3E-13	3.2E-16	1.6E-23	7.4E-17	4.9E-13	-
NCVXQP3.rsa	1.1E-9	2.6E-8	7.2E-8	1.6E-6	9.9E-8	1.3E-16	-	4.2E-6	-
NCVXQP5.rsa	3.1E-8	2.5E-9	3.9E-9	-	1.6E-7	4.3E-16	8.8E-10	6.9E-6	-
NCVXQP7.rsa	4.1E-8	7.6E-7	1.1E-6	1.5E-7	5.1E-9	1.8E-16	-	-	-
NCVXQP9.mat	4.8E-16	9.9E-12	3.2E-14	8.0E-17	9.5E-16	8.6E-18	6.0E-17	3.6E-24	-
olesnik0.rsa	2.9E-14	5.8E-16	2.6E-16	6.5E-16	2.8E-15	5.4E-17	6.0E-16	-	-
qa8fk.RSA	1.4E-15	1.5E-15	5.7E-16	4.0E-16	9.9E-16	5.7E-10	1.5E-15	3.4E-16	2.5E-15
SIT100.rsa	4.5E-12	3.7E-15	3.7E-15	4.5E-15	4.0E-14	1.3E-16	1.8E-14	-	-
SPARSINE.rsa	-	-	-	-	-	-	-	-	-
SPMSRTLS.rsa	5.7E-11	3.0E-12	3.3E-13	8.2E-14	7.4E-13	7.6E-13	3.7E-15	1.2E-16	4.8E-13
stokes128.mat	1.6E-14	1.0E-14	2.2E-14	7.0E-15	3.8E-14	2.0E-16	1.9E-14	-	-
stokes64.mat	8.6E-15	5.6E-15	5.5E-14	4.1E-15	4.5E-14	2.3E-16	7.3E-15	-	-
stokes64s.mat	7.7E-16	3.9E-15	1.7E-15	2.0E-15	5.1E-14	3.1E-15	2.7E-15	-	-
tuma1.mat	6.8E-13	5.1E-14	1.6E-13	2.4E-13	9.0E-15	1.0E-16	2.8E-14	-	-
tuma2.mat	2.3E-13	3.9E-14	5.4E-14	1.3E-13	4.5E-15	1.2E-16	1.6E-14	-	-
TURON_M.rsa	3.0E-5	2.2E-13	2.5E-15	2.6E-6	2.1E-15	7.2E-17	1.5E-14	-	-
vibrobox.RSA	5.7E-17	1.6E-16	8.6E-17	5.1E-18	6.2E-16	1.6E-16	9.8E-17	2.5E-17	1.1E-16

Table 3.2.2.9: Norm of scaled residuals following a single refinement

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	5.0E-17	4.4E-17	3.1E-17	2.8E-17	6.0E-17	1.9E-17	3.3E-17	2.2E-17	1.0E-16
A2NNSNSL.rsa	4.3E-17	4.0E-17	3.4E-17	1.7E-17	3.8E-17	1.3E-16	1.2E-16	2.4E-17	-
A5ESINDL.rsa	7.6E-17	7.2E-17	3.1E-17	5.7E-17	3.9E-17	4.3E-17	-	2.8E-17	8.5E-17
AUG2D.mat	-	0.0E+0	-	-	0.0E+0	1.3E-24	-	0.0E+0	-
AUG2DC.mat	-	0.0E+0	-	-	0.0E+0	5.6E-17	-	0.0E+0	-
AUG3D.mat	-	0.0E+0	-	-	-	2.8E-24	-	0.0E+0	-
AUG3DCQP.mat	1.6E-7	5.9E-17	4.0E-17	3.8E-17	1.5E-17	5.7E-17	-	4.2E-8	5.8E-17
bcsstk35.RSA	2.9E-16	1.8E-16	3.2E-17	5.7E-16	1.3E-16	6.9E-16	9.9E-17	1.3E-16	2.6E-16
bcsstk37.RSA	1.6E-15	1.3E-16	8.0E-17	9.4E-17	1.7E-16	2.0E-16	1.0E-16	1.8E-16	1.7E-16
bcsstk39.RSA	3.1E-16	3.2E-16	2.4E-16	2.1E-16	3.9E-16	4.4E-16	3.1E-16	3.9E-16	2.7E-16
BLOCKQP1.rsa	1.7E-9	1.9E-14	1.3E-14	1.2E-14	2.3E-14	3.6E-16	-	1.9E-14	4.7E-15

Table 3.2.2.9: Norm of scaled residuals following a single refinement (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
BLOWEYA.rsa	3.6E-16	4.7E-15	3.7E-15	4.2E-19	5.5E-15	5.4E-16	3.6E-16	1.8E-14	-
bmw3_2.rsa	2.9E-16	3.3E-16	8.5E-17	1.6E-16	3.3E-16	2.5E-16	2.7E-16	-	1.7E-16
BOYD1.RSA	8.2E-14	4.7E-14	1.1E-14	1.6E-14	1.8E-14	5.1E-15	-	8.4E-15	2.7E-14
BOYD2.RSA	1.4E-15	1.8E-15	1.4E-15	2.7E-15	2.6E-15	2.9E-15	-	2.1E-15	2.1E-15
BRAINPC2.rsa	-	2.3E-15	2.0E-15	9.3E-10	2.9E-8	7.8E-12	3.2E-16	2.9E-15	-
BRATU3D.RSA	-	-	3.6E-5	-	-	1.5E-16	-	1.5E-6	-
c-55.RSA	8.2E-8	9.7E-18	6.4E-18	6.2E-18	9.7E-18	4.9E-18	7.3E-18	6.0E-19	4.9E-18
c-58.RSA	2.2E-6	1.1E-15	9.7E-17	9.0E-16	7.4E-16	1.1E-15	2.0E-16	6.7E-17	2.2E-15
c-59.RSA	-	5.9E-15	9.1E-17	1.8E-15	3.2E-15	7.9E-15	9.8E-16	1.1E-16	2.6E-15
c-62.RSA	1.3E-6	2.8E-15	5.7E-16	1.2E-15	1.3E-15	1.7E-15	2.5E-16	1.7E-16	2.0E-15
c-63.RSA	5.6E-5	5.3E-17	7.8E-17	7.1E-17	1.1E-16	3.0E-16	1.1E-16	1.3E-17	1.5E-16
c-68.RSA	2.0E-10	3.9E-17	2.6E-17	2.2E-17	7.3E-17	3.9E-17	4.5E-18	7.1E-20	3.3E-17
c-69.RSA	1.2E-5	9.1E-17	4.9E-17	3.9E-17	4.1E-17	1.4E-16	1.8E-17	2.3E-18	1.8E-17
c-70.RSA	3.8E-7	3.3E-18	3.0E-18	6.0E-18	7.2E-17	3.0E-18	4.1E-18	1.4E-19	7.2E-17
c-71.RSA	3.1E-5	5.1E-16	2.0E-16	3.9E-16	3.7E-16	5.6E-16	2.2E-17	2.2E-18	4.4E-16
c-72.RSA	2.8E-7	1.1E-16	2.2E-17	1.9E-16	1.7E-16	8.2E-17	3.3E-17	4.1E-18	5.2E-18
CONT-201.RSA	-	-	-	-	-	3.1E-13	-	-	-
CONT-300.RSA	-	-	-	-	-	3.1E-9	-	-	-
copter2.rsa	1.1E-15	1.1E-16	9.2E-17	1.0E-16	1.1E-16	1.3E-16	1.6E-16	1.3E-16	1.1E-16
crystk02.RSA	2.4E-14	1.2E-16	7.9E-17	6.8E-17	1.1E-16	3.9E-7	1.2E-16	1.2E-16	-
crystk03.RSA	1.1E-13	1.3E-16	8.4E-17	8.5E-17	1.2E-16	2.3E-6	1.0E-16	1.2E-16	-
DARCY003.rsa	9.7E-17	1.3E-16	9.9E-17	8.6E-17	1.3E-16	9.7E-17	1.3E-16	-	-
dawson5.rsa	6.5E-14	2.1E-16	1.2E-16	1.3E-16	1.7E-16	1.5E-16	1.7E-16	1.7E-16	1.8E-16
DIXMAANL.rsa	2.1E-16	2.5E-16	1.5E-16	1.6E-16	1.6E-16	2.3E-16	1.6E-16	1.6E-16	2.2E-16
DTOC.mat	-	1.2E-20	-	-	1.9E-13	1.1E-16	2.4E-6	1.0E-20	-
D_PRETOK.rsa	9.3E-11	7.7E-17	5.9E-17	5.9E-17	7.6E-17	8.4E-17	1.5E-16	1.3E-6	-
HELM2D03.rsa	2.2E-16	1.8E-16	1.2E-16	1.1E-16	2.2E-16	2.0E-16	2.0E-16	2.3E-16	2.2E-16
HELM3D01.rsa	2.8E-16	2.7E-16	2.5E-16	2.5E-16	2.6E-16	2.5E-16	2.6E-16	2.6E-16	2.6E-16
K1_SAN.rsa	-	4.5E-17	-	-	4.3E-17	3.4E-17	8.5E-17	-	-
LINVERSE.rsa	1.7E-16	1.9E-16	1.1E-16	1.2E-16	1.7E-16	1.7E-16	2.5E-16	1.7E-16	1.7E-16
mario001.rsa	9.8E-17	9.8E-17	7.4E-17	8.6E-17	1.3E-16	9.8E-17	1.3E-16	-	-
mario002.rsa	9.7E-17	1.3E-16	9.9E-17	8.6E-17	1.3E-16	9.7E-17	1.3E-16	-	-
NCVXBQP1.rsa	1.5E-14	1.9E-16	1.6E-16	1.3E-16	1.7E-16	1.9E-16	2.2E-16	1.7E-16	2.1E-16
NCVXQP1.mat	3.5E-13	2.2E-13	2.1E-14	3.8E-14	6.4E-17	1.6E-23	3.5E-17	4.9E-13	-
NCVXQP3.rsa	2.7E-10	4.0E-8	1.9E-8	4.7E-7	2.7E-16	1.4E-16	-	7.2E-6	-
NCVXQP5.rsa	7.6E-12	3.9E-16	2.3E-15	-	2.0E-14	2.2E-16	2.1E-16	6.3E-6	-

Table 3.2.2.9: Norm of scaled residuals following a single refinement (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
NCVXQP7.rsa	2.6E-16	4.7E-7	2.5E-7	2.0E-7	2.8E-16	2.0E-16	-	-	-
NCVXQP9.mat	7.2E-24	8.9E-16	6.8E-23	2.1E-24	7.2E-24	7.9E-19	3.6E-24	1.8E-24	-
olesnik0.rsa	5.0E-17	3.7E-17	3.0E-17	2.1E-17	7.5E-17	2.8E-17	5.7E-17	-	-
qa8fk.RSA	6.3E-16	4.7E-16	1.6E-16	1.6E-16	9.2E-17	3.4E-10	2.9E-16	3.5E-16	3.3E-16
SIT100.rsa	3.2E-16	1.3E-16	4.4E-16	9.3E-17	1.6E-16	1.3E-16	3.8E-16	-	-
SPARSINE.rsa	-	-	-	-	-	-	-	-	-
SPMSRTLS.rsa	1.3E-16	1.3E-16	7.6E-17	9.1E-17	1.7E-16	1.2E-16	1.7E-16	1.2E-16	1.4E-16
stokes128.mat	2.3E-14	1.1E-14	1.9E-14	6.2E-15	2.8E-14	2.1E-16	3.0E-14	-	-
stokes64.mat	2.5E-15	5.1E-15	4.9E-14	2.0E-15	1.2E-13	2.8E-16	1.5E-14	-	-
stokes64s.mat	5.7E-16	3.8E-15	1.5E-15	2.1E-15	3.0E-14	3.0E-15	4.1E-15	-	-
tuma1.mat	1.2E-16	1.2E-16	6.8E-17	7.4E-17	1.4E-16	1.0E-16	1.4E-16	-	-
tuma2.mat	1.0E-16	1.0E-16	6.8E-17	6.8E-17	1.4E-16	1.1E-16	1.4E-16	-	-
TURON_M.rsa	2.9E-7	2.6E-15	5.5E-16	1.5E-8	2.7E-16	3.1E-17	1.7E-16	-	-
vibrobox.RSA	4.0E-17	3.7E-17	2.2E-17	7.4E-19	9.8E-17	8.9E-18	1.3E-17	8.5E-18	1.6E-17

3.2.3 Default runs on scaled matrices

Here are the results obtained with the (solver-dependent) default threshold pivoting parameter after the original matrix has been scaled by `MC30`.

Table 3.2.3.1: Return code

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	20	0	0	0	0	0	0	0	0
A2NNSNSL.rsa	20	0	0	0	0	0	0	0	-14
A5ESINDL.rsa	20	0	0	0	0	0	-99	0	0
AUG2D.mat	-6	6	-5	-6	0	7	-2	0	-14
AUG2DC.mat	-6	20	-5	-6	20	20	-2	20	-14
AUG3D.mat	-6	6	-5	-6	-99	7	-2	0	-14
AUG3DCQP.mat	-13	0	0	0	0	0	-2	0	0
bcsstk35.RSA	20	0	0	0	0	0	0	0	0
bcsstk37.RSA	-99	0	0	20	0	0	0	20	0
bcsstk39.RSA	20	0	0	0	0	0	0	0	0
BLOCKQP1.rsa	0	0	0	0	0	7	-2	0	0
BLOWEYA.rsa	20	0	0	0	0	7	0	0	-14
bmw3_2.rsa	-99	0	0	0	0	0	0	-2	0
BOYD1.RSA	20	0	0	0	-2	0	-99	0	0
BOYD2.RSA	20	0	0	0	0	0	-99	0	0
BRAINPC2.rsa	20	0	2	0	0	7	0	0	-14
BRATU3D.RSA	0	0	0	0	0	7	0	0	-14
c-55.RSA	20	0	0	0	0	0	0	-99	0
c-58.RSA	20	0	0	0	-99	0	-99	0	0
c-59.RSA	-99	0	0	0	-99	0	-99	0	0
c-62.RSA	20	0	0	0	-99	0	-99	-2	0
c-63.RSA	-99	0	0	0	0	0	-99	0	0
c-68.RSA	20	0	0	0	-99	0	-99	0	0
c-69.RSA	-13	0	0	0	-99	0	-99	0	0
c-70.RSA	20	0	0	0	-99	0	-2	0	0
c-71.RSA	20	0	0	-99	-99	0	-2	-2	0
c-72.RSA	-99	0	0	0	-99	0	-99	0	0
CONT-201.RSA	20	0	0	0	0	7	0	0	-14
CONT-300.RSA	-17	0	0	0	0	7	0	0	-14
copter2.rsa	0	0	0	0	0	0	0	0	0
crystk02.RSA	0	0	0	0	0	7	0	0	0
crystk03.RSA	0	0	0	0	0	0	0	0	0

Table 3.2.3.1: Return code (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
DARCY003.rsa	20	0	0	0	0	7	0	0	-14
dawson5.rsa	0	0	0	0	0	0	0	0	0
DIXMAANL.rsa	20	0	0	0	0	0	0	0	0
DTOC.mat	-99	20	-5	-6	20	20	-13	20	-14
D_PRETOK.rsa	20	0	0	20	0	7	0	20	-14
HELM2D03.rsa	0	0	0	0	0	0	0	0	0
HELM3D01.rsa	0	0	0	0	0	0	0	0	0
K1_SAN.rsa	-99	6	-5	-6	0	7	0	0	-14
LINVERSE.rsa	20	0	0	0	0	0	0	0	0
mario001.rsa	20	0	0	0	0	7	0	0	-14
mario002.rsa	20	0	0	0	0	7	0	0	-14
NCVXBQP1.rsa	20	0	0	0	0	0	0	0	0
NCVXQP1.mat	20	20	20	20	20	20	20	20	-14
NCVXQP3.rsa	20	0	0	0	-99	20	-2	0	-14
NCVXQP5.rsa	20	0	0	0	0	7	0	0	-14
NCVXQP7.rsa	-99	0	0	0	-2	20	-99	-2	-14
NCVXQP9.mat	20	0	0	0	0	7	0	0	-14
olesnik0.rsa	20	20	20	0	20	7	20	0	-14
qa8fk.RSA	0	0	0	0	0	7	0	0	0
SIT100.rsa	20	0	20	0	0	7	0	0	-14
SPARSINE.rsa	-99	-99	-99	-99	-99	-99	-2	-99	-99
SPMSRTLS.rsa	0	0	0	0	0	0	0	0	0
stokes128.mat	20	20	0	0	0	7	20	0	-14
stokes64.mat	20	20	0	0	0	7	0	20	-14
stokes64s.mat	0	20	20	20	0	7	20	20	-14
tuma1.mat	20	0	0	0	0	7	0	0	-14
tuma2.mat	20	0	0	0	0	7	0	0	-14
TURON_M.rsa	20	0	0	0	20	7	0	0	-14
vibrobox.RSA	20	20	20	20	20	20	20	20	-14

Table 3.2.3.2: Total time (CPU seconds)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	4.99	0.78	2.62	5.33	14.50	2.73	61.10	19.20	3.93
A2NNSNSL.rsa	5.85	0.85	2.64	4.79	8.17	2.61	45.20	17.30	-

Table 3.2.3.2: Total time (CPU seconds) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A5ESINDL.rsa	3.32	0.49	1.83	3.58	10.80	1.29	-	8.89	2.85
AUG2D.mat	-	273.84	-	-	56.60	0.99	-	0.08	-
AUG2DC.mat	-	325.07	-	-	75.90	1.03	-	0.10	-
AUG3D.mat	-	999.90	-	-	-	1.60	-	0.07	-
AUG3DCQP.mat	-	2.73	5.34	3.68	11.40	2.58	-	10.50	4.82
bcsstk35.RSA	3.30	2.49	3.64	4.69	5.95	2.91	5.20	6.90	5.74
bcsstk37.RSA	-	2.56	3.80	12.30	75.30	3.22	90.10	23.40	4.99
bcsstk39.RSA	8.18	6.29	8.76	10.75	15.90	7.57	10.70	12.60	10.90
BLOCKQP1.rsa	26.69	1.07	3.74	24.50	21.10	4.08	-	24.20	83.90
BLOWEYA.rsa	1.31	0.32	1.45	1.16	1.60	0.71	6.87	1.97	-
bmw3_2.rsa	-	84.83	87.97	208.38	1040.00	70.80	641.00	-	92.08
BOYD1.RSA	258.86	59.56	35.85	359.04	-	65.16	-	970.00	378.83
BOYD2.RSA	352.05	7.07	50.39	346.50	538.00	74.78	-	763.00	415.53
BRAINPC2.rsa	1.36	0.41	0.72	1.28	0.95	0.69	14.10	34.80	-
BRATU3D.RSA	143.56	69.56	25.06	46.23	219.00	11.73	47.30	48.60	-
c-55.RSA	93.29	17.26	20.98	87.61	1690.00	8.20	1300.00	-	49.89
c-58.RSA	117.46	12.82	14.01	55.68	-	6.45	-	97.90	50.94
c-59.RSA	-	18.68	37.31	147.38	-	9.74	-	74.80	48.03
c-62.RSA	417.76	38.26	79.03	541.46	-	18.17	-	-	93.20
c-63.RSA	-	7.53	11.21	70.47	1120.00	5.04	-	58.70	19.15
c-68.RSA	203.35	33.17	64.00	169.99	-	18.77	-	230.00	106.99
c-69.RSA	-	10.54	15.05	188.05	-	7.07	-	93.40	29.50
c-70.RSA	228.56	15.75	18.42	367.06	-	9.10	-	133.00	32.61
c-71.RSA	1154.83	102.63	109.88	-	-	47.50	-	-	843.73
c-72.RSA	-	13.22	20.48	135.03	-	9.26	-	68.90	42.73
CONT-201.RSA	13.09	17.64	6.42	18.72	18.10	5.84	18.50	18.70	-
CONT-300.RSA	-	47.80	19.64	85.07	48.80	16.00	63.40	54.30	-
copter2.rsa	17.94	18.86	20.63	22.59	26.90	16.70	30.30	58.10	16.50
crystk02.RSA	5.67	5.95	6.40	8.00	20.90	5.84	8.16	19.20	6.69
crystk03.RSA	14.54	15.77	17.06	21.11	57.80	13.92	19.90	49.90	15.33
DARCY003.rsa	40.11	9.96	34.89	27.46	33.10	22.00	80.40	62.80	-
dawson5.rsa	6.73	5.07	6.88	7.08	7.83	5.51	11.60	10.70	6.83
DIXMAANL.rsa	2.35	0.64	2.48	2.08	2.03	1.50	4.42	6.22	1.70
DTOC.mat	-	14.86	-	-	32.80	0.49	-	0.07	-
D_PRETOK.rsa	31.43	22.07	28.14	28.70	66.90	22.58	66.70	859.00	-
HELM2D03.rsa	48.42	31.06	37.64	39.52	42.30	30.20	109.00	78.80	35.99

Table 3.2.3.2: Total time (CPU seconds) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
HELM3D01.rsa	9.58	10.53	10.81	12.40	14.20	8.60	17.30	38.30	9.29
K1_SAN.rsa	-	5.61	-	-	10.30	5.07	10.70	48.90	-
LINVERSE.rsa	0.38	0.11	0.35	0.34	0.33	0.23	0.67	0.25	0.32
mario001.rsa	2.44	0.65	2.34	1.97	2.12	1.52	3.33	2.71	-
mario002.rsa	40.14	9.91	34.77	27.50	33.00	21.98	80.40	62.80	-
NCVXBQP1.rsa	4.85	4.14	5.12	5.09	11.60	3.51	8.68	19.70	3.93
NCVXQP1.mat	23.23	6.06	23.55	15.06	148.00	2.91	123.00	27.00	-
NCVXQP3.rsa	289.21	188.75	387.20	188.66	-	60.41	-	1540.00	-
NCVXQP5.rsa	43.16	51.95	67.88	54.25	515.00	28.70	92.70	533.00	-
NCVXQP7.rsa	-	378.99	836.92	741.95	-	100.83	-	-	-
NCVXQP9.mat	1.43	0.49	1.40	1.04	3.85	0.53	2.09	0.83	-
olesnik0.rsa	9.98	7.31	10.50	8.36	16.50	6.78	15.80	69.30	-
qa8fk.RSA	43.76	56.54	45.94	59.40	90.40	42.50	85.80	218.00	45.80
SIT100.rsa	2.26	0.59	0.79	1.90	3.52	0.52	6.69	13.70	-
SPARSINE.rsa	-	-	-	-	-	-	-	-	-
SPMSRTLS.rsa	0.73	0.30	0.82	0.75	0.62	0.49	1.42	0.71	0.96
stokes128.mat	5.64	2.90	5.56	4.75	5.45	3.93	7.69	10.90	-
stokes64.mat	1.05	0.42	1.10	0.97	1.03	0.74	1.38	2.10	-
stokes64s.mat	1.05	0.46	1.12	0.98	1.07	0.74	1.39	1.82	-
tuma1.mat	1.30	0.51	1.25	1.12	1.22	0.89	2.03	2.51	-
tuma2.mat	0.65	0.22	0.62	0.55	0.58	0.43	1.02	0.81	-
TURON_M.rsa	30.24	21.57	27.86	28.17	51.80	21.79	57.70	707.00	-
vibrobox.RSA	14.65	3.79	3.92	5.01	420.00	3.51	316.00	23.20	-

Table 3.2.3.3: Factorize time (CPU seconds)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	0.49	0.46	1.30	0.99	10.90	0.14	1.21	3.86	0.36
A2NNSNSL.rsa	0.49	0.45	1.33	0.95	4.78	0.14	1.26	3.46	-
A5ESINDL.rsa	0.31	0.29	0.98	0.68	9.00	0.09	-	2.62	0.25
AUG2D.mat	-	273.57	-	-	55.40	0.11	-	0.05	-
AUG2DC.mat	-	324.78	-	-	74.60	0.12	-	0.06	-
AUG3D.mat	-	999.08	-	-	-	0.60	-	0.04	-
AUG3DCQP.mat	-	1.12	3.22	1.65	9.67	1.04	-	9.45	1.61
bcsstk35.RSA	2.37	2.07	2.17	3.33	4.92	1.74	3.17	5.10	1.28

Table 3.2.3.3: Factorize time (CPU seconds) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
bcsstk37.RSA	-	2.22	2.39	11.05	74.00	2.15	88.10	20.90	1.39
bcsstk39.RSA	6.52	5.61	6.58	8.72	14.20	5.78	7.59	9.60	3.92
BLOCKQP1.rsa	0.92	0.65	1.08	3.35	2.73	0.22	-	1.60	0.44
BLOWEYA.rsa	0.18	0.21	0.43	0.26	0.70	0.05	0.34	0.42	-
bmw3_2.rsa	-	73.70	72.99	195.08	1020.00	58.35	620.00	-	51.08
BOYD1.RSA	2.44	1.71	1.78	52.49	-	0.23	-	917.00	0.55
BOYD2.RSA	3.07	2.21	7.79	25.99	146.00	0.68	-	9.15	1.96
BRAINPC2.rsa	0.55	0.28	0.40	0.35	0.38	0.08	0.39	32.80	-
BRATU3D.RSA	139.94	67.75	23.48	44.12	217.00	10.04	41.90	45.80	-
c-55.RSA	88.40	14.21	17.08	84.19	1680.00	5.92	1250.00	-	40.85
c-58.RSA	111.83	9.65	12.28	52.11	-	3.96	-	92.40	41.95
c-59.RSA	-	14.88	31.91	142.37	-	6.95	-	70.70	32.06
c-62.RSA	407.83	33.95	76.29	535.50	-	15.11	-	-	81.47
c-63.RSA	-	4.51	7.09	67.02	1120.00	2.49	-	54.90	7.75
c-68.RSA	194.63	26.94	56.48	163.53	-	14.81	-	221.00	60.96
c-69.RSA	-	5.96	8.94	182.48	-	2.89	-	87.40	10.73
c-70.RSA	219.09	10.91	11.75	361.25	-	4.84	-	126.00	12.28
c-71.RSA	1137.79	94.68	98.89	-	-	41.81	-	-	811.01
c-72.RSA	-	7.67	13.13	128.57	-	4.44	-	61.70	10.50
CONT-201.RSA	7.95	13.91	3.64	15.17	14.50	2.46	8.07	16.60	-
CONT-300.RSA	-	40.65	12.80	76.22	40.30	7.82	33.20	49.00	-
copter2.rsa	12.06	14.28	15.56	18.18	22.40	12.93	18.10	52.60	9.98
crystk02.RSA	4.82	4.88	5.31	6.95	19.90	4.66	6.35	17.40	3.39
crystk03.RSA	12.82	13.57	14.95	19.11	55.70	11.99	16.50	46.00	8.78
DARCY003.rsa	9.21	6.36	8.56	7.17	13.30	2.40	19.30	51.70	-
dawson5.rsa	2.79	4.42	2.68	3.57	4.10	2.23	4.34	8.43	1.94
DIXMAANL.rsa	0.41	0.35	0.74	0.51	0.67	0.14	0.84	1.08	0.16
DTOC.mat	-	14.52	-	-	31.30	0.04	-	0.04	-
D_PRETOK.rsa	14.78	12.94	15.01	17.67	54.40	11.00	40.60	829.00	-
HELM2D03.rsa	20.24	14.72	17.40	20.42	23.30	12.78	41.20	62.40	12.11
HELM3D01.rsa	6.38	7.87	8.07	9.80	11.90	6.55	9.23	35.10	5.33
K1_SAN.rsa	-	2.37	-	-	6.65	1.45	3.83	46.90	-
LINVERSE.rsa	0.08	0.07	0.10	0.11	0.12	0.03	0.13	0.17	0.03
mario001.rsa	0.39	0.44	0.62	0.56	0.77	0.14	0.72	2.10	-
mario002.rsa	9.21	6.36	8.53	7.17	13.30	2.40	19.20	51.60	-
NCVXBQP1.rsa	1.70	1.76	2.31	2.51	9.50	1.59	2.73	17.40	1.27

Table 3.2.3.3: Factorize time (CPU seconds) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
NCVXQP1.mat	21.83	5.33	21.77	14.21	147.00	2.24	120.00	25.90	-
NCVXQP3.rsa	275.52	179.46	317.72	178.32	-	54.26	-	1510.00	-
NCVXQP5.rsa	35.97	46.48	57.88	47.75	510.00	24.43	71.70	520.00	-
NCVXQP7.rsa	-	367.50	780.58	726.18	-	92.91	-	-	-
NCVXQP9.mat	0.69	0.41	0.30	0.52	3.38	0.07	0.83	0.60	-
olesnik0.rsa	3.20	3.04	3.51	3.76	11.50	2.04	5.91	63.60	-
qa8fk.RSA	34.40	48.42	39.38	52.82	82.70	35.67	62.70	207.00	33.85
SIT100.rsa	1.61	0.23	0.33	1.48	3.07	0.14	5.85	12.90	-
SPARSINE.rsa	-	-	-	-	-	-	-	-	-
SPMSRTLS.rsa	0.20	0.21	0.28	0.27	0.22	0.07	0.35	0.42	0.08
stokes128.mat	1.78	2.55	2.25	2.09	2.63	1.19	2.75	8.55	-
stokes64.mat	0.33	0.34	0.41	0.42	0.48	0.19	0.42	1.59	-
stokes64s.mat	0.33	0.39	0.49	0.42	0.52	0.19	0.42	1.39	-
tuma1.mat	0.29	0.40	0.49	0.39	0.52	0.17	0.56	2.04	-
tuma2.mat	0.15	0.17	0.23	0.17	0.25	0.07	0.24	0.64	-
TURON_M.rsa	13.10	12.16	12.75	16.70	39.10	9.97	30.90	681.00	-
vibrobox.RSA	12.77	2.41	2.67	3.85	418.00	2.36	310.00	22.10	-

Table 3.2.3.4: Solution time given factors (CPU seconds)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	0.06	0.05	0.40	0.30	0.18	0.07	0.72	0.38	0.19
A2NNSNSL.rsa	0.06	0.05	0.38	0.27	0.15	0.08	0.72	0.37	-
A5ESINDL.rsa	0.04	0.03	0.22	0.24	0.15	0.05	-	0.25	0.14
AUG2D.mat	-	0.20	-	-	0.45	0.10	-	0.01	-
AUG2DC.mat	-	0.21	-	-	0.52	0.10	-	0.01	-
AUG3D.mat	-	0.73	-	-	-	0.11	-	0.00	-
AUG3DCQP.mat	-	0.04	0.18	0.15	0.12	0.06	-	0.69	0.14
bcsstk35.RSA	0.09	0.09	0.14	0.13	0.28	0.10	0.21	1.17	0.11
bcsstk37.RSA	-	0.09	0.13	0.16	0.58	0.09	0.29	2.02	0.10
bcsstk39.RSA	0.21	0.20	0.29	0.27	0.63	0.21	0.44	2.06	0.23
BLOCKQP1.rsa	0.07	0.04	0.20	2.44	0.10	0.25	-	0.43	0.12
BLOWEYA.rsa	0.02	0.02	0.08	0.05	0.03	0.09	0.08	0.07	-
bmw3_2.rsa	-	1.30	1.69	1.76	5.87	1.24	3.85	-	1.44
BOYD1.RSA	0.18	0.07	0.49	50.22	-	0.10	-	0.71	0.24

Table 3.2.3.4: Solution time given factors (CPU seconds) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
BOYD2.RSA	0.36	0.26	1.95	22.39	0.92	0.50	-	1.88	1.08
BRAINPC2.rsa	0.02	0.03	0.07	0.06	0.03	0.10	0.07	0.14	-
BRATU3D.RSA	1.60	0.32	0.25	0.33	0.98	0.47	0.64	1.99	-
c-55.RSA	1.25	0.13	0.33	0.29	1.13	0.11	2.33	-	0.45
c-58.RSA	1.48	0.10	0.26	0.26	-	0.09	-	3.13	0.39
c-59.RSA	-	0.14	0.44	0.39	-	0.12	-	1.92	0.40
c-62.RSA	4.96	0.23	0.58	0.72	-	0.19	-	-	0.67
c-63.RSA	-	0.09	0.29	0.29	1.02	0.10	-	1.88	0.26
c-68.RSA	2.42	0.20	0.73	0.50	-	0.20	-	3.21	0.56
c-69.RSA	-	0.12	0.42	0.42	-	0.13	-	2.12	0.39
c-70.RSA	2.56	0.15	0.46	0.60	-	0.15	-	2.61	0.40
c-71.RSA	7.81	0.44	0.99	-	-	0.38	-	-	2.41
c-72.RSA	-	0.15	0.53	0.51	-	0.17	-	2.21	0.41
CONT-201.RSA	0.83	0.31	0.34	0.42	0.62	0.60	0.51	1.22	-
CONT-300.RSA	-	0.69	0.81	1.04	1.42	1.46	1.43	3.15	-
copter2.rsa	0.27	0.29	0.43	0.40	0.77	0.28	0.68	3.45	0.37
crystk02.RSA	0.11	0.11	0.14	0.14	0.38	0.33	0.22	1.52	0.12
crystk03.RSA	0.24	0.24	0.30	0.29	0.82	0.22	0.48	3.15	0.25
DARCY003.rsa	0.60	0.49	1.37	1.08	0.98	2.05	2.40	5.74	-
dawson5.rsa	0.13	0.15	0.21	0.20	0.33	0.15	0.33	1.39	0.18
DIXMAANL.rsa	0.05	0.05	0.19	0.13	0.07	0.08	0.16	0.20	0.10
DTOC.mat	-	0.02	-	-	1.15	0.06	-	0.00	-
D_PRETOK.rsa	0.53	0.48	0.82	0.74	1.78	1.54	1.77	26.50	-
HELM2D03.rsa	0.96	0.80	1.59	1.34	1.68	0.99	3.22	7.56	1.32
HELM3D01.rsa	0.15	0.16	0.25	0.23	0.38	0.15	0.35	1.88	0.21
K1_SAN.rsa	-	0.13	-	-	0.38	0.43	0.35	1.03	-
LINVERSE.rsa	0.01	0.01	0.02	0.02	0.00	0.01	0.02	0.03	0.02
mario001.rsa	0.04	0.04	0.11	0.09	0.07	0.15	0.12	0.25	-
mario002.rsa	0.60	0.48	1.37	1.09	0.98	2.06	2.40	5.74	-
NCVXBQP1.rsa	0.09	0.10	0.28	0.20	0.25	0.11	0.24	1.19	0.15
NCVXQP1.mat	0.53	0.07	0.12	0.12	0.37	0.12	0.30	0.71	-
NCVXQP3.rsa	4.77	0.77	1.24	0.99	-	1.41	-	22.20	-
NCVXQP5.rsa	0.40	0.44	0.78	0.59	1.50	0.98	1.17	10.40	-
NCVXQP7.rsa	-	1.14	1.64	1.69	-	1.75	-	-	-
NCVXQP9.mat	0.06	0.01	0.05	0.05	0.07	0.05	0.05	0.07	-
olesnik0.rsa	0.17	0.17	0.33	0.28	0.57	0.57	0.51	4.41	-

Table 3.2.3.4: Solution time given factors (CPU seconds) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
qa8fk.RSA	0.56	0.63	0.74	0.70	1.65	1.11	1.61	8.88	0.68
SIT100.rsa	0.11	0.01	0.03	0.05	0.10	0.04	0.07	0.59	-
SPARSINE.rsa	-	-	-	-	-	-	-	-	-
SPMSRTLS.rsa	0.02	0.02	0.06	0.04	0.03	0.03	0.06	0.14	0.06
stokes128.mat	0.10	0.11	0.20	0.18	0.25	0.35	0.25	1.27	-
stokes64.mat	0.02	0.02	0.04	0.04	0.05	0.06	0.05	0.25	-
stokes64s.mat	0.02	0.02	0.05	0.04	0.05	0.06	0.05	0.17	-
tuma1.mat	0.02	0.03	0.07	0.06	0.05	0.09	0.08	0.28	-
tuma2.mat	0.01	0.01	0.03	0.02	0.02	0.04	0.03	0.07	-
TURON_M.rsa	0.49	0.47	0.80	0.73	1.55	1.51	1.67	23.30	-
vibrobox.RSA	0.47	0.06	0.08	0.08	0.98	0.18	0.30	0.80	-

Table 3.2.3.5: Actual memory used (Mbytes)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	3.5E+1	2.1E+1	2.5E+1	2.9E+1	4.6E+1	2.6E+1	3.1E+1	3.9E+1	2.6E+1
A2NNSNSL.rsa	3.4E+1	2.1E+1	2.3E+1	3.0E+1	3.8E+1	2.6E+1	3.1E+1	3.9E+1	-
A5ESINDL.rsa	2.2E+1	1.5E+1	1.6E+1	2.0E+1	3.8E+1	1.8E+1	-	2.6E+1	1.8E+1
AUG2D.mat	-	1.6E+3	-	-	8.3E+1	1.0E+1	-	5.3E+0	-
AUG2DC.mat	-	1.8E+3	-	-	9.7E+1	1.1E+1	-	5.6E+0	-
AUG3D.mat	-	2.4E+3	-	-	-	1.3E+1	-	5.1E+0	-
AUG3DCQP.mat	-	2.4E+1	3.8E+1	3.3E+1	3.5E+1	1.9E+1	-	1.6E+2	2.9E+1
bcsstk35.RSA	5.7E+1	6.1E+1	5.8E+1	9.9E+1	5.2E+1	4.7E+1	5.5E+1	1.7E+2	7.0E+1
bcsstk37.RSA	-	5.6E+1	5.5E+1	1.3E+2	1.3E+2	4.4E+1	9.5E+1	4.6E+2	6.2E+1
bcsstk39.RSA	1.1E+2	1.2E+2	1.1E+2	1.9E+2	1.1E+2	9.4E+1	1.1E+2	1.8E+2	1.3E+2
BLOCKQP1.rsa	5.0E+1	3.8E+1	4.1E+1	5.3E+1	5.0E+1	2.7E+1	-	4.7E+1	3.4E+1
BLOWEYA.rsa	1.7E+1	9.5E+0	1.0E+1	1.1E+1	1.1E+1	1.1E+1	1.3E+1	1.3E+1	-
bmw3_2.rsa	-	7.3E+2	7.4E+2	1.5E+3	1.0E+3	6.1E+2	8.3E+2	-	7.7E+2
BOYD1.RSA	8.3E+1	6.0E+1	6.5E+1	7.7E+1	-	4.6E+1	-	1.2E+2	9.7E+1
BOYD2.RSA	1.3E+2	9.8E+1	1.2E+2	1.3E+2	1.7E+2	1.3E+2	-	1.7E+2	1.4E+2
BRAINPC2.rsa	1.9E+1	1.3E+1	1.1E+1	2.3E+1	1.1E+1	1.1E+1	1.4E+1	2.2E+1	-
BRATU3D.RSA	8.4E+1	1.5E+2	9.8E+1	3.5E+2	2.1E+2	6.5E+1	1.2E+2	8.5E+2	-
c-55.RSA	7.2E+1	6.9E+1	9.0E+1	3.0E+2	4.0E+2	3.9E+1	3.0E+2	-	1.3E+2
c-58.RSA	7.8E+1	5.6E+1	1.6E+2	2.5E+2	-	3.8E+1	-	1.7E+3	1.2E+2
c-59.RSA	-	7.3E+1	1.1E+2	3.4E+2	-	4.2E+1	-	1.3E+3	1.2E+2

Table 3.2.3.5: Actual memory used (Mbytes) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
c-62.RSA	1.2E+2	1.1E+2	3.6E+2	6.9E+2	-	7.0E+1	-	-	1.9E+2
c-63.RSA	-	4.4E+1	5.9E+1	2.2E+2	3.7E+2	3.1E+1	-	1.1E+3	7.1E+1
c-68.RSA	1.2E+2	9.9E+1	1.7E+2	4.1E+2	-	6.1E+1	-	2.4E+3	1.6E+2
c-69.RSA	-	5.5E+1	7.4E+1	2.5E+2	-	4.4E+1	-	1.3E+3	9.5E+1
c-70.RSA	9.2E+1	7.4E+1	9.0E+1	4.9E+2	-	4.9E+1	-	1.7E+3	1.0E+2
c-71.RSA	2.3E+2	2.1E+2	2.8E+2	-	-	1.3E+2	-	-	9.5E+2
c-72.RSA	-	6.7E+1	9.3E+1	3.5E+2	-	5.2E+1	-	1.4E+3	9.8E+1
CONT-201.RSA	9.1E+1	1.2E+2	6.5E+1	2.6E+2	1.0E+2	4.7E+1	1.1E+2	4.1E+2	-
CONT-300.RSA	-	2.8E+2	1.6E+2	6.8E+2	2.4E+2	1.2E+2	3.0E+2	1.0E+3	-
copter2.rsa	1.5E+2	1.3E+2	1.4E+2	2.1E+2	1.6E+2	1.0E+2	1.4E+2	7.3E+2	1.4E+2
crystk02.RSA	6.4E+1	6.7E+1	6.7E+1	1.1E+2	8.0E+1	5.1E+1	5.3E+1	1.7E+2	7.0E+1
crystk03.RSA	1.3E+2	1.4E+2	1.4E+2	2.3E+2	1.6E+2	1.1E+2	1.1E+2	6.9E+2	1.4E+2
DARCY003.rsa	3.7E+2	1.6E+2	1.7E+2	2.5E+2	1.8E+2	1.6E+2	4.4E+2	1.2E+3	-
dawson5.rsa	9.3E+1	7.8E+1	6.8E+1	1.2E+2	6.0E+1	5.5E+1	7.8E+1	2.5E+2	7.3E+1
DIXMAANL.rsa	3.5E+1	1.9E+1	2.0E+1	2.6E+1	1.6E+1	2.0E+1	3.1E+1	4.4E+1	2.1E+1
DTOC.mat	-	4.1E+2	-	-	3.5E+2	7.9E+0	-	3.4E+0	-
D_PRETOK.rsa	2.6E+2	1.9E+2	2.1E+2	3.1E+2	2.8E+2	1.4E+2	3.6E+2	2.2E+3	-
HELM2D03.rsa	5.1E+2	2.9E+2	3.4E+2	4.5E+2	2.7E+2	2.5E+2	6.2E+2	6.8E+2	3.2E+2
HELM3D01.rsa	8.6E+1	7.6E+1	8.4E+1	1.2E+2	8.4E+1	5.4E+1	7.0E+1	7.4E+2	8.5E+1
K1_SAN.rsa	-	5.8E+1	-	-	6.4E+1	3.8E+1	7.5E+1	8.8E+2	-
LINVERSE.rsa	8.0E+0	4.5E+0	5.1E+0	6.5E+0	4.1E+0	5.0E+0	4.5E+0	6.3E+0	5.4E+0
mario001.rsa	2.9E+1	1.4E+1	1.7E+1	2.9E+1	1.6E+1	1.6E+1	2.3E+1	8.0E+1	-
mario002.rsa	3.7E+2	1.6E+2	1.7E+2	2.5E+2	1.8E+2	1.6E+2	4.4E+2	1.2E+3	-
NCVXBQP1.rsa	5.4E+1	4.5E+1	4.4E+1	6.4E+1	5.4E+1	2.8E+1	4.8E+1	3.8E+2	4.2E+1
NCVXQP1.mat	2.6E+1	3.5E+1	5.6E+1	1.2E+2	1.0E+2	1.9E+1	1.1E+2	2.9E+2	-
NCVXQP3.rsa	2.5E+2	3.5E+2	5.0E+2	5.8E+2	-	1.9E+2	-	2.2E+3	-
NCVXQP5.rsa	1.6E+2	1.8E+2	2.7E+2	2.9E+2	2.9E+2	1.3E+2	2.0E+2	2.4E+3	-
NCVXQP7.rsa	-	5.0E+2	7.5E+2	1.1E+3	-	2.3E+2	-	-	-
NCVXQP9.mat	9.4E+0	7.5E+0	7.6E+0	1.3E+1	1.4E+1	5.7E+0	9.8E+0	2.3E+1	-
olesnik0.rsa	1.1E+2	7.1E+1	7.3E+1	1.1E+2	8.9E+1	5.0E+1	1.1E+2	1.1E+3	-
qa8fk.RSA	2.9E+2	3.1E+2	3.1E+2	4.4E+2	3.0E+2	2.1E+2	2.9E+2	2.0E+3	3.0E+2
SIT100.rsa	8.4E+0	8.2E+0	8.9E+0	3.0E+1	1.9E+1	5.6E+0	1.8E+1	2.4E+2	-
SPARSINE.rsa	-	-	-	-	-	-	-	-	-
SPMSRTLS.rsa	1.7E+1	1.0E+1	1.0E+1	1.5E+1	7.0E+0	1.1E+1	1.4E+1	1.6E+1	1.2E+1
stokes128.mat	7.0E+1	4.5E+1	5.3E+1	8.7E+1	4.5E+1	3.4E+1	5.8E+1	1.4E+2	-
stokes64.mat	1.6E+1	1.0E+1	1.3E+1	2.8E+1	1.1E+1	8.4E+0	1.1E+1	6.1E+1	-

Table 3.2.3.5: Actual memory used (Mbytes) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
stokes64s.mat	1.6E+1	1.0E+1	1.5E+1	2.8E+1	1.1E+1	8.4E+0	1.1E+1	2.9E+1	-
tuma1.mat	1.4E+1	1.2E+1	1.3E+1	2.0E+1	1.2E+1	9.0E+0	1.5E+1	6.6E+1	-
tuma2.mat	8.9E+0	5.8E+0	6.9E+0	9.5E+0	6.0E+0	5.4E+0	7.4E+0	2.5E+1	-
TURON_M.rsa	2.9E+2	2.1E+2	1.9E+2	3.0E+2	2.5E+2	1.4E+2	3.3E+2	2.2E+3	-
vibrobox.RSA	4.3E+1	4.0E+1	4.0E+1	5.8E+1	2.9E+2	2.7E+1	1.3E+2	4.8E+2	-

Table 3.2.3.6: Number of integers used for factors

Name	MA57	MUMPS	MUMPS_US	Oblio	SPOOLES	UMFPACK
A0NSDSIL.rsa	2.8E+5	9.7E+5	6.2E+5	3.6E+5	1.4E+6	1.0E+6
A2NNSNSL.rsa	2.8E+5	9.8E+5	5.9E+5	3.4E+5	1.3E+6	9.9E+5
A5ESINDL.rsa	2.0E+5	7.3E+5	4.2E+5	2.1E+5	-	6.0E+5
AUG2D.mat	2.1E+5	-	-	6.4E+5	-	1.6E+5
AUG2DC.mat	2.2E+5	-	-	6.9E+5	-	1.7E+5
AUG3D.mat	2.2E+5	-	-	-	-	1.4E+5
AUG3DCQP.mat	1.7E+5	5.0E+5	4.6E+5	8.9E+5	-	5.5E+6
bcsstk35.RSA	1.6E+5	3.4E+5	3.8E+5	2.7E+5	3.7E+6	6.7E+6
bcsstk37.RSA	1.4E+5	3.1E+5	3.6E+5	2.7E+5	5.6E+6	1.5E+7
bcsstk39.RSA	2.9E+5	6.4E+5	6.8E+5	4.4E+5	8.4E+6	1.3E+7
BLOCKQP1.rsa	3.2E+5	8.8E+5	7.4E+5	5.4E+5	-	1.4E+6
BLOWEYA.rsa	3.8E+4	3.8E+5	2.0E+5	1.4E+5	7.8E+5	2.5E+5
bmw3_2.rsa	1.5E+6	3.1E+6	3.4E+6	2.5E+6	7.2E+7	-
BOYD1.RSA	8.4E+5	1.9E+6	1.6E+6	-	-	1.7E+6
BOYD2.RSA	1.4E+6	5.3E+6	2.9E+6	1.3E+6	-	3.6E+6
BRAINPC2.rsa	3.6E+4	4.0E+5	3.6E+5	2.1E+5	8.0E+5	4.7E+5
BRATU3D.RSA	4.3E+5	5.4E+5	6.2E+5	1.8E+6	1.0E+7	1.8E+7
c-55.RSA	3.8E+5	9.9E+5	6.3E+5	4.0E+6	1.2E+7	-
c-58.RSA	3.1E+5	7.5E+5	5.5E+5	-	-	2.4E+7
c-59.RSA	4.2E+5	1.4E+6	7.5E+5	-	-	1.5E+7
c-62.RSA	6.0E+5	8.9E+5	9.6E+5	-	-	-
c-63.RSA	3.2E+5	9.3E+5	6.4E+5	2.8E+6	-	1.5E+7
c-68.RSA	6.1E+5	2.1E+6	1.1E+6	-	-	2.5E+7
c-69.RSA	4.6E+5	1.4E+6	9.4E+5	-	-	1.6E+7
c-70.RSA	5.2E+5	1.4E+6	1.1E+6	-	-	2.1E+7
c-71.RSA	1.1E+6	2.5E+6	1.7E+6	-	-	-

Table 3.2.3.6: Number of integers used for factors (continued)

Name	MA57	MUMPS	MUMPS_US	Oblio	SPOOLES	UMFPACK
c-72.RSA	5.3E+5	1.6E+6	1.1E+6	-	-	1.7E+7
CONT-201.RSA	3.7E+5	1.3E+6	1.3E+6	1.0E+6	9.1E+6	1.5E+7
CONT-300.RSA	7.9E+5	3.1E+6	2.9E+6	2.3E+6	2.7E+7	4.0E+7
copter2.rsa	4.3E+5	9.6E+5	9.1E+5	9.5E+5	1.2E+7	3.0E+7
crystk02.RSA	1.1E+5	2.3E+5	2.6E+5	1.9E+5	4.4E+6	1.2E+7
crystk03.RSA	2.0E+5	4.4E+5	4.8E+5	3.6E+5	9.6E+6	2.6E+7
DARCY003.rsa	1.1E+6	4.1E+6	3.8E+6	2.5E+6	3.8E+7	3.6E+7
dawson5.rsa	3.1E+5	6.6E+5	6.6E+5	5.8E+5	6.0E+6	9.7E+6
DIXMAANL.rsa	2.0E+5	7.5E+5	4.8E+5	3.7E+5	2.1E+6	8.8E+5
DTOC.mat	9.6E+4	-	-	2.2E+5	-	1.4E+5
D_PRETOK.rsa	7.4E+5	2.3E+6	2.3E+6	1.7E+6	3.3E+7	2.3E+8
HELM2D03.rsa	1.8E+6	5.4E+6	4.3E+6	3.4E+6	5.8E+7	5.8E+7
HELM3D01.rsa	2.6E+5	6.0E+5	5.4E+5	5.6E+5	6.0E+6	1.6E+7
K1_SAN.rsa	2.4E+5	-	-	5.7E+5	5.9E+6	2.9E+7
LINVERSE.rsa	1.6E+4	7.6E+4	8.4E+4	5.5E+4	2.4E+5	1.3E+5
mario001.rsa	1.1E+5	3.9E+5	3.7E+5	2.4E+5	1.5E+6	2.0E+6
mario002.rsa	1.1E+6	4.1E+6	3.8E+6	2.5E+6	3.8E+7	3.6E+7
NCVXBQP1.rsa	2.2E+5	7.1E+5	5.3E+5	4.6E+5	3.8E+6	9.5E+6
NCVXQP1.mat	1.1E+5	2.3E+5	2.6E+5	7.4E+5	4.9E+6	9.2E+6
NCVXQP3.rsa	1.1E+6	1.6E+6	1.9E+6	-	-	1.8E+8
NCVXQP5.rsa	6.7E+5	1.1E+6	1.2E+6	2.4E+6	1.7E+7	8.7E+7
NCVXQP7.rsa	1.4E+6	2.2E+6	2.9E+6	-	-	-
NCVXQP9.mat	4.7E+4	1.7E+5	1.5E+5	1.3E+5	5.7E+5	6.5E+5
olesnik0.rsa	3.2E+5	1.0E+6	1.0E+6	7.6E+5	8.6E+6	3.8E+7
qa8fk.RSA	5.6E+5	1.2E+6	1.3E+6	1.1E+6	2.7E+7	8.1E+7
SIT100.rsa	3.7E+4	1.4E+5	1.3E+5	9.5E+4	1.3E+6	5.5E+6
SPARSINE.rsa	-	-	-	-	-	-
SPMSRTLS.rsa	3.9E+4	2.3E+5	1.6E+5	1.2E+5	8.2E+5	3.2E+5
stokes128.mat	2.0E+5	6.3E+5	7.3E+5	5.2E+5	4.4E+6	1.0E+7
stokes64.mat	4.9E+4	1.5E+5	1.8E+5	1.3E+5	7.4E+5	2.0E+6
stokes64s.mat	4.9E+4	1.6E+5	1.8E+5	1.3E+5	7.5E+5	1.9E+6
tuma1.mat	6.1E+4	2.5E+5	2.1E+5	1.5E+5	9.9E+5	2.0E+6
tuma2.mat	3.3E+4	1.4E+5	1.2E+5	8.1E+4	4.2E+5	7.1E+5
TURON_M.rsa	7.5E+5	2.3E+6	2.4E+6	1.7E+6	3.0E+7	2.0E+8
vibrobox.RSA	8.1E+4	2.0E+5	2.0E+5	3.4E+5	5.7E+6	1.0E+7

Table 3.2.3.7: Number of reals used for factors

Name	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	5.4E+5	3.9E+5	1.0E+6	1.6E+6	3.6E+5	1.4E+6	8.6E+5	4.1E+5
A2NNSNSL.rsa	5.1E+5	3.6E+5	1.0E+6	1.1E+6	3.3E+5	1.3E+6	8.3E+5	-
A5ESINDL.rsa	3.1E+5	2.3E+5	6.1E+5	1.7E+6	2.4E+5	-	4.8E+5	2.2E+5
AUG2D.mat	7.5E+6	-	-	5.9E+6	3.1E+5	-	1.1E+5	-
AUG2DC.mat	8.0E+6	-	-	6.8E+6	3.2E+5	-	1.1E+5	-
AUG3D.mat	2.1E+7	-	-	-	6.9E+5	-	9.4E+4	-
AUG3DCQP.mat	1.1E+6	2.9E+6	2.2E+6	1.1E+6	1.1E+6	-	5.4E+6	1.1E+6
bcsstk35.RSA	2.9E+6	3.7E+6	6.5E+6	4.2E+6	3.5E+6	3.7E+6	6.6E+6	2.9E+6
bcsstk37.RSA	3.0E+6	3.7E+6	9.9E+6	9.5E+6	3.4E+6	5.6E+6	1.5E+7	2.9E+6
bcsstk39.RSA	7.1E+6	8.9E+6	1.5E+7	9.3E+6	8.1E+6	8.4E+6	1.3E+7	6.9E+6
BLOCKQP1.rsa	7.8E+5	4.0E+5	1.6E+6	8.4E+5	7.8E+5	-	1.3E+6	3.8E+5
BLOWEYA.rsa	5.0E+5	1.7E+5	3.5E+5	4.4E+5	1.3E+5	7.8E+5	1.9E+5	-
bmw3_2.rsa	4.9E+7	5.6E+7	1.1E+8	8.6E+7	4.8E+7	7.2E+7	-	4.6E+7
BOYD1.RSA	6.5E+5	6.5E+5	1.3E+6	-	6.5E+5	-	1.5E+6	6.5E+5
BOYD2.RSA	1.7E+6	1.3E+6	3.4E+6	9.9E+6	1.3E+6	-	2.7E+6	1.3E+6
BRAINPC2.rsa	6.8E+5	3.4E+5	9.0E+5	3.9E+5	2.3E+5	8.0E+5	4.1E+5	-
BRATU3D.RSA	1.2E+7	7.6E+6	2.0E+7	1.3E+7	5.8E+6	1.0E+7	1.8E+7	-
c-55.RSA	4.0E+6	7.3E+6	1.7E+7	1.6E+7	3.4E+6	1.2E+7	-	5.9E+6
c-58.RSA	3.0E+6	5.2E+6	1.5E+7	-	2.6E+6	-	2.4E+7	4.8E+6
c-59.RSA	4.0E+6	8.8E+6	2.5E+7	-	3.6E+6	-	1.5E+7	4.8E+6
c-62.RSA	7.3E+6	2.3E+7	5.4E+7	-	6.7E+6	-	-	9.3E+6
c-63.RSA	2.5E+6	4.4E+6	1.8E+7	1.5E+7	2.2E+6	-	1.5E+7	2.5E+6
c-68.RSA	6.0E+6	1.5E+7	2.6E+7	-	5.5E+6	-	2.5E+7	6.4E+6
c-69.RSA	3.2E+6	5.5E+6	2.3E+7	-	2.6E+6	-	1.6E+7	3.6E+6
c-70.RSA	4.0E+6	6.6E+6	4.0E+7	-	3.4E+6	-	2.0E+7	3.5E+6
c-71.RSA	1.4E+7	2.4E+7	9.7E+7	-	1.3E+7	-	-	3.9E+7
c-72.RSA	3.7E+6	6.8E+6	2.9E+7	-	3.4E+6	-	1.7E+7	3.4E+6
CONT-201.RSA	1.1E+7	4.6E+6	1.8E+7	8.3E+6	4.0E+6	9.1E+6	1.5E+7	-
CONT-300.RSA	2.5E+7	1.2E+7	4.8E+7	1.9E+7	1.0E+7	2.7E+7	3.9E+7	-
copter2.rsa	1.0E+7	1.2E+7	2.0E+7	1.1E+7	1.0E+7	1.2E+7	3.0E+7	9.9E+6
crystk02.RSA	4.4E+6	5.1E+6	8.7E+6	6.2E+6	4.6E+6	4.4E+6	1.2E+7	4.1E+6
crystk03.RSA	9.8E+6	1.1E+7	2.0E+7	1.3E+7	1.0E+7	9.6E+6	2.6E+7	8.9E+6
DARCY003.rsa	9.6E+6	1.0E+7	1.6E+7	1.0E+7	5.4E+6	3.8E+7	3.5E+7	-
dawson5.rsa	5.0E+6	4.7E+6	8.2E+6	4.5E+6	4.4E+6	6.0E+6	9.6E+6	3.9E+6
DIXMAANL.rsa	6.4E+5	4.3E+5	9.9E+5	3.9E+5	3.9E+5	2.1E+6	7.6E+5	4.2E+5

Table 3.2.3.7: Number of reals used for factors (continued)

Name	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
DTOC.mat	5.8E+5	-	-	2.6E+7	1.1E+5	-	9.5E+4	-
D_PRETOK.rsa	1.5E+7	1.7E+7	2.9E+7	2.6E+7	1.3E+7	3.3E+7	2.3E+8	-
HELM2D03.rsa	2.2E+7	2.2E+7	4.0E+7	2.1E+7	2.0E+7	5.8E+7	5.7E+7	2.0E+7
HELM3D01.rsa	5.4E+6	6.3E+6	1.0E+7	5.6E+6	5.2E+6	6.0E+6	1.6E+7	5.1E+6
K1_SAN.rsa	3.6E+6	-	-	5.2E+6	2.9E+6	5.9E+6	2.9E+7	-
LINVERSE.rsa	1.4E+5	1.1E+5	2.2E+5	1.3E+5	1.0E+5	2.4E+5	1.1E+5	5.4E+4
mario001.rsa	7.8E+5	8.2E+5	1.3E+6	7.8E+5	4.2E+5	1.5E+6	2.0E+6	-
mario002.rsa	9.6E+6	1.0E+7	1.6E+7	1.0E+7	5.4E+6	3.8E+7	3.5E+7	-
NCVXBQP1.rsa	2.4E+6	2.5E+6	4.5E+6	3.4E+6	2.3E+6	3.8E+6	9.4E+6	2.1E+6
NCVXQP1.mat	2.2E+6	4.3E+6	6.7E+6	4.8E+6	1.3E+6	4.9E+6	9.2E+6	-
NCVXQP3.rsa	2.6E+7	4.3E+7	5.3E+7	-	1.6E+7	-	1.8E+8	-
NCVXQP5.rsa	1.4E+7	2.4E+7	2.7E+7	1.9E+7	1.1E+7	1.7E+7	8.7E+7	-
NCVXQP7.rsa	3.9E+7	5.9E+7	1.0E+8	-	1.9E+7	-	-	-
NCVXQP9.mat	3.8E+5	3.0E+5	8.7E+5	7.9E+5	1.4E+5	5.7E+5	6.1E+5	-
olesnik0.rsa	5.0E+6	5.6E+6	9.0E+6	7.7E+6	3.9E+6	8.6E+6	3.7E+7	-
qa8fk.RSA	2.5E+7	2.6E+7	4.4E+7	2.5E+7	2.3E+7	2.7E+7	8.1E+7	2.3E+7
SIT100.rsa	4.8E+5	5.6E+5	2.3E+6	1.5E+6	3.7E+5	1.3E+6	5.5E+6	-
SPARSINE.rsa	-	-	-	-	-	-	-	-
SPMSRTLS.rsa	3.5E+5	2.7E+5	5.3E+5	2.5E+5	2.5E+5	8.2E+5	2.6E+5	1.3E+5
stokes128.mat	3.2E+6	4.3E+6	6.3E+6	3.2E+6	2.7E+6	4.4E+6	9.9E+6	-
stokes64.mat	6.8E+5	9.0E+5	1.3E+6	6.7E+5	5.5E+5	7.4E+5	1.9E+6	-
stokes64s.mat	6.8E+5	1.0E+6	1.3E+6	6.9E+5	5.5E+5	7.5E+5	1.9E+6	-
tuma1.mat	7.3E+5	7.2E+5	1.2E+6	5.7E+5	4.2E+5	9.9E+5	1.9E+6	-
tuma2.mat	3.2E+5	3.2E+5	5.3E+5	2.7E+5	1.9E+5	4.2E+5	6.8E+5	-
TURON_M.rsa	1.5E+7	1.6E+7	2.8E+7	2.2E+7	1.3E+7	3.0E+7	2.0E+8	-
vibrobox.RSA	2.3E+6	2.8E+6	4.5E+6	1.9E+7	2.3E+6	5.7E+6	1.0E+7	-

Table 3.2.3.8: Norm of scaled residuals

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	4.7E-17	1.1E-15	1.8E-17	3.7E-17	6.8E-16	1.9E-16	2.6E-17	6.5E-18	3.4E-16
A2NNSNSL.rsa	5.7E-17	2.6E-16	5.4E-17	3.5E-17	1.2E-15	1.7E-16	5.7E-17	7.2E-18	-
A5ESINDL.rsa	1.4E-17	4.1E-17	2.0E-17	1.9E-17	4.2E-15	5.1E-16	-	2.5E-17	4.3E-16
AUG2D.mat	-	0.0E+0	-	-	0.0E+0	1.9E-21	-	0.0E+0	-
AUG2DC.mat	-	0.0E+0	-	-	0.0E+0	5.6E-17	-	0.0E+0	-

Table 3.2.3.8: Norm of scaled residuals (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
AUG3D.mat	-	0.0E+0	-	-	-	2.7E-22	-	0.0E+0	-
AUG3DCQP.mat	-	1.2E-16	1.5E-18	9.1E-19	7.3E-17	9.7E-21	-	7.3E-21	1.1E-18
bcsstk35.RSA	3.2E-20	1.3E-16	1.8E-20	1.1E-18	2.7E-16	4.0E-20	6.5E-21	3.9E-20	1.1E-20
bcsstk37.RSA	-	1.8E-16	3.5E-21	4.5E-14	4.6E-16	5.8E-21	1.4E-20	8.7E-14	1.2E-20
bcsstk39.RSA	2.7E-19	6.0E-16	6.6E-20	5.1E-19	1.3E-15	2.9E-19	1.9E-19	1.2E-19	1.0E-19
BLOCKQP1.rsa	5.6E-13	2.2E-12	7.9E-13	1.9E-13	9.2E-14	3.6E-16	-	2.2E-14	7.7E-13
BLOWEYA.rsa	5.4E-14	8.8E-14	9.2E-14	4.2E-14	4.0E-14	2.6E-14	6.7E-14	2.7E-14	-
bmw3_2.rsa	-	4.0E-16	1.5E-22	1.3E-17	1.8E-15	3.4E-22	1.9E-22	-	3.0E-22
BOYD1.RSA	1.1E-16	2.2E-9	1.9E-16	5.3E-16	-	8.3E-15	-	2.0E-20	1.2E-15
BOYD2.RSA	8.7E-15	6.1E-7	4.8E-15	5.7E-15	4.5E-7	8.7E-15	-	3.1E-23	1.2E-14
BRAINPC2.rsa	4.8E-16	2.6E-15	1.3E-16	1.6E-13	3.5E-13	4.0E-18	1.4E-16	2.4E-17	-
BRATU3D.RSA	6.5E-10	6.9E-10	4.2E-11	2.9E-8	8.4E-13	1.1E-14	1.2E-11	1.2E-16	-
c-55.RSA	2.9E-16	1.9E-17	7.2E-17	2.5E-16	5.8E-14	1.4E-13	2.5E-16	-	7.5E-14
c-58.RSA	9.9E-5	1.8E-16	5.1E-16	5.2E-16	-	2.6E-12	-	2.7E-17	5.3E-12
c-59.RSA	-	2.2E-16	8.8E-18	1.8E-15	-	2.4E-12	-	2.3E-17	2.5E-12
c-62.RSA	4.4E-15	3.7E-16	6.7E-16	6.2E-16	-	1.1E-12	-	-	2.4E-12
c-63.RSA	-	3.2E-17	4.3E-19	1.9E-15	3.7E-15	5.0E-13	-	6.9E-18	5.1E-13
c-68.RSA	2.4E-19	4.0E-16	4.5E-20	1.2E-19	-	5.0E-17	-	3.6E-19	4.0E-17
c-69.RSA	-	1.8E-17	4.8E-17	1.3E-16	-	6.1E-14	-	1.3E-19	2.2E-14
c-70.RSA	3.0E-5	7.2E-17	4.4E-17	3.9E-17	-	6.0E-14	-	3.6E-19	5.4E-14
c-71.RSA	3.2E-16	6.3E-17	1.1E-16	-	-	1.2E-13	-	-	1.1E-13
c-72.RSA	-	1.3E-16	4.1E-17	8.6E-17	-	1.4E-13	-	1.3E-19	1.4E-14
CONT-201.RSA	3.9E-13	2.3E-11	1.0E-15	5.5E-10	1.5E-13	2.2E-10	3.9E-15	1.2E-16	-
CONT-300.RSA	-	5.8E-11	3.3E-15	6.5E-10	2.1E-13	1.5E-9	5.3E-15	1.2E-16	-
copter2.rsa	5.8E-13	1.1E-12	1.2E-12	2.4E-12	1.7E-13	1.8E-12	4.2E-13	1.3E-16	3.0E-10
crystk02.RSA	1.3E-10	1.9E-16	6.6E-11	6.6E-11	3.8E-16	1.2E-8	1.0E-10	7.6E-11	1.2E-10
crystk03.RSA	1.8E-10	1.7E-16	7.9E-11	1.5E-10	4.0E-16	1.6E-10	1.6E-10	8.6E-11	2.2E-10
DARCY003.rsa	7.5E-16	1.7E-14	7.3E-16	1.4E-15	6.8E-15	7.4E-12	5.5E-16	9.0E-18	-
dawson5.rsa	6.5E-13	7.1E-13	1.5E-13	3.9E-13	6.6E-14	1.1E-12	5.2E-14	1.8E-16	4.1E-11
DIXMAANL.rsa	1.4E-14	9.5E-14	1.7E-15	1.3E-15	1.7E-15	1.4E-14	1.5E-15	3.7E-17	2.3E-14
DTOC.mat	-	1.4E-16	-	-	3.9E-13	4.0E-13	-	2.3E-17	-
D_PRETOK.rsa	1.0E-17	2.7E-16	6.9E-18	6.4E-16	6.1E-16	5.6E-18	2.1E-17	2.0E-18	-
HELM2D03.rsa	1.7E-12	1.4E-12	2.7E-13	3.1E-13	1.4E-13	1.7E-11	3.8E-14	1.7E-16	4.0E-12
HELM3D01.rsa	8.5E-13	5.8E-13	1.5E-12	2.2E-12	1.1E-13	4.7E-12	1.0E-13	4.0E-16	1.1E-10
K1_SAN.rsa	-	6.3E-16	-	-	1.5E-15	1.8E-13	9.4E-18	2.2E-14	-
LINVERSE.rsa	3.2E-15	7.3E-15	6.8E-16	2.0E-15	7.7E-16	4.7E-16	2.6E-16	5.7E-17	3.7E-16

Table 3.2.3.8: Norm of scaled residuals (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
mario001.rsa	7.3E-16	5.9E-15	4.1E-16	3.8E-16	1.5E-15	2.2E-14	4.7E-16	1.8E-17	-
mario002.rsa	7.5E-16	1.7E-14	7.3E-16	1.4E-15	6.8E-15	7.4E-12	5.5E-16	9.0E-18	-
NCVXBQP1.rsa	1.2E-15	1.1E-13	1.7E-15	3.0E-16	1.9E-14	1.2E-15	2.9E-16	1.1E-18	8.8E-15
NCVXQP1.mat	2.8E-9	5.9E-14	1.5E-15	1.2E-22	5.8E-16	3.1E-20	3.1E-19	3.3E-20	-
NCVXQP3.rsa	2.3E-14	2.8E-9	9.4E-10	3.8E-12	-	5.4E-15	-	1.1E-18	-
NCVXQP5.rsa	1.2E-14	1.5E-11	1.5E-13	8.4E-14	4.0E-13	3.3E-16	3.3E-15	8.7E-19	-
NCVXQP7.rsa	-	1.5E-9	1.4E-10	1.8E-12	-	2.2E-18	-	-	-
NCVXQP9.mat	1.8E-18	4.3E-20	1.9E-21	7.5E-19	8.2E-17	4.3E-19	9.2E-19	7.0E-26	-
olesnik0.rsa	1.6E-17	7.0E-16	1.1E-16	8.5E-16	6.5E-16	9.2E-18	3.4E-17	1.7E-18	-
qa8fk.RSA	1.4E-14	1.5E-15	9.2E-15	6.9E-15	7.5E-16	4.0E-10	1.9E-14	8.0E-15	2.2E-14
SIT100.rsa	3.9E-16	9.8E-15	3.1E-19	6.3E-9	3.2E-13	2.7E-9	1.4E-15	5.6E-19	-
SPARSINE.rsa	-	-	-	-	-	-	-	-	-
SPMSRTLS.rsa	8.8E-14	6.4E-15	1.0E-14	8.7E-15	4.3E-15	1.4E-13	2.0E-15	1.6E-16	2.6E-13
stokes128.mat	4.2E-14	1.0E-14	1.1E-13	1.6E-14	1.2E-14	5.4E-14	3.3E-14	5.4E-12	-
stokes64.mat	2.6E-14	5.6E-15	1.2E-13	5.7E-15	4.0E-15	1.5E-14	1.4E-14	7.2E-12	-
stokes64s.mat	3.8E-14	2.6E-15	4.8E-15	1.3E-14	1.2E-15	3.2E-14	2.1E-14	3.9E-14	-
tuma1.mat	1.5E-14	5.2E-14	2.2E-15	4.7E-14	1.2E-14	1.1E-16	2.6E-15	4.8E-18	-
tuma2.mat	1.2E-14	4.0E-14	3.8E-15	7.4E-15	1.1E-14	1.1E-16	2.4E-15	5.0E-18	-
TURON_M.rsa	5.3E-16	4.2E-15	2.2E-16	5.6E-15	5.0E-16	3.0E-17	5.8E-16	1.0E-17	-
vibrobox.RSA	7.1E-22	1.6E-16	4.5E-22	5.1E-19	2.0E-15	6.8E-22	1.5E-21	3.1E-17	-

Table 3.2.3.9: Norm of scaled residuals following a single refinement

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	1.2E-17	1.3E-16	8.4E-18	5.6E-18	1.4E-16	2.5E-17	7.7E-18	7.8E-18	1.7E-17
A2NNSNSL.rsa	1.1E-17	3.0E-17	1.6E-18	1.6E-18	9.7E-17	9.2E-18	4.3E-18	4.8E-18	-
A5ESINDL.rsa	6.1E-18	9.7E-17	5.3E-18	3.3E-18	7.0E-17	7.7E-18	-	2.1E-18	9.4E-18
AUG2D.mat	-	0.0E+0	-	-	0.0E+0	1.3E-24	-	0.0E+0	-
AUG2DC.mat	-	0.0E+0	-	-	0.0E+0	5.6E-17	-	0.0E+0	-
AUG3D.mat	-	0.0E+0	-	-	-	2.8E-24	-	0.0E+0	-
AUG3DCQP.mat	-	5.9E-17	7.7E-19	4.7E-19	8.3E-17	7.2E-21	-	7.3E-21	9.9E-19
bcsstk35.RSA	3.7E-20	1.8E-16	5.7E-21	2.2E-20	6.9E-17	1.2E-20	1.9E-20	3.9E-20	1.7E-20
bcsstk37.RSA	-	1.5E-16	2.1E-21	3.4E-14	1.3E-16	4.7E-21	6.3E-21	1.9E-13	5.1E-21
bcsstk39.RSA	1.2E-19	3.8E-16	5.1E-20	6.7E-20	2.9E-16	1.1E-19	9.8E-20	8.1E-20	1.1E-19
BLOCKQP1.rsa	1.1E-15	1.9E-14	1.3E-14	3.7E-15	2.3E-14	3.6E-16	-	1.9E-14	4.7E-15

Table 3.2.3.9: Norm of scaled residuals following a single refinement (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
BLOWEYA.rsa	1.4E-13	2.2E-14	7.5E-14	3.0E-14	4.6E-15	5.6E-15	4.8E-14	3.6E-15	-
bmw3_2.rsa	-	2.0E-16	5.3E-23	1.4E-22	2.5E-16	5.1E-23	9.3E-23	-	1.8E-22
BOYD1.RSA	2.2E-21	4.7E-14	2.1E-21	5.5E-22	-	2.5E-20	-	1.9E-20	2.1E-21
BOYD2.RSA	2.9E-23	1.8E-15	3.3E-23	2.4E-23	2.6E-15	4.9E-23	-	9.8E-23	1.7E-22
BRAINPC2.rsa	6.4E-18	3.5E-15	3.0E-18	4.7E-18	2.4E-14	1.5E-17	6.3E-18	1.7E-17	-
BRATU3D.RSA	1.7E-16	1.8E-16	9.1E-17	1.2E-16	1.6E-16	1.3E-16	1.8E-16	1.4E-16	-
c-55.RSA	1.6E-18	7.9E-18	2.3E-19	8.2E-19	4.1E-16	1.7E-18	1.2E-18	-	1.6E-18
c-58.RSA	4.8E-5	1.3E-17	1.9E-17	1.3E-17	-	2.0E-17	-	3.4E-17	2.4E-17
c-59.RSA	-	5.3E-16	5.2E-18	1.0E-17	-	1.8E-17	-	2.4E-17	1.6E-17
c-62.RSA	5.5E-18	1.1E-16	1.3E-18	2.7E-18	-	1.3E-17	-	-	5.5E-18
c-63.RSA	-	6.8E-18	1.6E-19	4.0E-19	1.9E-15	3.5E-18	-	2.8E-18	1.9E-18
c-68.RSA	8.5E-21	3.9E-17	4.3E-21	4.3E-21	-	4.3E-20	-	9.0E-23	8.6E-21
c-69.RSA	-	9.4E-18	1.9E-19	1.5E-19	-	8.9E-20	-	2.6E-19	2.9E-19
c-70.RSA	1.3E-5	1.4E-18	2.0E-19	3.6E-19	-	7.2E-19	-	2.5E-20	7.1E-19
c-71.RSA	2.0E-18	3.4E-17	9.1E-19	-	-	7.4E-19	-	-	1.0E-18
c-72.RSA	-	1.7E-17	1.3E-18	1.1E-18	-	1.7E-18	-	4.7E-20	2.2E-18
CONT-201.RSA	9.5E-18	1.9E-16	4.9E-18	1.4E-17	1.2E-16	3.1E-13	1.0E-17	1.4E-16	-
CONT-300.RSA	-	1.9E-16	4.1E-18	1.9E-15	1.7E-16	3.1E-9	7.4E-18	1.4E-16	-
copter2.rsa	1.4E-16	1.1E-16	9.5E-17	1.0E-16	1.5E-16	1.5E-16	1.4E-16	1.7E-16	1.4E-16
crystk02.RSA	7.2E-11	1.2E-16	3.6E-11	4.7E-11	1.1E-16	5.2E-9	7.0E-11	7.4E-11	6.8E-11
crystk03.RSA	8.4E-11	1.3E-16	5.3E-11	6.0E-11	1.1E-16	9.2E-11	9.3E-11	7.9E-11	8.8E-11
DARCY003.rsa	1.0E-17	1.3E-16	6.4E-18	5.8E-18	1.9E-16	1.0E-17	1.3E-17	1.3E-17	-
dawson5.rsa	2.1E-16	1.9E-16	1.3E-16	1.2E-16	1.9E-16	1.7E-16	1.8E-16	1.7E-16	2.1E-16
DIXMAANL.rsa	4.5E-17	2.1E-16	2.8E-17	2.9E-17	1.7E-16	4.0E-17	5.5E-17	3.8E-17	4.3E-17
DTOC.mat	-	2.2E-20	-	-	9.1E-14	8.6E-13	-	5.4E-17	-
D_PRETOK.rsa	3.9E-18	8.6E-17	2.8E-18	9.0E-19	8.7E-17	3.8E-18	5.8E-18	2.3E-18	-
HELM2D03.rsa	1.5E-16	2.0E-16	9.9E-17	8.3E-17	1.7E-16	1.5E-16	1.9E-16	1.6E-16	1.7E-16
HELM3D01.rsa	3.7E-16	2.6E-16	3.5E-16	4.6E-16	2.9E-16	3.6E-16	4.3E-16	3.0E-16	4.9E-16
K1_SAN.rsa	-	6.3E-17	-	-	5.2E-17	6.6E-19	1.4E-18	7.9E-19	-
LINVERSE.rsa	4.9E-17	1.9E-16	2.9E-17	3.0E-17	1.9E-16	4.0E-17	6.4E-17	4.9E-17	5.2E-17
mario001.rsa	1.8E-17	9.8E-17	1.2E-17	1.2E-17	1.7E-16	2.0E-17	2.4E-17	1.8E-17	-
mario002.rsa	1.0E-17	1.3E-16	6.4E-18	5.8E-18	1.9E-16	1.0E-17	1.3E-17	1.3E-17	-
NCVXBQP1.rsa	3.1E-18	2.0E-16	1.6E-18	1.7E-18	2.2E-16	9.8E-19	2.6E-18	1.1E-18	2.9E-18
NCVXQP1.mat	1.8E-11	3.2E-17	7.3E-20	9.4E-22	9.9E-17	3.7E-23	1.2E-19	1.3E-20	-
NCVXQP3.rsa	2.3E-18	2.4E-16	1.2E-18	1.1E-18	-	1.1E-14	-	9.3E-19	-
NCVXQP5.rsa	2.3E-18	2.6E-16	1.1E-18	1.2E-18	2.1E-16	9.5E-19	2.0E-18	9.3E-19	-

Table 3.2.3.9: Norm of scaled residuals following a single refinement (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
NCVXQP7.rsa	-	2.4E-16	1.0E-18	3.4E-18	-	8.8E-19	-	-	-
NCVXQP9.mat	7.0E-26	3.6E-24	1.4E-26	1.9E-19	5.2E-24	2.4E-19	6.0E-26	6.0E-26	-
olesnik0.rsa	6.2E-18	7.0E-17	4.6E-18	4.7E-18	8.7E-17	3.1E-18	7.1E-18	8.2E-19	-
qa8fk.RSA	1.1E-14	4.7E-16	4.0E-15	1.3E-14	6.5E-17	1.9E-10	5.5E-15	3.7E-15	2.0E-14
SIT100.rsa	9.4E-17	2.5E-16	9.3E-21	5.9E-13	2.2E-16	6.3E-7	2.0E-16	1.4E-18	-
SPARSINE.rsa	-	-	-	-	-	-	-	-	-
SPMSRTLS.rsa	1.2E-16	1.3E-16	8.4E-17	9.7E-17	1.4E-16	1.2E-16	1.3E-16	1.2E-16	1.1E-16
stokes128.mat	1.6E-14	1.1E-14	4.8E-14	3.7E-14	1.2E-15	5.7E-14	3.0E-14	7.0E-12	-
stokes64.mat	2.1E-14	5.1E-15	3.2E-14	2.2E-15	5.2E-16	1.4E-14	3.8E-15	5.5E-12	-
stokes64s.mat	1.3E-14	2.1E-15	2.4E-15	6.0E-15	9.9E-16	2.8E-14	1.2E-14	2.0E-14	-
tuma1.mat	4.1E-18	1.0E-16	2.9E-18	2.4E-18	1.7E-16	4.5E-18	5.8E-18	5.2E-18	-
tuma2.mat	4.2E-18	1.0E-16	2.3E-18	2.4E-18	1.4E-16	4.8E-18	5.1E-18	5.0E-18	-
TURON_M.rsa	1.9E-17	3.5E-16	5.3E-17	5.2E-17	8.7E-17	1.9E-17	4.4E-17	5.7E-17	-
vibrobox.RSA	1.5E-22	3.7E-17	4.5E-23	3.3E-19	3.0E-14	8.2E-23	2.6E-22	8.9E-18	-

3.2.4 Default runs on scaled matrices

Here are the results obtained with small ($u = 10^{-10}$) threshold pivoting parameter after the original matrix has been scaled by `MC30`.

Table 3.2.4.1: Return code

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	20	0	0	0	0	0	0	0	0
A2NNSNSL.rsa	20	0	0	0	0	0	0	0	-14
A5ESINDL.rsa	20	0	0	0	0	0	-2	0	0
AUG2D.mat	-6	6	-5	-6	0	7	-2	0	-14
AUG2DC.mat	-6	20	-5	-6	20	20	-2	20	-14
AUG3D.mat	-6	6	-5	-6	-99	7	-2	0	-14
AUG3DCQP.mat	-13	0	0	0	0	0	-2	20	0
bcsstk35.RSA	20	0	0	0	0	0	0	0	0
bcsstk37.RSA	20	0	0	0	0	0	0	0	0
bcsstk39.RSA	20	0	0	0	0	0	0	0	0
BLOCKQP1.rsa	0	0	0	0	0	7	-2	0	0
BLOWEYA.rsa	20	0	0	0	0	7	0	0	-14
bmw3_2.rsa	20	0	0	0	0	0	0	0	0
BOYD1.RSA	20	0	0	0	0	0	-2	0	0
BOYD2.RSA	20	0	0	0	0	0	-99	0	0
BRAINPC2.rsa	20	0	0	0	0	7	0	0	-14
BRATU3D.RSA	-13	-13	0	-13	-13	7	-13	0	-14
c-55.RSA	20	0	0	0	0	0	0	0	0
c-58.RSA	20	0	0	0	0	0	0	0	0
c-59.RSA	20	0	0	0	0	0	0	0	0
c-62.RSA	20	0	0	0	0	0	0	0	0
c-63.RSA	20	0	0	0	0	0	0	0	0
c-68.RSA	20	0	0	0	0	0	0	0	0
c-69.RSA	20	0	0	0	0	0	0	0	0
c-70.RSA	20	0	0	0	0	0	0	0	0
c-71.RSA	20	0	0	0	0	0	0	0	0
c-72.RSA	20	0	0	0	0	0	0	0	0
CONT-201.RSA	-17	-13	-13	-13	-13	7	0	-13	-14
CONT-300.RSA	-17	-13	-13	-13	-13	7	0	-13	-14
copter2.rsa	0	0	0	0	0	0	0	0	0
crystk02.RSA	0	0	0	0	0	7	0	0	0
crystk03.RSA	0	0	0	0	0	0	0	0	0

Table 3.2.4.1: Return code (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
DARCY003.rsa	20	0	0	0	0	7	0	-13	-14
dawson5.rsa	0	0	0	0	0	0	0	0	0
DIXMAANL.rsa	20	0	0	0	0	0	0	0	0
DTOC.mat	-6	20	-5	-6	20	20	-13	20	-14
D_PRETOK.rsa	20	20	20	20	20	7	20	-13	-14
HELM2D03.rsa	0	0	0	0	0	0	0	0	0
HELM3D01.rsa	0	0	0	0	0	0	0	0	0
K1_SAN.rsa	-6	6	-5	-6	0	7	0	-13	-14
LINVERSE.rsa	20	0	0	0	0	0	0	0	0
mario001.rsa	20	0	0	0	0	7	0	-13	-14
mario002.rsa	20	0	0	0	0	7	0	-13	-14
NCVXBQP1.rsa	20	0	0	0	0	0	0	0	0
NCVXQP1.mat	20	20	20	20	20	20	20	20	-14
NCVXQP3.rsa	20	20	20	20	0	20	-2	-13	-14
NCVXQP5.rsa	20	0	0	0	0	7	0	-13	-14
NCVXQP7.rsa	20	20	20	0	0	20	-2	–	-14
NCVXQP9.mat	20	0	0	0	0	7	0	0	-14
olesnik0.rsa	20	20	20	0	20	7	20	-13	-14
qa8fk.RSA	0	0	0	0	0	7	0	0	0
SIT100.rsa	20	0	20	0	0	7	20	-13	-14
SPARSINE.rsa	-99	-99	-99	-99	-99	-99	-2	-99	-99
SPMSRTLS.rsa	0	0	0	0	0	0	0	0	0
stokes128.mat	20	20	0	0	0	7	20	-13	-14
stokes64.mat	20	20	0	0	0	7	0	-13	-14
stokes64s.mat	20	20	0	20	0	7	20	-13	-14
tuma1.mat	20	0	0	0	0	7	0	-13	-14
tuma2.mat	20	0	0	0	0	7	0	-13	-14
TURON_M.rsa	20	0	0	0	20	7	20	-13	-14
vibrobox.RSA	20	20	20	20	20	20	20	20	-14

Table 3.2.4.2: Total time (CPU seconds)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	4.92	0.78	2.67	5.31	4.30	2.73	50.60	20.40	3.93
A2NNSNSL.rsa	5.70	0.85	2.65	4.80	4.05	2.61	44.50	19.30	-

Table 3.2.4.2: Total time (CPU seconds) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A5ESINDL.rsa	3.30	0.49	1.83	3.57	2.18	1.29	-	10.10	2.85
AUG2D.mat	-	274.46	-	-	56.80	0.99	-	0.08	-
AUG2DC.mat	-	325.74	-	-	76.10	1.03	-	0.09	-
AUG3D.mat	-	996.11	-	-	-	1.60	-	0.07	-
AUG3DCQP.mat	-	2.72	5.34	3.67	11.20	2.58	-	9.84	4.82
bcsstk35.RSA	3.09	2.48	3.64	4.52	3.75	2.91	4.47	5.68	5.74
bcsstk37.RSA	3.03	2.55	3.78	4.50	4.27	3.22	4.37	4.93	4.99
bcsstk39.RSA	8.19	6.32	8.76	10.74	10.90	7.57	10.70	12.60	10.90
BLOCKQP1.rsa	26.46	1.06	3.73	24.50	21.10	4.08	-	36.10	83.90
BLOWEYA.rsa	1.31	0.32	1.45	1.17	1.15	0.71	6.77	2.01	-
bmw3_2.rsa	73.30	82.98	86.16	105.90	125.00	70.80	131.00	227.00	92.08
BOYD1.RSA	257.37	59.56	35.80	358.98	227.00	65.16	-	126.00	378.83
BOYD2.RSA	351.00	7.08	50.75	347.04	395.00	74.78	-	1050.00	415.53
BRAINPC2.rsa	1.38	0.28	0.69	1.28	0.93	0.69	13.90	2.47	-
BRATU3D.RSA	-	-	14.37	-	-	11.73	-	40.40	-
c-55.RSA	9.30	16.89	20.59	12.99	81.90	8.20	72.20	26.20	49.89
c-58.RSA	8.57	12.49	13.40	11.03	73.90	6.45	88.20	17.40	50.94
c-59.RSA	10.54	18.29	36.78	16.88	104.00	9.74	72.30	17.40	48.03
c-62.RSA	18.38	37.55	71.48	30.25	254.00	18.17	204.00	68.40	93.20
c-63.RSA	6.75	7.30	11.03	7.45	30.00	5.04	43.30	10.10	19.15
c-68.RSA	17.70	31.52	61.59	30.46	226.00	18.77	397.00	55.40	106.99
c-69.RSA	9.88	10.30	14.82	10.08	30.60	7.07	52.10	13.40	29.50
c-70.RSA	11.50	15.50	18.22	13.28	68.20	9.10	172.00	23.10	32.61
c-71.RSA	44.40	101.43	108.47	77.00	715.00	47.50	686.00	200.00	843.73
c-72.RSA	11.78	13.06	19.92	13.66	58.10	9.26	63.30	17.50	42.73
CONT-201.RSA	-	-	-	-	-	5.84	16.90	-	-
CONT-300.RSA	-	-	-	-	-	16.00	54.90	-	-
copter2.rsa	17.80	18.84	20.68	22.55	25.70	16.70	30.10	53.50	16.50
crystk02.RSA	5.58	5.96	6.40	8.00	8.63	5.84	8.01	19.20	6.69
crystk03.RSA	14.40	15.76	17.06	21.04	22.70	13.92	19.80	49.90	15.33
DARCY003.rsa	40.07	9.84	34.91	27.48	26.90	22.00	79.90	-	-
dawson5.rsa	6.69	5.07	6.87	7.03	7.67	5.51	11.60	10.20	6.83
DIXMAANL.rsa	2.35	0.64	2.47	2.07	2.00	1.50	4.44	6.17	1.70
DTOC.mat	-	9.78	-	-	0.87	0.49	-	0.07	-
D_PRETOK.rsa	29.42	21.95	28.05	28.25	32.00	22.58	53.70	-	-
HELM2D03.rsa	48.38	31.06	37.63	39.48	41.80	30.20	108.00	78.70	35.99

Table 3.2.4.2: Total time (CPU seconds) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
HELM3D01.rsa	9.49	10.51	10.84	12.35	13.90	8.60	17.30	35.30	9.29
K1_SAN.rsa	-	5.61	-	-	6.38	5.07	10.20	-	-
LINVERSE.rsa	0.37	0.11	0.35	0.34	0.28	0.23	0.67	0.25	0.32
mario001.rsa	2.44	0.64	2.35	1.97	1.88	1.52	3.33	-	-
mario002.rsa	40.14	9.84	34.78	27.49	26.90	21.98	79.30	-	-
NCVXBQP1.rsa	4.82	4.10	5.13	5.03	5.15	3.51	8.56	16.30	3.93
NCVXQP1.mat	5.31	4.96	15.65	6.68	19.80	2.91	9.49	20.60	-
NCVXQP3.rsa	80.71	189.38	392.43	145.38	454.00	60.41	-	-	-
NCVXQP5.rsa	31.51	51.10	67.51	49.16	92.30	28.70	61.60	-	-
NCVXQP7.rsa	179.16	396.82	876.47	322.14	1160.00	100.83	-	-	-
NCVXQP9.mat	1.05	0.48	1.40	0.74	0.75	0.53	1.55	0.74	-
olesnik0.rsa	9.75	7.31	10.50	8.34	8.85	6.78	15.00	-	-
qa8fk.RSA	43.72	56.55	45.95	59.49	90.30	42.50	83.90	218.00	45.80
SIT100.rsa	0.79	0.59	0.79	0.67	0.70	0.52	1.18	-	-
SPARSINE.rsa	-	-	-	-	-	-	-	-	-
SPMSRTLS.rsa	0.73	0.30	0.82	0.76	0.62	0.49	1.41	0.71	0.96
stokes128.mat	5.64	2.92	5.57	4.76	5.37	3.93	7.76	-	-
stokes64.mat	1.05	0.42	1.10	0.99	1.02	0.74	1.39	-	-
stokes64s.mat	1.05	0.47	1.12	0.98	1.03	0.74	1.39	-	-
tuma1.mat	1.30	0.51	1.25	1.11	1.13	0.89	2.03	-	-
tuma2.mat	0.65	0.22	0.62	0.55	0.53	0.43	1.01	-	-
TURON_M.rsa	29.64	21.53	27.86	28.09	30.70	21.79	53.60	-	-
vibrobox.RSA	3.96	3.79	3.93	4.49	5.77	3.51	9.32	6.28	-

Table 3.2.4.3: Factorize time (CPU seconds)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	0.48	0.46	1.34	0.98	0.77	0.14	1.15	5.02	0.36
A2NNSNSL.rsa	0.47	0.45	1.33	0.97	0.73	0.14	1.16	5.48	-
A5ESINDL.rsa	0.30	0.29	0.98	0.67	0.45	0.09	-	3.81	0.25
AUG2D.mat	-	274.18	-	-	55.50	0.11	-	0.05	-
AUG2DC.mat	-	325.44	-	-	74.70	0.12	-	0.05	-
AUG3D.mat	-	995.35	-	-	-	0.60	-	0.04	-
AUG3DCQP.mat	-	1.12	3.22	1.65	9.48	1.04	-	9.07	1.61
bcsstk35.RSA	2.15	2.08	2.17	3.16	2.78	1.74	2.46	4.00	1.28

Table 3.2.4.3: Factorize time (CPU seconds) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
bcsstk37.RSA	2.14	2.21	2.37	3.29	3.28	2.15	2.54	3.79	1.39
bcsstk39.RSA	6.52	5.63	6.59	8.72	9.28	5.78	7.59	9.60	3.92
BLOCKQP1.rsa	0.91	0.66	1.08	3.35	2.72	0.22	-	13.30	0.44
BLOWEYA.rsa	0.18	0.21	0.43	0.26	0.25	0.05	0.36	0.42	-
bmw3_2.rsa	61.32	71.85	71.19	92.81	112.00	58.35	110.00	204.00	51.08
BOYD1.RSA	2.44	1.71	1.76	52.48	2.02	0.23	-	73.10	0.55
BOYD2.RSA	3.08	2.21	8.12	26.15	3.23	0.68	-	307.00	1.96
BRAINPC2.rsa	0.56	0.18	0.35	0.36	0.37	0.08	0.39	0.49	-
BRATU3D.RSA	-	-	12.79	-	-	10.04	-	37.80	-
c-55.RSA	5.53	13.84	16.69	9.68	79.10	5.92	25.30	23.10	40.85
c-58.RSA	4.34	9.32	11.67	7.54	70.80	3.96	15.10	14.30	41.95
c-59.RSA	5.89	14.47	31.37	12.02	101.00	6.95	23.50	14.20	32.06
c-62.RSA	13.24	33.25	68.75	24.71	249.00	15.11	77.10	62.60	81.47
c-63.RSA	2.48	4.29	6.90	4.12	26.90	2.49	16.10	7.46	7.75
c-68.RSA	11.22	25.23	54.08	24.19	221.00	14.81	94.70	47.60	60.96
c-69.RSA	3.10	5.71	8.71	4.69	25.80	2.89	14.00	8.64	10.73
c-70.RSA	4.43	10.64	11.56	7.79	63.10	4.84	50.90	17.40	12.28
c-71.RSA	34.82	93.50	97.49	67.45	706.00	41.81	278.00	186.00	811.01
c-72.RSA	3.92	7.51	12.58	7.37	52.50	4.44	16.70	11.40	10.50
CONT-201.RSA	-	-	-	-	-	2.46	6.53	-	-
CONT-300.RSA	-	-	-	-	-	7.82	25.20	-	-
copter2.rsa	11.92	14.27	15.62	18.14	21.30	12.93	18.10	48.20	9.98
crystk02.RSA	4.74	4.89	5.31	6.95	7.67	4.66	6.21	17.30	3.39
crystk03.RSA	12.67	13.56	14.95	19.06	20.80	11.99	16.30	46.00	8.78
DARCY003.rsa	9.20	6.35	8.57	7.13	7.33	2.40	19.30	-	-
dawson5.rsa	2.76	4.42	2.68	3.54	3.93	2.23	4.36	8.04	1.94
DIXMAANL.rsa	0.41	0.35	0.73	0.50	0.63	0.14	0.87	1.03	0.16
DTOC.mat	-	9.44	-	-	0.45	0.04	-	0.04	-
D_PRETOK.rsa	12.80	12.83	14.93	17.27	20.20	11.00	27.70	-	-
HELM2D03.rsa	20.19	14.74	17.40	20.37	22.80	12.78	41.30	62.30	12.11
HELM3D01.rsa	6.30	7.86	8.09	9.76	11.60	6.55	9.21	32.20	5.33
K1_SAN.rsa	-	2.37	-	-	2.82	1.45	3.37	-	-
LINVERSE.rsa	0.07	0.08	0.10	0.11	0.08	0.03	0.13	0.16	0.03
mario001.rsa	0.40	0.44	0.62	0.57	0.53	0.14	0.73	-	-
mario002.rsa	9.21	6.36	8.54	7.17	7.33	2.40	19.30	-	-
NCVXBQP1.rsa	1.66	1.73	2.30	2.46	3.08	1.59	2.66	14.00	1.27

Table 3.2.4.3: Factorize time (CPU seconds) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
NCVXQP1.mat	4.38	4.23	13.88	5.86	19.00	2.24	6.43	19.70	-
NCVXQP3.rsa	71.21	180.09	321.62	135.04	446.00	54.26	-	-	-
NCVXQP5.rsa	24.36	45.58	57.65	42.77	87.80	24.43	40.60	-	-
NCVXQP7.rsa	163.01	385.18	820.27	306.67	1150.00	92.91	-	-	-
NCVXQP9.mat	0.36	0.40	0.29	0.22	0.32	0.07	0.28	0.53	-
olesnik0.rsa	2.96	3.05	3.50	3.73	4.05	2.04	5.15	-	-
qa8fk.RSA	34.36	48.42	39.38	52.96	82.60	35.67	62.20	207.00	33.85
SIT100.rsa	0.24	0.22	0.33	0.28	0.33	0.14	0.38	-	-
SPARSINE.rsa	-	-	-	-	-	-	-	-	-
SPMSRTLS.rsa	0.20	0.21	0.28	0.27	0.22	0.07	0.36	0.42	0.08
stokes128.mat	1.80	2.56	2.25	2.10	2.55	1.19	2.77	-	-
stokes64.mat	0.33	0.34	0.41	0.43	0.47	0.19	0.43	-	-
stokes64s.mat	0.34	0.39	0.49	0.43	0.48	0.19	0.43	-	-
tuma1.mat	0.29	0.41	0.49	0.38	0.45	0.17	0.55	-	-
tuma2.mat	0.14	0.17	0.23	0.17	0.20	0.07	0.23	-	-
TURON_M.rsa	12.51	12.08	12.75	16.61	18.50	9.97	27.00	-	-
vibrobox.RSA	2.48	2.41	2.68	3.32	4.60	2.36	4.29	5.39	-

Table 3.2.4.4: Solution time given factors (CPU seconds)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	0.06	0.05	0.39	0.29	0.10	0.07	0.72	0.36	0.19
A2NNSNSL.rsa	0.06	0.05	0.38	0.28	0.08	0.08	0.72	0.36	-
A5ESINDL.rsa	0.04	0.03	0.22	0.24	0.05	0.05	-	0.25	0.14
AUG2D.mat	-	0.20	-	-	0.45	0.10	-	0.01	-
AUG2DC.mat	-	0.21	-	-	0.52	0.10	-	0.01	-
AUG3D.mat	-	0.68	-	-	-	0.11	-	0.00	-
AUG3DCQP.mat	-	0.04	0.18	0.15	0.12	0.06	-	0.42	0.14
bcsstk35.RSA	0.09	0.09	0.14	0.13	0.25	0.10	0.20	1.05	0.11
bcsstk37.RSA	0.08	0.09	0.13	0.12	0.25	0.09	0.18	0.65	0.10
bcsstk39.RSA	0.21	0.20	0.29	0.27	0.57	0.21	0.43	2.06	0.23
BLOCKQP1.rsa	0.07	0.05	0.20	2.44	0.10	0.25	-	0.41	0.12
BLOWEYA.rsa	0.02	0.02	0.08	0.05	0.03	0.09	0.08	0.11	-
bmw3_2.rsa	1.28	1.29	1.67	1.56	3.47	1.24	3.35	16.70	1.44
BOYD1.RSA	0.19	0.07	0.47	50.21	0.13	0.10	-	0.69	0.24

Table 3.2.4.4: Solution time given factors (CPU seconds) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
BOYD2.RSA	0.35	0.26	1.97	22.39	0.47	0.50	-	1.88	1.08
BRAINPC2.rsa	0.02	0.02	0.09	0.06	0.03	0.10	0.06	0.13	-
BRATU3D.RSA	-	-	0.25	-	-	0.47	-	1.75	-
c-55.RSA	0.12	0.13	0.33	0.19	0.28	0.11	2.08	1.13	0.45
c-58.RSA	0.10	0.10	0.26	0.17	0.23	0.09	0.83	0.71	0.39
c-59.RSA	0.12	0.13	0.43	0.22	0.30	0.12	1.60	0.90	0.40
c-62.RSA	0.20	0.23	0.56	0.30	0.57	0.19	7.24	2.31	0.67
c-63.RSA	0.09	0.09	0.29	0.18	0.20	0.10	2.08	0.69	0.26
c-68.RSA	0.19	0.20	0.73	0.34	0.48	0.20	6.38	1.68	0.56
c-69.RSA	0.13	0.12	0.42	0.25	0.25	0.13	1.29	0.91	0.39
c-70.RSA	0.15	0.14	0.46	0.28	0.32	0.15	4.15	1.18	0.40
c-71.RSA	0.38	0.43	0.99	0.58	1.07	0.38	25.60	4.61	2.41
c-72.RSA	0.16	0.14	0.53	0.32	0.32	0.17	1.31	1.07	0.41
CONT-201.RSA	-	-	-	-	-	0.60	0.47	-	-
CONT-300.RSA	-	-	-	-	-	1.46	1.35	-	-
copter2.rsa	0.27	0.29	0.43	0.40	0.77	0.28	0.68	3.24	0.37
crystk02.RSA	0.11	0.11	0.14	0.14	0.32	0.33	0.22	1.52	0.12
crystk03.RSA	0.24	0.24	0.30	0.29	0.70	0.22	0.48	3.15	0.25
DARCY003.rsa	0.60	0.49	1.37	1.09	0.77	2.05	2.38	-	-
dawson5.rsa	0.13	0.15	0.22	0.20	0.32	0.15	0.33	1.36	0.18
DIXMAANL.rsa	0.05	0.05	0.19	0.13	0.07	0.08	0.16	0.20	0.10
DTOC.mat	-	0.02	-	-	0.03	0.06	-	0.00	-
D_PRETOK.rsa	0.48	0.48	0.81	0.73	1.12	1.54	1.60	-	-
HELM2D03.rsa	0.96	0.80	1.60	1.33	1.68	0.99	3.20	7.56	1.32
HELM3D01.rsa	0.14	0.16	0.25	0.22	0.40	0.15	0.35	1.79	0.21
K1_SAN.rsa	-	0.13	-	-	0.27	0.43	0.34	-	-
LINVERSE.rsa	0.01	0.01	0.02	0.02	0.02	0.01	0.02	0.03	0.02
mario001.rsa	0.04	0.04	0.11	0.09	0.07	0.15	0.11	-	-
mario002.rsa	0.60	0.49	1.37	1.08	0.77	2.06	2.38	-	-
NCVXBQP1.rsa	0.09	0.09	0.28	0.20	0.18	0.11	0.23	1.12	0.15
NCVXQP1.mat	0.06	0.06	0.12	0.09	0.17	0.12	0.19	0.54	-
NCVXQP3.rsa	0.63	0.77	1.23	0.94	1.92	1.41	-	-	-
NCVXQP5.rsa	0.35	0.44	0.78	0.60	0.97	0.98	1.08	-	-
NCVXQP7.rsa	4.85	1.14	1.63	1.42	2.90	1.75	-	-	-
NCVXQP9.mat	0.01	0.01	0.05	0.04	0.02	0.05	0.05	0.06	-
olesnik0.rsa	0.16	0.17	0.33	0.28	0.35	0.57	0.48	-	-

Table 3.2.4.4: Solution time given factors (CPU seconds) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
qa8fk.RSA	0.56	0.62	0.74	0.70	1.65	1.11	1.60	8.88	0.68
SIT100.rsa	0.01	0.01	0.03	0.03	0.03	0.04	0.04	-	-
SPARSINE.rsa	-	-	-	-	-	-	-	-	-
SPMSRTLS.rsa	0.02	0.02	0.06	0.05	0.03	0.03	0.06	0.14	0.06
stokes128.mat	0.10	0.11	0.21	0.18	0.23	0.35	0.26	-	-
stokes64.mat	0.02	0.02	0.04	0.04	0.05	0.06	0.05	-	-
stokes64s.mat	0.02	0.02	0.05	0.04	0.05	0.06	0.05	-	-
tuma1.mat	0.02	0.03	0.07	0.05	0.03	0.09	0.08	-	-
tuma2.mat	0.01	0.01	0.03	0.03	0.02	0.04	0.03	-	-
TURON_M.rsa	0.49	0.47	0.80	0.73	1.05	1.51	1.62	-	-
vibrobox.RSA	0.06	0.06	0.08	0.08	0.17	0.18	0.17	0.54	-

Table 3.2.4.5: Actual memory used (Mbytes)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	3.5E+1	2.1E+1	2.5E+1	2.9E+1	2.1E+1	2.6E+1	3.0E+1	3.7E+1	2.6E+1
A2NNSNSL.rsa	3.4E+1	2.1E+1	2.3E+1	3.0E+1	2.0E+1	2.6E+1	3.0E+1	3.7E+1	-
A5ESINDL.rsa	2.2E+1	1.5E+1	1.6E+1	2.0E+1	1.5E+1	1.8E+1	-	2.5E+1	1.8E+1
AUG2D.mat	-	1.6E+3	-	-	8.3E+1	1.0E+1	-	5.3E+0	-
AUG2DC.mat	-	1.8E+3	-	-	9.7E+1	1.1E+1	-	5.6E+0	-
AUG3D.mat	-	2.4E+3	-	-	-	1.3E+1	-	5.1E+0	-
AUG3DCQP.mat	-	2.4E+1	3.8E+1	3.3E+1	3.3E+1	1.9E+1	-	1.5E+2	2.9E+1
bcsstk35.RSA	5.7E+1	6.1E+1	5.8E+1	9.8E+1	4.3E+1	4.7E+1	5.3E+1	1.6E+2	7.0E+1
bcsstk37.RSA	5.2E+1	5.5E+1	5.4E+1	9.4E+1	4.5E+1	4.4E+1	4.6E+1	7.7E+1	6.2E+1
bcsstk39.RSA	1.1E+2	1.2E+2	1.1E+2	1.9E+2	9.3E+1	9.4E+1	1.1E+2	1.8E+2	1.3E+2
BLOCKQP1.rsa	5.0E+1	3.8E+1	4.1E+1	5.3E+1	5.0E+1	2.7E+1	-	4.7E+1	3.4E+1
BLOWEYA.rsa	1.7E+1	9.5E+0	1.0E+1	1.1E+1	8.7E+0	1.1E+1	1.3E+1	1.3E+1	-
bmw3_2.rsa	7.4E+2	7.2E+2	7.3E+2	1.2E+3	5.9E+2	6.1E+2	7.1E+2	2.0E+3	7.7E+2
BOYD1.RSA	8.3E+1	6.0E+1	6.5E+1	7.7E+1	6.1E+1	4.6E+1	-	7.0E+1	9.7E+1
BOYD2.RSA	1.3E+2	9.8E+1	1.2E+2	1.3E+2	1.0E+2	1.3E+2	-	1.7E+2	1.4E+2
BRAINPC2.rsa	1.9E+1	9.4E+0	8.5E+0	2.3E+1	1.1E+1	1.1E+1	1.4E+1	1.6E+1	-
BRATU3D.RSA	-	-	9.8E+1	-	-	6.5E+1	-	8.9E+2	-
c-55.RSA	7.0E+1	6.8E+1	8.9E+1	9.0E+1	9.6E+1	3.9E+1	1.1E+2	5.5E+2	1.3E+2
c-58.RSA	7.7E+1	5.5E+1	1.5E+2	8.6E+1	9.3E+1	3.8E+1	7.3E+1	4.7E+2	1.2E+2
c-59.RSA	8.4E+1	7.2E+1	1.1E+2	1.0E+2	1.2E+2	4.2E+1	1.1E+2	3.9E+2	1.2E+2

Table 3.2.4.5: Actual memory used (Mbytes) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
c-62.RSA	1.2E+2	1.1E+2	3.4E+2	1.6E+2	2.0E+2	7.0E+1	2.0E+2	1.1E+3	1.9E+2
c-63.RSA	5.6E+1	4.3E+1	5.8E+1	6.3E+1	6.1E+1	3.1E+1	1.0E+2	2.5E+2	7.1E+1
c-68.RSA	1.2E+2	9.5E+1	1.7E+2	1.4E+2	1.6E+2	6.1E+1	2.1E+2	1.2E+3	1.6E+2
c-69.RSA	7.8E+1	5.4E+1	7.3E+1	7.7E+1	6.6E+1	4.4E+1	1.2E+2	1.9E+2	9.5E+1
c-70.RSA	9.0E+1	7.3E+1	8.9E+1	9.9E+1	1.1E+2	4.9E+1	1.8E+2	4.8E+2	1.0E+2
c-71.RSA	2.2E+2	2.1E+2	2.8E+2	3.1E+2	3.6E+2	1.3E+2	4.4E+2	2.3E+3	9.5E+2
c-72.RSA	9.2E+1	6.5E+1	9.2E+1	9.9E+1	9.4E+1	5.2E+1	1.4E+2	3.4E+2	9.8E+1
CONT-201.RSA	-	-	-	-	-	4.7E+1	9.9E+1	-	-
CONT-300.RSA	-	-	-	-	-	1.2E+2	2.8E+2	-	-
copter2.rsa	1.5E+2	1.3E+2	1.4E+2	2.1E+2	1.5E+2	1.0E+2	1.3E+2	6.7E+2	1.4E+2
crystk02.RSA	6.4E+1	6.7E+1	6.7E+1	1.1E+2	6.1E+1	5.1E+1	5.3E+1	1.7E+2	7.0E+1
crystk03.RSA	1.3E+2	1.4E+2	1.4E+2	2.3E+2	1.3E+2	1.1E+2	1.1E+2	6.9E+2	1.4E+2
DARCY003.rsa	3.7E+2	1.6E+2	1.7E+2	2.5E+2	1.5E+2	1.6E+2	4.3E+2	-	-
dawson5.rsa	9.3E+1	7.8E+1	6.7E+1	1.2E+2	5.6E+1	5.5E+1	7.7E+1	2.4E+2	7.3E+1
DIXMAANL.rsa	3.5E+1	1.9E+1	2.0E+1	2.6E+1	1.6E+1	2.0E+1	3.1E+1	4.4E+1	2.1E+1
DTOC.mat	-	4.1E+2	-	-	9.5E+0	7.9E+0	-	3.4E+0	-
D_PRETOK.rsa	2.5E+2	1.9E+2	2.1E+2	3.1E+2	2.0E+2	1.4E+2	3.2E+2	-	-
HELM2D03.rsa	5.1E+2	2.9E+2	3.4E+2	4.5E+2	2.6E+2	2.5E+2	6.2E+2	6.8E+2	3.2E+2
HELM3D01.rsa	8.6E+1	7.6E+1	8.4E+1	1.2E+2	8.1E+1	5.4E+1	7.0E+1	6.7E+2	8.5E+1
K1_SAN.rsa	-	5.8E+1	-	-	4.8E+1	3.8E+1	7.2E+1	-	-
LINVERSE.rsa	8.0E+0	4.5E+0	5.1E+0	6.5E+0	3.8E+0	5.0E+0	4.5E+0	6.3E+0	5.4E+0
mario001.rsa	2.9E+1	1.4E+1	1.7E+1	2.9E+1	1.4E+1	1.6E+1	2.3E+1	-	-
mario002.rsa	3.7E+2	1.6E+2	1.7E+2	2.5E+2	1.5E+2	1.6E+2	4.3E+2	-	-
NCVXBQP1.rsa	5.4E+1	4.5E+1	4.4E+1	6.4E+1	3.8E+1	2.8E+1	4.6E+1	2.6E+2	4.2E+1
NCVXQP1.mat	2.4E+1	3.4E+1	5.3E+1	9.6E+1	5.0E+1	1.9E+1	3.8E+1	2.0E+2	-
NCVXQP3.rsa	2.4E+2	3.5E+2	5.0E+2	5.6E+2	4.4E+2	1.9E+2	-	-	-
NCVXQP5.rsa	1.7E+2	1.8E+2	2.7E+2	2.9E+2	2.3E+2	1.3E+2	1.7E+2	-	-
NCVXQP7.rsa	3.2E+2	5.0E+2	7.5E+2	8.1E+2	6.6E+2	2.3E+2	-	-	-
NCVXQP9.mat	9.3E+0	7.4E+0	7.6E+0	9.2E+0	6.9E+0	5.7E+0	8.1E+0	2.1E+1	-
olesnik0.rsa	1.1E+2	7.1E+1	7.3E+1	1.1E+2	6.5E+1	5.0E+1	1.0E+2	-	-
qa8fk.RSA	2.9E+2	3.1E+2	3.1E+2	4.4E+2	3.0E+2	2.1E+2	2.9E+2	2.0E+3	3.0E+2
SIT100.rsa	8.4E+0	8.1E+0	8.9E+0	1.1E+1	7.8E+0	5.6E+0	8.6E+0	-	-
SPARSINE.rsa	-	-	-	-	-	-	-	-	-
SPMSRTLS.rsa	1.7E+1	1.0E+1	1.0E+1	1.5E+1	7.0E+0	1.1E+1	1.4E+1	1.6E+1	1.2E+1
stokes128.mat	7.0E+1	4.5E+1	5.3E+1	8.7E+1	4.6E+1	3.4E+1	5.8E+1	-	-
stokes64.mat	1.6E+1	1.0E+1	1.3E+1	2.8E+1	1.1E+1	8.4E+0	1.1E+1	-	-

Table 3.2.4.5: Actual memory used (Mbytes) (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
stokes64s.mat	1.6E+1	1.0E+1	1.5E+1	2.8E+1	1.1E+1	8.4E+0	1.1E+1	-	-
tuma1.mat	1.4E+1	1.2E+1	1.3E+1	2.0E+1	1.1E+1	9.0E+0	1.5E+1	-	-
tuma2.mat	8.9E+0	5.8E+0	6.9E+0	9.6E+0	5.8E+0	5.4E+0	7.3E+0	-	-
TURON_M.rsa	2.8E+2	2.1E+2	1.9E+2	3.0E+2	1.9E+2	1.4E+2	3.2E+2	-	-
vibrobox.RSA	4.2E+1	4.0E+1	4.0E+1	5.6E+1	4.3E+1	2.7E+1	3.2E+1	2.0E+2	-

Table 3.2.4.6: Number of integers used for factors

Name	MA57	MUMPS	MUMPS_US	Oblio	SPOOLES	UMFPACK
A0NSDSIL.rsa	2.8E+5	9.7E+5	6.1E+5	3.6E+5	1.3E+6	9.6E+5
A2NNSNSL.rsa	2.8E+5	9.8E+5	5.9E+5	3.3E+5	1.3E+6	9.3E+5
A5ESINDL.rsa	2.0E+5	7.3E+5	4.1E+5	2.1E+5	-	5.9E+5
AUG2D.mat	2.1E+5	-	-	6.4E+5	-	1.6E+5
AUG2DC.mat	2.2E+5	-	-	6.9E+5	-	1.7E+5
AUG3D.mat	2.2E+5	-	-	-	-	1.4E+5
AUG3DCQP.mat	1.7E+5	5.0E+5	4.6E+5	8.8E+5	-	4.9E+6
bcsstk35.RSA	1.6E+5	3.4E+5	3.7E+5	2.6E+5	3.5E+6	5.5E+6
bcsstk37.RSA	1.4E+5	3.1E+5	3.4E+5	2.3E+5	3.3E+6	5.7E+6
bcsstk39.RSA	2.9E+5	6.4E+5	6.8E+5	4.3E+5	8.4E+6	1.3E+7
BLOCKQP1.rsa	3.2E+5	8.8E+5	7.4E+5	5.4E+5	-	1.4E+6
BLOWEYA.rsa	3.8E+4	3.8E+5	2.0E+5	1.4E+5	7.8E+5	2.5E+5
bmw3_2.rsa	1.5E+6	3.1E+6	3.3E+6	2.3E+6	6.1E+7	1.1E+8
BOYD1.RSA	8.4E+5	1.9E+6	1.6E+6	6.5E+5	-	1.5E+6
BOYD2.RSA	1.4E+6	5.3E+6	2.9E+6	1.3E+6	-	3.6E+6
BRAINPC2.rsa	1.0E+5	3.4E+5	3.6E+5	2.1E+5	7.8E+5	4.7E+5
BRATU3D.RSA	-	5.4E+5	-	-	-	1.6E+7
c-55.RSA	3.9E+5	9.9E+5	5.7E+5	2.2E+6	5.7E+6	9.2E+6
c-58.RSA	3.2E+5	7.5E+5	4.9E+5	1.9E+6	4.3E+6	4.7E+6
c-59.RSA	4.2E+5	1.4E+6	6.7E+5	2.3E+6	5.9E+6	6.4E+6
c-62.RSA	6.0E+5	8.8E+5	7.6E+5	4.5E+6	1.1E+7	2.0E+7
c-63.RSA	3.3E+5	9.2E+5	5.8E+5	1.4E+6	5.2E+6	4.6E+6
c-68.RSA	6.2E+5	2.1E+6	1.0E+6	3.9E+6	1.2E+7	1.3E+7
c-69.RSA	4.7E+5	1.4E+6	8.4E+5	1.7E+6	7.3E+6	5.7E+6
c-70.RSA	5.3E+5	1.4E+6	9.1E+5	2.2E+6	9.8E+6	8.2E+6
c-71.RSA	1.2E+6	2.5E+6	1.4E+6	8.4E+6	2.4E+7	4.0E+7

Table 3.2.4.6: Number of integers used for factors (continued)

Name	MA57	MUMPS	MUMPS_US	Oblio	SPOOLES	UMFPACK
c-72.RSA	5.4E+5	1.6E+6	1.0E+6	2.2E+6	9.1E+6	6.6E+6
CONT-201.RSA	-	1.3E+6	-	-	8.4E+6	-
CONT-300.RSA	-	3.1E+6	-	-	2.5E+7	-
copter2.rsa	4.3E+5	9.6E+5	9.1E+5	9.5E+5	1.2E+7	2.8E+7
crystk02.RSA	1.1E+5	2.3E+5	2.6E+5	1.9E+5	4.4E+6	1.2E+7
crystk03.RSA	2.0E+5	4.4E+5	4.8E+5	3.6E+5	9.6E+6	2.6E+7
DARCY003.rsa	1.1E+6	4.1E+6	3.8E+6	2.3E+6	3.8E+7	-
dawson5.rsa	3.1E+5	6.6E+5	6.6E+5	5.7E+5	6.0E+6	9.4E+6
DIXMAANL.rsa	2.0E+5	7.5E+5	4.8E+5	3.7E+5	2.1E+6	8.2E+5
DTOC.mat	9.6E+4	-	-	1.5E+5	-	1.4E+5
D_PRETOK.rsa	7.4E+5	2.3E+6	2.3E+6	1.5E+6	2.8E+7	-
HELM2D03.rsa	1.8E+6	5.4E+6	4.3E+6	3.4E+6	5.8E+7	5.8E+7
HELM3D01.rsa	2.6E+5	6.0E+5	5.4E+5	5.6E+5	6.0E+6	1.5E+7
K1_SAN.rsa	2.4E+5	-	-	5.2E+5	5.6E+6	-
LINVERSE.rsa	1.6E+4	7.6E+4	8.4E+4	4.8E+4	2.3E+5	1.3E+5
mario001.rsa	1.1E+5	3.9E+5	3.7E+5	2.2E+5	1.5E+6	-
mario002.rsa	1.1E+6	4.1E+6	3.8E+6	2.3E+6	3.8E+7	-
NCVXBQP1.rsa	2.2E+5	7.1E+5	5.3E+5	4.5E+5	3.8E+6	8.6E+6
NCVXQP1.mat	1.0E+5	2.3E+5	2.4E+5	5.1E+5	2.2E+6	7.0E+6
NCVXQP3.rsa	1.1E+6	1.6E+6	-	4.4E+6	-	-
NCVXQP5.rsa	6.7E+5	1.1E+6	1.2E+6	2.1E+6	1.5E+7	-
NCVXQP7.rsa	1.4E+6	2.2E+6	2.7E+6	7.2E+6	-	-
NCVXQP9.mat	4.7E+4	1.7E+5	1.4E+5	9.2E+4	4.2E+5	4.0E+5
olesnik0.rsa	3.2E+5	1.0E+6	1.0E+6	6.8E+5	8.1E+6	-
qa8fk.RSA	5.6E+5	1.2E+6	1.3E+6	1.1E+6	2.7E+7	8.1E+7
SIT100.rsa	3.8E+4	1.4E+5	1.1E+5	7.8E+4	5.7E+5	-
SPARSINE.rsa	-	-	-	-	-	-
SPMSRTLS.rsa	3.9E+4	2.3E+5	1.6E+5	1.2E+5	8.2E+5	3.2E+5
stokes128.mat	2.0E+5	6.3E+5	7.3E+5	5.1E+5	4.4E+6	-
stokes64.mat	4.9E+4	1.5E+5	1.8E+5	1.3E+5	7.4E+5	-
stokes64s.mat	4.9E+4	1.6E+5	1.8E+5	1.3E+5	7.4E+5	-
tuma1.mat	6.1E+4	2.5E+5	2.1E+5	1.4E+5	9.8E+5	-
tuma2.mat	3.3E+4	1.4E+5	1.2E+5	7.9E+4	4.1E+5	-
TURON_M.rsa	7.5E+5	2.3E+6	2.4E+6	1.5E+6	2.8E+7	-
vibrobox.RSA	8.1E+4	2.0E+5	2.0E+5	2.8E+5	2.7E+6	4.2E+6

Table 3.2.4.7: Number of reals used for factors

Name	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	5.4E+5	3.9E+5	1.0E+6	3.6E+5	3.6E+5	1.3E+6	8.0E+5	4.1E+5
A2NNSNSL.rsa	5.1E+5	3.6E+5	9.9E+5	3.3E+5	3.3E+5	1.3E+6	7.7E+5	-
A5ESINDL.rsa	3.1E+5	2.3E+5	5.9E+5	2.4E+5	2.4E+5	-	4.7E+5	2.2E+5
AUG2D.mat	7.5E+6	-	-	5.9E+6	3.1E+5	-	1.1E+5	-
AUG2DC.mat	8.0E+6	-	-	6.8E+6	3.2E+5	-	1.1E+5	-
AUG3D.mat	2.1E+7	-	-	-	6.9E+5	-	9.4E+4	-
AUG3DCQP.mat	1.1E+6	2.9E+6	2.2E+6	1.0E+6	1.1E+6	-	4.8E+6	1.1E+6
bcsstk35.RSA	2.9E+6	3.7E+6	6.3E+6	3.5E+6	3.5E+6	3.5E+6	5.5E+6	2.9E+6
bcsstk37.RSA	3.0E+6	3.7E+6	6.2E+6	3.5E+6	3.4E+6	3.3E+6	5.6E+6	2.9E+6
bcsstk39.RSA	7.1E+6	8.9E+6	1.5E+7	8.4E+6	8.1E+6	8.4E+6	1.3E+7	6.9E+6
BLOCKQP1.rsa	7.8E+5	4.0E+5	1.6E+6	8.4E+5	7.8E+5	-	1.3E+6	3.8E+5
BLOWEYA.rsa	4.9E+5	1.7E+5	3.5E+5	1.6E+5	1.3E+5	7.8E+5	1.9E+5	-
bmw3_2.rsa	4.8E+7	5.5E+7	9.3E+7	5.1E+7	4.8E+7	6.1E+7	1.0E+8	4.6E+7
BOYD1.RSA	6.5E+5	6.5E+5	1.3E+6	6.5E+5	6.5E+5	-	1.3E+6	6.5E+5
BOYD2.RSA	1.7E+6	1.3E+6	3.4E+6	1.3E+6	1.3E+6	-	2.7E+6	1.3E+6
BRAINPC2.rsa	2.6E+5	1.7E+5	9.0E+5	3.4E+5	2.3E+5	7.8E+5	4.1E+5	-
BRATU3D.RSA	-	7.6E+6	-	-	5.8E+6	-	1.6E+7	-
c-55.RSA	3.9E+6	7.2E+6	7.0E+6	3.3E+6	3.4E+6	5.7E+6	9.2E+6	5.9E+6
c-58.RSA	2.9E+6	4.9E+6	5.5E+6	2.6E+6	2.6E+6	4.3E+6	4.6E+6	4.8E+6
c-59.RSA	3.8E+6	8.8E+6	7.2E+6	3.4E+6	3.6E+6	5.9E+6	6.3E+6	4.8E+6
c-62.RSA	7.1E+6	2.1E+7	1.4E+7	6.6E+6	6.7E+6	1.1E+7	2.0E+7	9.3E+6
c-63.RSA	2.3E+6	4.3E+6	4.6E+6	2.1E+6	2.2E+6	5.2E+6	4.5E+6	2.5E+6
c-68.RSA	5.6E+6	1.5E+7	1.1E+7	5.4E+6	5.5E+6	1.2E+7	1.3E+7	6.4E+6
c-69.RSA	3.1E+6	5.4E+6	5.5E+6	2.5E+6	2.6E+6	7.3E+6	5.6E+6	3.6E+6
c-70.RSA	3.8E+6	6.5E+6	7.1E+6	3.3E+6	3.4E+6	9.8E+6	8.1E+6	3.5E+6
c-71.RSA	1.4E+7	2.3E+7	2.6E+7	1.3E+7	1.3E+7	2.4E+7	4.0E+7	3.9E+7
c-72.RSA	3.5E+6	6.6E+6	7.0E+6	3.2E+6	3.4E+6	9.1E+6	6.5E+6	3.4E+6
CONT-201.RSA	-	4.6E+6	-	-	4.0E+6	8.4E+6	-	-
CONT-300.RSA	-	1.2E+7	-	-	1.0E+7	2.5E+7	-	-
copter2.rsa	1.0E+7	1.2E+7	2.0E+7	1.1E+7	1.0E+7	1.2E+7	2.8E+7	9.9E+6
crystk02.RSA	4.4E+6	5.1E+6	8.7E+6	4.9E+6	4.6E+6	4.4E+6	1.2E+7	4.1E+6
crystk03.RSA	9.8E+6	1.1E+7	2.0E+7	1.1E+7	1.0E+7	9.6E+6	2.6E+7	8.9E+6
DARCY003.rsa	9.6E+6	1.0E+7	1.6E+7	7.0E+6	5.4E+6	3.8E+7	-	-
dawson5.rsa	5.0E+6	4.7E+6	8.2E+6	4.4E+6	4.4E+6	6.0E+6	9.3E+6	3.9E+6
DIXMAANL.rsa	6.4E+5	4.3E+5	9.9E+5	3.9E+5	3.9E+5	2.1E+6	7.0E+5	4.2E+5

Table 3.2.4.7: Number of reals used for factors (continued)

Name	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
DTOC.mat	5.0E+5	-	-	5.0E+5	1.1E+5	-	9.5E+4	-
D_PRETOK.rsa	1.5E+7	1.7E+7	2.9E+7	1.5E+7	1.3E+7	2.8E+7	-	-
HELM2D03.rsa	2.2E+7	2.2E+7	4.0E+7	2.1E+7	2.0E+7	5.8E+7	5.7E+7	2.0E+7
HELM3D01.rsa	5.4E+6	6.3E+6	1.0E+7	5.5E+6	5.2E+6	6.0E+6	1.5E+7	5.1E+6
K1_SAN.rsa	3.6E+6	-	-	3.3E+6	2.9E+6	5.6E+6	-	-
LINVERSE.rsa	1.4E+5	1.1E+5	2.2E+5	1.0E+5	1.0E+5	2.3E+5	1.1E+5	5.4E+4
mario001.rsa	7.8E+5	8.2E+5	1.3E+6	5.7E+5	4.2E+5	1.5E+6	-	-
mario002.rsa	9.6E+6	1.0E+7	1.6E+7	7.0E+6	5.4E+6	3.8E+7	-	-
NCVXBQP1.rsa	2.4E+6	2.5E+6	4.5E+6	2.4E+6	2.3E+6	3.8E+6	8.5E+6	2.1E+6
NCVXQP1.mat	2.1E+6	4.0E+6	4.6E+6	2.1E+6	1.3E+6	2.2E+6	6.9E+6	-
NCVXQP3.rsa	2.6E+7	4.3E+7	-	2.4E+7	1.6E+7	-	-	-
NCVXQP5.rsa	1.4E+7	2.4E+7	2.7E+7	1.3E+7	1.1E+7	1.5E+7	-	-
NCVXQP7.rsa	3.9E+7	5.9E+7	7.7E+7	3.7E+7	1.9E+7	-	-	-
NCVXQP9.mat	3.8E+5	3.0E+5	4.9E+5	2.1E+5	1.4E+5	4.2E+5	3.7E+5	-
olesnik0.rsa	5.0E+6	5.6E+6	9.0E+6	4.5E+6	3.9E+6	8.1E+6	-	-
qa8fk.RSA	2.5E+7	2.6E+7	4.4E+7	2.5E+7	2.3E+7	2.7E+7	8.1E+7	2.3E+7
SIT100.rsa	4.6E+5	5.6E+5	8.4E+5	4.4E+5	3.7E+5	5.7E+5	-	-
SPARSINE.rsa	-	-	-	-	-	-	-	-
SPMSRTLS.rsa	3.5E+5	2.7E+5	5.3E+5	2.5E+5	2.5E+5	8.2E+5	2.6E+5	1.3E+5
stokes128.mat	3.2E+6	4.3E+6	6.3E+6	3.2E+6	2.7E+6	4.4E+6	-	-
stokes64.mat	6.8E+5	9.0E+5	1.3E+6	6.7E+5	5.5E+5	7.4E+5	-	-
stokes64s.mat	6.8E+5	1.0E+6	1.3E+6	6.7E+5	5.5E+5	7.4E+5	-	-
tuma1.mat	7.3E+5	7.2E+5	1.1E+6	5.0E+5	4.2E+5	9.8E+5	-	-
tuma2.mat	3.2E+5	3.2E+5	5.2E+5	2.3E+5	1.9E+5	4.1E+5	-	-
TURON_M.rsa	1.5E+7	1.6E+7	2.8E+7	1.4E+7	1.3E+7	2.8E+7	-	-
vibrobox.RSA	2.3E+6	2.8E+6	4.3E+6	2.5E+6	2.3E+6	2.7E+6	4.2E+6	-

Table 3.2.4.8: Norm of scaled residuals

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	1.2E-15	1.3E-15	4.0E-17	2.1E-16	1.6E-15	1.9E-16	3.2E-17	2.0E-17	3.4E-16
A2NNSNSL.rsa	8.2E-14	1.9E-15	1.4E-16	4.0E-17	1.3E-15	1.7E-16	4.6E-16	5.7E-18	-
A5ESINDL.rsa	1.5E-14	2.3E-15	7.0E-17	4.9E-16	6.8E-15	5.1E-16	-	1.4E-17	4.3E-16
AUG2D.mat	-	0.0E+0	-	-	0.0E+0	1.9E-21	-	0.0E+0	-
AUG2DC.mat	-	0.0E+0	-	-	0.0E+0	5.6E-17	-	0.0E+0	-

Table 3.2.4.8: Norm of scaled residuals (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
AUG3D.mat	-	0.0E+0	-	-	-	2.7E-22	-	0.0E+0	-
AUG3DCQP.mat	-	1.2E-16	1.5E-18	9.1E-19	7.3E-17	9.7E-21	-	1.8E-6	1.1E-18
bcsstk35.RSA	4.5E-19	1.3E-16	2.9E-20	1.2E-20	3.4E-16	4.0E-20	1.3E-20	6.3E-21	1.1E-20
bcsstk37.RSA	1.6E-16	1.7E-16	3.1E-21	2.6E-21	2.4E-16	5.8E-21	8.5E-21	4.6E-21	1.2E-20
bcsstk39.RSA	3.0E-19	6.3E-16	6.6E-20	8.4E-20	1.0E-15	2.9E-19	1.8E-19	1.2E-19	1.0E-19
BLOCKQP1.rsa	8.4E-7	2.2E-12	7.9E-13	1.5E-13	9.2E-14	3.6E-16	-	2.2E-14	7.7E-13
BLOWEYA.rsa	5.4E-14	8.8E-15	9.2E-14	4.2E-14	3.9E-14	2.6E-14	6.7E-14	3.6E-15	-
bmw3_2.rsa	2.2E-20	2.4E-16	5.7E-23	4.2E-23	1.4E-15	3.4E-22	1.8E-22	1.0E-22	3.0E-22
BOYD1.RSA	3.1E-16	2.2E-9	1.9E-16	5.1E-16	5.2E-9	8.3E-15	-	2.0E-20	1.2E-15
BOYD2.RSA	8.7E-15	6.1E-7	4.8E-15	5.7E-15	4.7E-7	8.7E-15	-	6.7E-23	1.2E-14
BRAINPC2.rsa	2.7E-7	8.1E-13	2.5E-16	9.7E-10	5.9E-13	4.0E-18	1.1E-16	2.4E-17	-
BRATU3D.RSA	-	-	6.1E-2	-	-	1.1E-14	-	1.4E-2	-
c-55.RSA	9.6E-8	5.9E-11	7.8E-14	1.3E-13	8.3E-11	1.4E-13	4.7E-14	4.5E-19	7.5E-14
c-58.RSA	1.1E-6	2.1E-10	2.7E-12	8.6E-13	2.8E-10	2.6E-12	4.4E-14	3.8E-17	5.3E-12
c-59.RSA	2.0E-5	1.8E-9	3.7E-13	4.0E-13	7.5E-10	2.4E-12	2.1E-13	2.2E-17	2.5E-12
c-62.RSA	6.5E-7	6.7E-10	4.2E-13	6.1E-13	7.4E-10	1.1E-12	9.5E-14	5.4E-18	2.4E-12
c-63.RSA	8.5E-7	1.2E-10	2.7E-13	5.2E-13	3.2E-10	5.0E-13	4.1E-13	6.9E-18	5.1E-13
c-68.RSA	8.1E-12	6.2E-14	2.5E-17	2.8E-17	8.9E-14	5.0E-17	4.5E-18	3.6E-19	4.0E-17
c-69.RSA	1.8E-7	6.1E-11	3.5E-14	1.4E-14	1.0E-10	6.1E-14	2.0E-14	2.0E-19	2.2E-14
c-70.RSA	6.1E-9	3.7E-11	1.2E-14	4.2E-14	1.5E-11	6.0E-14	3.0E-14	3.3E-19	5.4E-14
c-71.RSA	7.4E-6	1.5E-10	2.6E-14	7.0E-14	2.7E-10	1.2E-13	9.0E-15	3.1E-18	1.1E-13
c-72.RSA	3.8E-9	5.6E-11	1.7E-14	4.4E-14	8.5E-11	1.4E-13	1.4E-14	1.3E-19	1.4E-14
CONT-201.RSA	-	-	-	-	-	2.2E-10	1.6E-3	-	-
CONT-300.RSA	-	-	-	-	-	1.5E-9	2.0E-3	-	-
copter2.rsa	7.4E-8	1.2E-11	8.8E-11	8.0E-10	2.5E-11	1.8E-12	1.3E-12	1.4E-16	3.0E-10
crystk02.RSA	3.2E-9	1.9E-16	6.6E-11	6.6E-11	4.2E-16	1.2E-8	1.1E-10	8.1E-11	1.2E-10
crystk03.RSA	6.2E-8	1.7E-16	7.9E-11	1.5E-10	3.0E-16	1.6E-10	1.8E-10	8.6E-11	2.2E-10
DARCY003.rsa	1.5E-15	1.7E-14	7.3E-16	1.4E-15	8.1E-14	7.4E-12	1.4E-15	-	-
dawson5.rsa	1.4E-7	1.2E-10	1.9E-12	2.5E-11	7.1E-12	1.1E-12	5.4E-13	1.8E-16	4.1E-11
DIXMAANL.rsa	1.4E-12	1.5E-12	6.0E-15	1.2E-14	1.6E-13	1.4E-14	1.5E-14	4.3E-17	2.3E-14
DTOC.mat	-	5.2E-20	-	-	9.8E-13	4.0E-13	-	2.3E-17	-
D_PRETOK.rsa	2.8E-13	1.4E-15	5.6E-17	3.1E-17	5.0E-15	5.6E-18	9.3E-17	-	-
HELM2D03.rsa	2.7E-9	1.0E-11	1.9E-12	2.7E-12	7.2E-11	1.7E-11	7.0E-13	1.5E-16	4.0E-12
HELM3D01.rsa	2.1E-9	9.9E-12	2.4E-11	7.3E-11	4.8E-12	4.7E-12	1.0E-12	4.0E-16	1.1E-10
K1_SAN.rsa	-	7.0E-16	-	-	5.5E-15	1.8E-13	8.7E-18	-	-
LINVERSE.rsa	1.1E-13	1.5E-14	1.6E-15	2.2E-15	2.1E-14	4.7E-16	4.1E-16	5.7E-17	3.7E-16

Table 3.2.4.8: Norm of scaled residuals (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
mario001.rsa	6.4E-16	5.9E-15	4.1E-16	3.8E-16	1.8E-14	2.2E-14	6.7E-16	-	-
mario002.rsa	1.5E-15	1.7E-14	7.3E-16	1.4E-15	8.1E-14	7.4E-12	1.4E-15	-	-
NCVXBQP1.rsa	1.3E-11	6.9E-12	1.7E-13	4.7E-14	2.4E-12	1.2E-15	4.2E-14	1.0E-18	8.8E-15
NCVXQP1.mat	2.8E-9	2.9E-14	4.4E-13	1.2E-13	2.8E-14	3.1E-20	7.7E-18	9.0E-12	-
NCVXQP3.rsa	2.5E-8	2.6E-8	2.0E-8	6.8E-6	1.4E-3	5.4E-15	-	-	-
NCVXQP5.rsa	1.9E-8	2.5E-9	5.9E-11	3.1E-10	9.0E-8	3.3E-16	7.2E-12	-	-
NCVXQP7.rsa	8.2E-9	7.6E-7	8.5E-6	2.4E-7	3.4E-5	2.2E-18	-	-	-
NCVXQP9.mat	3.9E-18	9.9E-12	2.0E-17	6.1E-18	7.9E-16	4.3E-19	9.2E-19	6.0E-26	-
olesnik0.rsa	1.8E-16	5.8E-16	1.5E-17	4.6E-17	1.6E-15	9.2E-18	8.9E-17	-	-
qa8fk.RSA	1.4E-14	1.5E-15	9.2E-15	6.9E-15	7.5E-16	4.0E-10	1.9E-14	8.0E-15	2.2E-14
SIT100.rsa	1.2E-16	3.7E-15	1.3E-17	5.7E-6	5.0E-15	2.7E-9	7.1E-17	-	-
SPARSINE.rsa	-	-	-	-	-	-	-	-	-
SPMSRTLS.rsa	7.2E-11	3.0E-12	3.8E-13	1.5E-13	6.8E-13	1.4E-13	2.0E-15	1.6E-16	2.6E-13
stokes128.mat	4.4E-14	1.0E-14	1.1E-12	1.6E-14	1.0E-13	5.4E-14	3.3E-14	-	-
stokes64.mat	1.4E-14	5.6E-15	6.6E-14	5.7E-15	1.8E-14	1.5E-14	1.4E-14	-	-
stokes64s.mat	1.2E-13	3.9E-15	5.8E-14	8.3E-15	1.2E-14	3.2E-14	2.6E-14	-	-
tuma1.mat	2.2E-14	5.1E-14	2.4E-15	6.5E-15	1.2E-14	1.1E-16	3.1E-15	-	-
tuma2.mat	1.9E-14	3.9E-14	3.8E-15	6.5E-15	4.4E-15	1.1E-16	2.2E-15	-	-
TURON_M.rsa	1.5E-14	2.2E-13	1.1E-16	2.1E-16	1.8E-15	3.0E-17	2.6E-15	-	-
vibrobox.RSA	6.4E-22	1.6E-16	4.5E-22	3.7E-22	6.4E-16	6.8E-22	1.3E-21	4.6E-22	-

Table 3.2.4.9: Norm of scaled residuals following a single refinement

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
A0NSDSIL.rsa	1.7E-17	4.4E-17	1.8E-18	1.3E-18	9.9E-17	2.5E-17	3.4E-18	3.8E-18	1.7E-17
A2NNSNSL.rsa	3.0E-17	4.0E-17	4.4E-18	2.2E-18	7.4E-17	9.2E-18	6.7E-18	4.8E-18	-
A5ESINDL.rsa	4.3E-18	7.2E-17	5.7E-18	2.8E-18	7.0E-17	7.7E-18	-	2.1E-18	9.4E-18
AUG2D.mat	-	0.0E+0	-	-	0.0E+0	1.3E-24	-	0.0E+0	-
AUG2DC.mat	-	0.0E+0	-	-	0.0E+0	5.6E-17	-	0.0E+0	-
AUG3D.mat	-	0.0E+0	-	-	-	2.8E-24	-	0.0E+0	-
AUG3DCQP.mat	-	5.9E-17	7.7E-19	4.7E-19	8.3E-17	7.2E-21	-	1.8E-6	9.9E-19
bcsstk35.RSA	4.1E-20	1.8E-16	1.8E-20	1.7E-20	2.1E-16	1.2E-20	1.9E-20	2.6E-20	1.7E-20
bcsstk37.RSA	1.3E-19	1.3E-16	2.0E-21	2.4E-21	1.9E-16	4.7E-21	5.3E-21	8.1E-21	5.1E-21
bcsstk39.RSA	1.1E-19	3.2E-16	5.1E-20	5.2E-20	3.9E-16	1.1E-19	9.7E-20	8.1E-20	1.1E-19
BLOCKQP1.rsa	1.7E-9	1.9E-14	1.3E-14	1.2E-14	2.3E-14	3.6E-16	-	1.9E-14	4.7E-15

Table 3.2.4.9: Norm of scaled residuals following a single refinement (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
BLOWEYA.rsa	1.4E-13	4.7E-15	7.5E-14	3.0E-14	5.6E-15	5.6E-15	4.8E-14	3.1E-15	-
bmw3_2.rsa	2.1E-22	3.3E-16	9.4E-23	3.7E-23	1.4E-16	5.1E-23	9.6E-23	8.6E-23	1.8E-22
BOYD1.RSA	2.5E-21	4.7E-14	2.1E-21	1.4E-21	7.8E-15	2.5E-20	-	2.1E-20	2.1E-21
BOYD2.RSA	2.9E-23	1.8E-15	3.3E-23	2.4E-23	2.6E-15	4.9E-23	-	4.3E-23	1.7E-22
BRAINPC2.rsa	9.2E-11	2.3E-15	4.7E-18	6.1E-15	2.3E-14	1.5E-17	6.3E-18	1.7E-17	-
BRATU3D.RSA	-	-	1.8E-5	-	-	1.3E-16	-	4.1E-8	-
c-55.RSA	6.7E-9	9.7E-18	8.2E-19	8.2E-19	7.1E-16	1.7E-18	1.5E-18	3.1E-20	1.6E-18
c-58.RSA	3.5E-7	1.1E-15	1.2E-17	9.8E-18	2.2E-15	2.0E-17	2.6E-17	3.0E-17	2.4E-17
c-59.RSA	6.9E-6	5.9E-15	8.8E-18	8.3E-18	9.2E-15	1.8E-17	2.1E-17	2.4E-17	1.6E-17
c-62.RSA	1.2E-6	2.8E-15	2.8E-18	3.3E-18	1.6E-15	1.3E-17	5.8E-18	1.9E-19	5.5E-18
c-63.RSA	6.6E-7	5.3E-17	2.9E-20	1.4E-18	3.8E-15	3.5E-18	7.5E-18	2.9E-18	1.9E-18
c-68.RSA	1.1E-13	3.9E-17	4.3E-21	4.3E-21	2.1E-16	4.3E-20	1.0E-20	4.5E-23	8.6E-21
c-69.RSA	1.6E-7	9.1E-17	4.2E-20	3.4E-20	4.6E-17	8.9E-20	5.0E-19	4.0E-19	2.9E-19
c-70.RSA	7.8E-9	3.3E-18	3.5E-19	3.6E-19	3.0E-16	7.2E-19	7.0E-19	3.7E-20	7.1E-19
c-71.RSA	1.4E-5	5.1E-16	6.2E-19	2.7E-19	6.3E-15	7.4E-19	4.9E-18	5.7E-18	1.0E-18
c-72.RSA	2.2E-9	1.1E-16	1.0E-18	2.1E-19	3.4E-16	1.7E-18	1.3E-19	4.7E-20	2.2E-18
CONT-201.RSA	-	-	-	-	-	3.1E-13	9.0E-7	-	-
CONT-300.RSA	-	-	-	-	-	3.1E-9	9.7E-7	-	-
copter2.rsa	9.2E-16	1.1E-16	1.1E-16	1.1E-16	1.7E-16	1.5E-16	1.6E-16	1.7E-16	1.4E-16
crystk02.RSA	2.7E-10	1.2E-16	3.6E-11	4.7E-11	1.3E-16	5.2E-9	7.3E-11	8.4E-11	6.8E-11
crystk03.RSA	3.1E-8	1.3E-16	5.3E-11	6.0E-11	1.4E-16	9.2E-11	9.9E-11	7.9E-11	8.8E-11
DARCY003.rsa	9.0E-18	1.3E-16	6.4E-18	7.0E-18	1.9E-16	1.0E-17	1.3E-17	-	-
dawson5.rsa	3.8E-14	2.1E-16	1.2E-16	1.2E-16	1.6E-16	1.7E-16	2.5E-16	1.5E-16	2.1E-16
DIXMAANL.rsa	4.4E-17	2.5E-16	2.7E-17	2.6E-17	1.7E-16	4.0E-17	4.7E-17	3.9E-17	4.3E-17
DTOC.mat	-	1.2E-20	-	-	1.9E-13	8.6E-13	-	5.4E-17	-
D_PRETOK.rsa	1.7E-18	7.7E-17	2.5E-18	2.8E-18	1.0E-16	3.8E-18	8.2E-18	-	-
HELM2D03.rsa	1.8E-16	1.8E-16	9.9E-17	8.3E-17	1.8E-16	1.5E-16	1.8E-16	1.5E-16	1.7E-16
HELM3D01.rsa	4.0E-16	2.7E-16	4.1E-16	4.3E-16	2.1E-16	3.6E-16	3.0E-16	3.6E-16	4.9E-16
K1_SAN.rsa	-	4.5E-17	-	-	7.9E-17	6.6E-19	7.9E-19	-	-
LINVERSE.rsa	5.3E-17	1.9E-16	2.9E-17	3.0E-17	1.9E-16	4.0E-17	6.4E-17	4.9E-17	5.2E-17
mario001.rsa	2.1E-17	9.8E-17	1.2E-17	1.2E-17	1.4E-16	2.0E-17	2.7E-17	-	-
mario002.rsa	9.0E-18	1.3E-16	6.4E-18	7.0E-18	1.9E-16	1.0E-17	1.3E-17	-	-
NCVXBQP1.rsa	4.5E-17	1.9E-16	1.5E-18	1.4E-18	2.1E-16	9.8E-19	2.6E-18	1.1E-18	2.9E-18
NCVXQP1.mat	1.8E-11	2.2E-13	1.0E-12	1.2E-15	9.9E-17	3.7E-23	7.6E-20	9.0E-12	-
NCVXQP3.rsa	7.4E-11	4.0E-8	5.8E-8	1.2E-5	2.0E-10	1.1E-14	-	-	-
NCVXQP5.rsa	7.1E-14	3.9E-16	4.4E-17	2.7E-17	8.7E-15	9.5E-19	1.8E-18	-	-

Table 3.2.4.9: Norm of scaled residuals following a single refinement (continued)

Name	BCSEXT	MA57	MUMPS	MUMPS_US	Oblio	PARDISO	SPOOLES	UMFPACK	WSMP
NCVXQP7.rsa	2.4E-18	4.7E-7	3.2E-6	2.0E-13	3.7E-14	8.8E-19	-	-	-
NCVXQP9.mat	6.0E-26	8.9E-16	5.6E-26	1.9E-19	2.5E-24	2.4E-19	7.0E-26	6.0E-26	-
olesnik0.rsa	2.6E-19	3.7E-17	1.1E-18	4.6E-18	1.7E-16	3.1E-18	4.2E-18	-	-
qa8fk.RSA	1.1E-14	4.7E-16	4.0E-15	1.3E-14	6.5E-17	1.9E-10	5.5E-15	3.7E-15	2.0E-14
SIT100.rsa	2.7E-19	1.3E-16	1.8E-18	6.4E-8	3.9E-16	6.3E-7	1.7E-17	-	-
SPARSINE.rsa	-	-	-	-	-	-	-	-	-
SPMSRTLS.rsa	1.2E-16	1.3E-16	8.4E-17	9.7E-17	1.7E-16	1.2E-16	1.3E-16	1.2E-16	1.1E-16
stokes128.mat	3.2E-14	1.1E-14	5.6E-13	3.7E-14	2.2E-14	5.7E-14	3.0E-14	-	-
stokes64.mat	1.5E-14	5.1E-15	5.8E-14	2.2E-15	1.3E-14	1.4E-14	3.8E-15	-	-
stokes64s.mat	1.2E-13	3.8E-15	3.9E-14	2.9E-15	9.9E-15	2.8E-14	1.4E-14	-	-
tuma1.mat	4.8E-18	1.2E-16	2.3E-18	2.1E-18	1.4E-16	4.5E-18	4.8E-18	-	-
tuma2.mat	5.1E-18	1.0E-16	2.3E-18	2.5E-18	1.4E-16	4.8E-18	5.6E-18	-	-
TURON_M.rsa	4.7E-18	2.6E-15	9.9E-18	2.5E-17	7.8E-17	1.9E-17	7.2E-17	-	-
vibrobox.RSA	1.2E-22	3.7E-17	4.5E-23	1.7E-22	2.3E-16	8.2E-23	3.3E-22	4.5E-22	-

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