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# Nonlinearly-Constrained Optimization Using Asynchronous Parallel Generating Set Search

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#### Abstract

Many optimization problems in computational science and engineering (CS&E) are characterized by expensive objective and/or constraint function evaluations paired with a lack of derivative information. Direct search methods such as generating set search (GSS) are well understood and efficient for derivative-free optimization of unconstrained and linearly-constrained problems. This paper addresses the more difficult problem of general nonlinear programming where derivatives for objective or constraint functions are unavailable, which is the case for many CS&E applications. We focus on penalty methods that use GSS to solve the linearly-constrained problems, comparing different penalty functions. A classical choice for penalizing constraint violations is  $\ell_2^2$ , the squared  $\ell_2$  norm, which has advantages for derivative-based optimization methods. In our numerical tests, however, we show that exact penalty functions based on the  $\ell_1, \ell_2$ , and  $\ell_\infty$  norms converge to good approximate solutions more quickly and thus are attractive alternatives. Unfortunately, exact penalty functions are discontinuous and consequently introduce theoretical problems that degrade the final solution accuracy, so we also consider smoothed variants. Smoothed-exact penalty functions are theoretically attractive because they retain the differentiability of the original problem. Numerically, they are a compromise between exact and  $\ell_2^2$ , i.e., they converge to a good solution somewhat quickly without sacrificing much solution accuracy. Moreover, the smoothing is parameterized and can potentially be adjusted to balance the two considerations. Since many CS&E optimization problems are characterized by expensive function evaluations, reducing the number of function evaluations is paramount, and the results of this paper show that exact and smoothed-exact penalty functions are well-suited to this task.

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#### 1 Introduction

In computational science and engineering (CS&E), optimization problems do not always match the textbook. As a motivating application, consider the typical problem of parameter tuning on partial differential equations (PDEs) simulation, where the goal is optimize the fit to experimental data or some design objective. Due to the complexity of the simulations, which involve meshers, iterative nonlinear and linear solvers, and so on, gradients may not be readily available even though the underlying objective and constraint functions are theoretically smooth. In our experience, furthermore, many simulation codes are too complex to apply tools for automatic differentiation and too noisy to approximate the gradients. Consequently, we need to use derivative-free optimization techniques [15].

In the choice of derivative-free techniques, we must consider three further real-life CS&E challenges. First, problems that are based on large-scale simulations can require significant computation time on the order of minutes, hours, and even days. To make the solution time practical, therefore, we need to do multiple evaluations in parallel and do as few evaluations overall as possible. Second, the simulation time can vary from evaluation to evaluation. For example, suppose a black-boxed objective function is wrapped around a large-scale PDE simulation. These simulations typically require many linear solves, and the speed of these depend on how effective the preconditioner is, which can vary for different parameters. Third, real-world CS&E problems tend to be based on simulations that fail from time to time for unexplained reasons. Consequently, a practical solver must be robust to bad evaluations.

Generating set search (GSS) [15] has proven to be a useful tool for these sorts of CS&E problems in the unconstrained and linearly-constrained cases. These methods are easily parallelized, meaning that multiple function evaluations can be performed simultaneously. Moreover, the evaluations in GSS can be done asynchronously, which is sometimes the only practical option for problems of this sort, and has been shown to decrease overall solve time in several case studies [11, 14, 10]. Though asynchronous methods are not a primary focus of this study, we mention this because it serves to motivate our choice for the subproblem solver. Finally, GSS is robust in the presence of missing evaluations [14, 9, 10]. GSS is a family of methods that includes generalized pattern search [33, 17, 18, 2, 15].

The goal of this paper is to extend GSS methods to general nonlinear programming. In this realm, only a few options exist in theory or practice. Lewis and Torczon proposed an augmented Lagrangian method based on pattern search [19] and later based on GSS [16]. It works well but is expensive in terms of the number of function evaluations. Augmented Lagrangian methods have many parameters to tune, so it remains to be seen if there is ideal combination that is competitive with the methods we discuss here. Audet and Dennis have proposed a filter-like method for handling constraints in the context of pattern search [3] as well as a method that samples every possible point in the limit and therefore is theoretically guaranteed to converge to a KKT point [1]. The filter-like method has some similarities to the approach described here in that there is generally some mechanism for penalizing the constraints. Perhaps the most promising approach we have encountered in the literature is that of Liuzzi and Lucidi [20] who use a smooth approximation to the  $\ell_{\infty}$  norm (see (11)) in a penalty-based approach that solves a sequence of linearly constrained subproblems using GSS. We provide numerical experiments comparing this and other smoothing approximation to alternate norms in §4.

This paper focuses on penalty methods and is akin to approaches used in [19, 16, 20] in that a sequence of merit-function-based, linearly-constrained subproblems is solved. To give a more precise description, we establish the following notation. The nonlinear programming problem is

$$\min_{\substack{x \in \mathbb{R}^n \\ x \in \mathbb{R}^n}} f(x),$$
subject to  $c_{\mathcal{E}}(x) = 0,$  (1)  
 $c_{\mathcal{I}}(x) \le 0,$   
 $l \le Ax \le u.$ 

Here,  $f : \mathbb{R}^n \to \mathbb{R}$  is the objective function,  $c : \mathbb{R}^n \to \mathbb{R}^m$  combines the  $m_e$  equality and  $m_i$ inequality nonlinear constraints with  $\mathcal{I} \cup \mathcal{E} = \{1, \ldots, m = m_e + m_i\}$ . The matrix  $A \in \mathbb{R}^{p \times n}$ contains all linear constraints and we require only that  $l \leq u$  (permitting equality constraints). Penalty methods transform constrained optimization problems into a sequence of unconstrained (or linearly constrained) subproblems, whose solutions converge to a solution of the original optimization problem. Consequently, (1) is reduced to a sequence of linearly constrained problems of the following form:

$$\min_{\substack{x \in \mathbb{R}^n \\ \text{subject to}}} f(x) + \mathcal{P}(x, \rho_k),$$
(2)

The penalty function  $\mathcal{P}: \mathbb{R}^n \to \mathbb{R}$  enforces feasibility in the limit, i.e.,

$$\lim_{\rho \to \infty} \mathcal{P}(x, \rho) = \begin{cases} +\infty & \text{if any nonlinear constraint is violated,} \\ 0 & \text{otherwise.} \end{cases}$$

The parameter  $\rho_k$  is referred to as the penalty parameter and determines the severity of the penalty. See, e.g., Luenberger [22] and Fiacco and McCormick [6] for general discussions on penalty methods.

The goal of this paper is to investigate the suitability of different penalty functions in the context of derivative-free optimization. Before we continue, it is important to understand that for optimization in a CS&E context, there is a hierarchy of goals, and the computation of an exact Karush-Kuhn-Tucker (KKT) point is not first on the list. Generally, the goal in optimization for CS&E is *improvement* in the objective function and achieving feasibility with respect to the nonlinear constraints. Ideally, we want to find a KKT point; in practice, however, we must balance finding an accurate solution with getting a timely solution. So, preference goes to methods that find a good solution in a O(1000) evaluations rather than a perfect solution in O(10,000) evaluations. Methods that "waste" evaluations over-solving a subproblem are not ideal. Ultimately, feasibility is paramount because an infeasible approximate solution, even with a very low objective value, is generally useless to the application. Thus, our primary goal, given a budget of evaluations, is that on exit we provide an approximate solution satisfying the user specified constraint violation tolerance. It is with these criteria in mind that we proceed to discuss alternative penalty functions.

To simplify descriptions of the penalty functions, we use the standard transformation to all nonlinear equality constraints by defining  $c^+ : \mathbb{R}^n \to \mathbb{R}^m$  as

$$c_i^+(x) = \begin{cases} c_i(x) & \text{if } i \in \mathcal{E}, \\ \max\{0, c_i(x)\} & \text{if } i \in \mathcal{I}. \end{cases}$$

Perhaps the most common penalty function is based on the squared  $\ell_2$  norm:

$$\mathcal{P}_{\ell_2^2}(x,\rho) = \rho \|c^+(x)\|_2^2.$$
(3)

The  $\ell_2^2$  penalty function has the advantage of being smooth and having "simple" derivatives. For instance, if only equality constraints are present, then

$$\frac{\partial \mathcal{P}_{\ell_2^2}(x,\rho)}{\partial x} = J(x)^T \lambda(x),$$

where J(x) denotes the Jacobian of c(x) and  $\lambda(x) = 2c(x)$ . Thus, in derivative-based approaches, one may exploit the simple linear relationship between the Lagrange multipliers of (1) and c(x) [24]. More complex penalty functions mean that the relationship between c(x) and the corresponding  $\lambda(x)$  would necessarily by nonlinear because the derivatives are no longer "simple".

Our subproblem solver, GSS, theoretically requires the existence of derivatives for the convergence theory to apply; however, the specific structure of the derivatives is irrelevant because they are not used explicitly. Still, smoothness is important because non-smooth penalty functions have been shown to cause GSS to converge to a non-differentiable point rather than a KKT point; see, e.g., [15]. Consequently, the "simplicity" of the derivatives for the  $\ell_2^2$  penalty function is not important, but its smoothness is.

Unfortunately, a major drawback to the  $\ell_2^2$  penalty function is the uneven way that it penalizes constraints. It places extreme emphasis on constraint violations larger than one and little emphasis on violations less than one. This means that  $\rho_k$  has to be very large to enforce asymptotic feasibility. But larger values of  $\rho_k$  force GSS to tick-tack down steep constraint valleys using very small steps. Consequently, our experiences with the  $\ell_2^2$  penalty function and the closely-related augmented Lagrangian merit function,

$$f(x) + \lambda^T c^+(x) + \rho \|c^+(x)\|_2^2$$

have not been satisfactory because both require a large number of function evaluations.

Motivated by these problems with the  $\ell_2^2$  penalty function, this paper considers the benefits and disadvantages of alternative penalty functions in the context of CS&E optimization problems where the goal is to get a good approximate solution in a small number of evaluations. Exact penalty functions are attractive because there exists a finite penalty parameter  $\rho$  such that a minimizer of (2) coincides with the minimizer of (1). In this paper we consider exact penalty functions based on the  $\ell_1$ ,  $\ell_2$ , and  $\ell_{\infty}$  norms. A difficulty with exact penalty functions is their inherit non-smoothness. However, since we are using GSS to solve the subproblem (2), gradients are not explicitly required. The primary drawback in our context is that the subproblem solver may not converge to a constrained stationary point of (2); instead, it may converge to a point of non-differentiability. Nonetheless, our computational experiments on a collection of CUTEr nonlinearly constrained test problems indicate that using exact penalty functions has several advantages. Overall, the number of function evaluations or less versus 63% for  $\ell_2^2$ . The quality of the final objective function did degrade somewhat, but approximately 84% of the problems were no more than 10% worse than the  $\ell_2^2$  final value (and some were better).

In order to "fix" the non-smoothness of exact penalty functions, many authors have proposed smoothed variants. We tested smoothed-exact penalty functions based on the  $\ell_1$ ,  $\ell_2$ , and  $\ell_{\infty}$  norms. Because these functions are smooth, the GSS subproblem solver is guaranteed to converge to a local optimum for (2). In our computational experiments, the number of function evaluations was still reduced (compared to  $\ell_2^2$ ); approximately 73% of the problems successfully terminated in 1000 function evaluations or less. The quality of the final objective function improved as compared to the exact penalty functions; approximately 96% of the problems were less than 10% worse than the  $\ell_2^2$ final value.

The outline of the paper is as follows. In §2, the general penalty method for solving (1) as a sequence of linearly-constrained subproblems is described as well as the testing environment. In §3, exact penalty functions based on the  $\ell_1$ ,  $\ell_2$ , and  $\ell_{\infty}$  norms are compared to the  $\ell_2^2$  penalty function. Smoothed variants of these exact penalty functions are examined in §4. Theoretical underpinnings of the various approaches are discussed in §5, including pointers to some open problems. Finally, §6 looks at related work on other penalty functions, and §7 summarizes our findings. Detailed numerical results can be found in Appendix A.

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### 2 Algorithmic framework

The basic framework in Algorithm 1 is the same for all penalty functions. At each iteration, we solve a linearly-constrained subproblem of the form in (2). The iterations to solve the subproblem are referred to as "minor iterations", while the iterations of Algorithm 1 are referred to "major iterations". Not all subproblems are solved to the same accuracy; instead, the accuracy is increased as the major iterations progress. Additionally, the penalty parameter is increased as the major iterations progress. The method continues until either the constraint violation is reduced to the desired level and the subproblem is solved to the desired accuracy, or the budget of function evaluations is exhausted.

Algorithm 1 Generic penalty method	
Require: $\mathcal{P}(\cdot, \cdot, \cdot)$	▷ Choose penalty function
<b>Require:</b> $x_0$ satisfying $l \leq Ax_0 \leq u$	$\triangleright$ Initial starting point
<b>Require:</b> $S_{\max} > 0$	▷ Max evaluations per subproblem
<b>Require:</b> $T_{\max} \gg S_{\max}$	$\triangleright$ Max evaluations overall
<b>Require:</b> $\rho_{\max} \gg 1$	▷ Maximum allowable penalty parameter
<b>Require:</b> $0 < \rho_0 < \rho_{\max}$	▷ Initial value for penalty parameter
<b>Require:</b> $\alpha_0 > 0$ ( $\alpha_0 = 0$ if not smoothed)	$\triangleright$ Initial value for smoothing parameter
<b>Require:</b> $0 < \alpha_{\min} < \alpha_0$	$\triangleright$ Minimum value for the smoothing parameter
Require: $\delta^* > 0$	$\triangleright$ Final subproblem stopping tolerance
<b>Require:</b> $0 < \delta_{\min} < \delta^*$	▷ Minimum subproblem stopping tolerance
<b>Require:</b> $\delta_0 > \delta^*$	▷ Initial subproblem stopping tolerance
<b>Require:</b> $\eta^* > 0$	$\triangleright$ Final constraint tolerance
1: $k \leftarrow 0$ 2: $T \leftarrow 0$ 3: while not converged do	
4: $(x_{k+1}, S, \mathtt{state}) \leftarrow \operatorname{APGSS}(x_k, \mathcal{P}(\cdot, \rho_k, \alpha_k),$	$\delta_k, S_{\max}$ > Solve subproblem
5: <b>if</b> $\delta_k < \delta^*$ , <b>state</b> is successful, and $\eta(x_{k+1})$	$0 < n^{\star}$ then
6: <b>exit</b> (successfully)	
7: end if	
8: $T \leftarrow T + S$	▷ Update total number of evaluations
9: if $T > T_{\text{max}}$ then	· · · · · · · · · · · · · · · · · · ·
10: <b>exit</b> (unsuccessfully)	
11: end if	
12: <b>if</b> $\eta(x_{k+1}) > \max\{\eta^*, \frac{m}{5}\alpha_k\}$ <b>then</b>	
13: $\rho_{k+1} \leftarrow \min\{2\rho_k, \rho_{\max}\}$	$\triangleright$ Increase penalty parameter
14: end if	
15: $\alpha_{k+1} \leftarrow \max\{\alpha_k/2, \alpha_{\min}\}$	$\triangleright$ Reduce smoothing parameter
16: $\delta_{k+1} \leftarrow \max\{\delta_k/2, \delta_{\min}\}$	▷ Reduce subproblem stopping tolerance
17: $k \leftarrow k + 1$ 18: end while	

The penalty function in Algorithm 1 takes three parameters:  $\mathcal{P}(x, \rho, \alpha)$ . The parameter  $\rho$  controls the constraint penalization, as in (3). The new additional parameter  $\alpha$  controls the degree of

smoothing for the smoothed exact penalty functions discussed in §4. It can be safely ignored for penalty functions that do not require it by initializing  $\alpha_0 = 0$ .

At each major iteration, a linearly-constrained subproblem of the form in (2) is solved using asynchronous, parallel GSS (APGSS) for linearly-constrained problems as described in [10]. As inputs, it takes the solution of the last subproblem  $(x_k)$ , the penalty-based objective function with  $\rho = \rho_k$  and  $\alpha = \alpha_k$ , the stopping tolerance  $(\delta_k)$ , and the maximum number of function evaluations allocated for the subproblem  $(S_{\text{max}})$ . The subproblem does a series of minor iterations until it converges or exhausts the function evaluations. It returns the best point found,  $x_{k+1}$ ; the number of function evaluations used, S; and a flag indicating whether or not the subproblem solver exited successfully, state.

An important factor is reducing the overall constraint violation, which is measured in terms of the maximum violation given by

$$\eta(x) = \max\{ |c_i^+(x)|, \ i = 1, \dots, m\}.$$
(4)

Consequently,  $\eta(x)$  plays a role in the convergence of the algorithm. Algorithm 1 is considered to have exited successfully if the following three criteria are satisfied:

- 1. The subproblem stopping tolerance is less than the desired final tolerance  $\delta^*$ . Note that  $\delta_k$  is allowed to drop below  $\delta^*$  but not below  $\delta_{\min}$ .
- 2. The subproblem is solved successfully, meaning that APGSS successfully exited with a step length tolerance of  $\delta_k \leq \delta^*$ .
- 3. The penalty parameter is large enough so that the maximum constraint violation,  $\eta(x_{k+1})$ , is less than the specified threshold,  $\eta^*$ .

Note also that the penalty parameter  $\rho$  is not increased if  $\eta(x_{k+1})$  is sufficiently small. Though there are many options for controlling the reduction and growth rates of the penalty parameter, smoothing parameter, and stopping tolerance, we opted for a simple scheme because our primary goal at this point is to directly compare different penalty functions and not the fine tuning of a particular approach.

Detailed results and algorithmic settings are provided in Appendix A, and summary results comparing the number of function evaluations and final objective values are discussed in the sections that follow. The test set comprised all CUTEr [8] problems with up to ten variables and between one and ten nonlinear constraints, for a total of 145 problems. A run for a given test problem and penalty function either terminates successfully (meaning, at a minimum, that  $\eta(x^*) < \eta^*$ ) or unsuccessfully (e.g., because the number of function evaluations was exhausted). The number of problems in the union of all successful terminations is 128, so we use this in computing percentages of problems solved within a given number of function evaluations. Conversely, the number of problems in the intersection is 98, and we restrict ourselves to these when comparing the relative accuracies. Note that since the subproblems are solved using the *asynchronous* method APGSS, we tested each penalty function multiple times and averaged the results. A penalty function is only reported to have exited successfully if it did so on *every* run. Also, in comparing the number of function evaluations, note that APGSS caches the objective and constraint function values for re-use in future minor and even major iterations, which means the same point will never be evaluated twice in the same run. Efficient re-use of previously evaluated points is critical for CS&E applications where evaluations are expensive.

#### Exact penalty functions 3

Exact penalty methods are attractive because there exists a finite value of the penalty parameter  $\rho$ such that that a minimizer (2) coincides with a solution to (1); see, e.g., [22]. On the other hand, a drawback for exact penalty functions based on primal variables (as opposed to dual variables) is that they are necessarily non-smooth at an optimal point [24]. For an in depth analysis of the optimization of exact penalty functions, see Pillo and Grippo [26] and Pillo [25]. There are several definitions for exact penalty functions in the literature. To avoid ambiguity, we use the following definition from [26]:

**Definition 3.1** The function  $\mathcal{P}(x,\rho)$  is an exact penalty function for (1) with respect to a set  $\Omega$  if there exists an  $\bar{\rho} > 0$  such that for all  $\rho > \bar{\rho}$ , a global (local) unconstrained minimizer of

$$\min_{x \in \Omega^{\circ}} f(x) + \mathcal{P}(x, \rho)$$

is a global (local) minimizer for (1).

Pillo and Grippo [26] further show that if the extended Mangasarian-Fromovitz constraint qual*ification* is satisfied on  $\Omega$ , then

$$\mathcal{P}(x,\rho) = \rho \|c^+(x)\|_q$$

is exact with respect to  $\Omega$  for  $1 \leq q \leq \infty$ . In this paper we explore properties of the following exact penalty functions:

$$\mathcal{P}_{\ell_1}(x,\rho) = \rho \|c^+(x)\|_1,\tag{5}$$

$$\mathcal{P}_{\ell_2}(x,\rho) = \rho \|c^+(x)\|_2, \tag{6}$$
  
$$\mathcal{P}_{\ell_2}(x,\rho) = \rho \|c^+(x)\|_2 \tag{6}$$

$$\mathcal{P}_{\ell_{\infty}}(x,\rho) = \rho \|c^+(x)\|_{\infty}.$$
(7)

Figure 1 shows two-dimensional contour plots for the  $\ell_1$ ,  $\ell_2$ ,  $\ell_\infty$  and  $\ell_2^2$  penalty functions, corresponding to two constraints. Dark blue indicates areas where the constraint violation penalty is very small. The bigger this area is, the larger the penalty parameter has to be in order to reduce the constraint violation. Note that this dark blue area is relatively large for  $\ell_2^2$  and much smaller for the three exact penalty functions. Conversely, the areas in red denote large penalties. Functions with more red restrict the possible steps that the algorithms can take to obtain decrease until the penalty parameter is very small. Once again, the  $\ell_2^2$  penalty function is the worst in this respect.

Overall the exact penalty functions are more attractive in that they allow larger steps for the GSS subproblem solver and do not require that the penalty parameter be increased exponentially to sufficiently reduce the constraint violation. For example, consider the  $\ell_1$  penalty function. Because it is linear in the constraint violation, it is possible to take relatively large steps yet decrease the objective value. Furthermore, being linear in the constraint violation means that the penalty parameter does not have to get asymptotically large to enforce constraint feasibility, once again enabling larger steps. Thus, exact penalty functions permit GSS methods take larger steps than would be permitted by  $\ell_2^2$ . The downside, as Audet and Dennis [3] demonstrate, is that GSS methods applied to exact penalty function can and do get stuck at points of non-differentiability.

The question is, how often does this happen in practice? Detailed numerical results for a collection of 145 CUTEr test problems are presented in Appendix A. Exact penalty functions were pitted against the  $\ell_2^2$  penalty function. Recall from §2, that the general framework emphasizes constraint satisfaction overall with  $\eta(x_{k+1}) < \eta^*$  being required, at a minimum, for a successful exit. In these tests,  $\eta^{\star} = 10^{-3}$ . Figure 2 presents summary results showing how many problems completed for a given number of function evaluations; Table 1 lists how many problems were solved in total. As mentioned previously, the number of function evaluations should be as small as possible. Here we

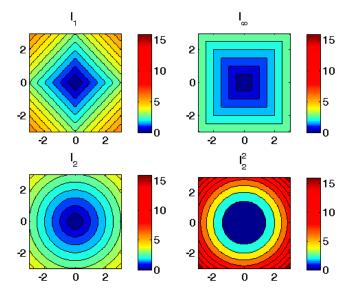


Figure 1. Contours of various penalty function for two constraints.

see that the exact penalty methods are able to exit successfully in 1000 function evaluations or less for approximately 80% of the test problems. In contrast,  $\ell_2^2$ , only solved 60% of the test problems within 1000 evaluations.

Penalty	Number	of function	n evaluations
Function	$\leq 1000$	$\leq 2500$	$\leq T_{\rm max}$
$\ell_{\infty}$	97	109	111
$\ell_1$	108	114	118
$\ell_2$	106	118	125
$\ell_2^2$	81	104	120

Table 1. Number of problems solved for each penalty function.

The number of function evaluations does not tell the entire story. Because of the constraint satisfaction requirement in the general framework, we are only comparing problems that have achieved sufficient feasibility, i.e.,  $\eta(x) < \eta^* = 10^{-3}$ . But there are no explicit requirements on the objective function value. Figure 3 shows the relative difference between the final objective function values for the 98 test problems that all methods were able to solve. The relative difference is calculated as

$$\frac{f(x) - f(y)}{\max\{1, |f(x)|, |f(y)|\}},\tag{8}$$

where x is the solution obtained using the  $\ell_2^2$  penalty function, and y is the solution obtained using the exact penalty function. Values greater than zero indicate that the exact method did better, whereas values less than zero indicate that the  $\ell_2^2$  method was better. Table 2 shows the percentage of problems that have the specified relative difference or better.

Observe that the exact penalty functions found better optima on a few problems. Moreover, the exact methods obtain an objective value that was no more than 10% worse than  $\ell_2^2$  on 84% of the test problems.

Thus, we may be able to achieve lower overall objective values with  $\ell_2^2$ , but at a higher cost in terms of the number of function evaluations. Though there is the danger of the subproblem

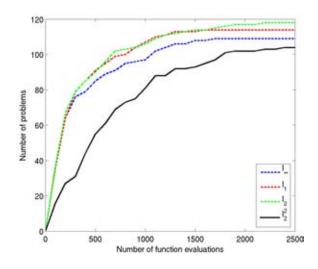


Figure 2. Number of problems that successfully exited for exact methods and  $\ell_2^2$ .

Penalty	Rel.	Diff.
Function	-0.1	-0.01
$\ell_{\infty}$	84%	65%
$\ell_1$	83%	62%
$\ell_2$	86%	65%

**Table 2.** Percentage of the 98 problems solved by all methods that have a relative difference with  $\ell_2^2$  no smaller than the specified value.

solver failing to find a KKT point, it appears that exact penalty function obtain, on average, good approximate solutions using fewer evaluations than  $\ell_2^2$ .

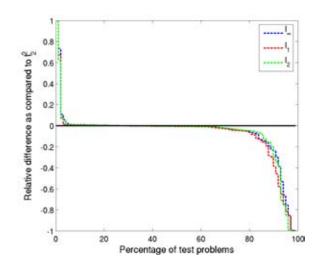


Figure 3. Relative difference in final objective value compared to  $\ell_2^2$ .

#### 4 Smoothed exact penalty functions

Because GSS methods are derivative-free, they are naturally resilient to the non-smooth nature of an exact penalty function in that there is no problem in executing the method. Yet, GSS methods do not guarantee global convergence to KKT points unless sufficient smoothness is present, perhaps explaining why the final objective values for the exact penalty functions are not as good as those obtained by  $\ell_2^2$ . Therefore, this section considers smoothed penalty functions that are variants of the  $\ell_1$ ,  $\ell_2$ , and  $\ell_{\infty}$  penalty functions. These penalty functions have a third parameter,  $\alpha$ , that controls the degree of smoothing. Let S denote the smoothed version of the exact penalty function  $\mathcal{E}$ . Each of the penalty functions in this section satisfies the following properties:

- 1.  $\mathcal{S}(x,\rho,\alpha) > \mathcal{E}(x,\rho)$  for  $\alpha > 0$ ,
- 2.  $|\mathcal{S}(x,\rho,\alpha) \mathcal{E}(x,\rho)| \leq C\alpha$  for some constant C, independent of  $\rho$ , and
- 3.  $S(x, \rho, \alpha)$  is smooth if c(x) is smooth.

The motivation for using smoothed penalty functions comes from the fact that the *theory* of GSS methods (used to solve the linearly-constrained subproblems) requires that the objective function be continuously differentiable. Thus, it is hoped that a continuous objective function will improve overall performance.

The smoothed version of the  $\ell_1$  penalty function used in this paper is based on Chen and Mangasarian [4], who exploit the properties of the sigmoid function from neural networks to approximate the sign function, integrating the sigmoid function to obtain a smooth approximation to the  $\ell_1$  penalty function. Their focus is on handling linear and convex inequalities. Spellucci [32] use this same penalty function for the linear constraints in quadratic programming. The smoothed  $\ell_1$ penalty function is defined as

$$\mathcal{P}_{s_1}(x,\rho,\alpha) = \sum_{i\in\mathcal{E}} \theta(\rho c_i(x),\alpha) + \sum_{i\in\mathcal{I}} \psi(\rho c_i(x),\alpha),$$
(9)

where

$$\theta(t, \alpha) = \alpha \ln(2 + 2\cosh(t/\alpha)),$$
  
$$\psi(t, \alpha) = \alpha \ln(1 + \exp(t/\alpha)).$$

The equality and inequality constrained are treated separately, though  $\theta(t, \alpha)$  is just  $\psi(t, \alpha) + \psi(-t, \alpha)$ . Spellucci [32] proves the following bounds:

$$\begin{split} |t| &< \theta(t,\alpha) < |t| + \frac{8}{3}\alpha e^{-|t|/\alpha}, \\ t^+ &< \psi(t,\alpha) < t^+ + \frac{4}{3}\alpha e^{-|t|/\alpha}. \end{split}$$

This implies

$$\rho \|c^+(x)\|_1 < \mathcal{P}_{s_1}(x,\rho,\alpha) < \rho \|c^+(x)\|_1 + 3m\alpha e^{-\rho\eta(x)/\alpha} \le \rho \|$$

where  $\eta(x) = ||c(x)||_{\infty}$ .

The smoothed version of the  $\ell_2$  penalty function used in this paper relies on a positive shift parameter to smooth the square-root function as in [5, 35, 27, 27, 34, 13, 36, 31], though of these only [5, 31] used this technique in the context of smoothing the  $\ell_2$  norm as described in §6. The smoothed version of the  $\ell_2$  penalty function is given by

$$\mathcal{P}_{s_2}(x,\rho,\alpha) = \rho \sqrt{\|c^+(x)\|_2^2 + (\alpha/\rho)^2}.$$
(10)

It is straightforward to show that

$$\rho \|c^+(x)\|_2 < \mathcal{P}_{s_2}(x,\rho,\alpha) < \rho \|c^+(x)\|_2 + \frac{\alpha^2}{\max(\rho \|c^+(x)\|_2,\alpha)} \le \rho \|c^+(x)\|_2 + \alpha.$$

The smoothed version of the  $\ell_{\infty}$  penalty function used in this paper was also used by [30, 37, 20, 21]. Note that Liuzzi and Lucidi [20] and Liuzzi et al. [21] explore properties of this function in the context of derivative-free programming and also handle linear constraints explicitly. The smoothed version of the  $\ell_{\infty}$  penalty function is given by

$$\mathcal{P}_{s_{\infty}} = \alpha \ln \left( 1 + \sum_{i \in \mathcal{E}} 2 \cosh(\rho c_i(x)/\alpha) + \sum_{i \in \mathcal{I}} e^{\rho c_i(x)/\alpha} \right).$$
(11)

Xu [37] proves the following error bound for the smoothing of the maximum violation norm:

$$\rho \|x\|_{\infty} \le \mathcal{P}_{s_{\infty}}(x,\rho,\alpha) \le \rho \|x\|_{\infty} + \alpha \ln(m).$$

Again, the question is, how do smoothed methods compare to  $\ell_2^2$  and their exact counterparts. Detailed results are in Appendix A. Smoothed penalty functions were pitted against their exact counterparts and  $\ell_2^2$ . Figure 4 shows summary results comparing the number of function evaluations required to successfully exit, and Table 3 shows the how many problems were solved in total by the method. With the smoothed penalty functions, the method exited successfully in less than 1000 function evaluations on approximately 73% of the test problems. In general, smoothing increased the number of function evaluations as compared to the exact penalties, but this is to be expected as a smooth problem potentially prevents the GSS subproblem solver from exiting early at a nonstationary point. Overall, however, the number of evaluations is still less than  $\ell_2^2$ .

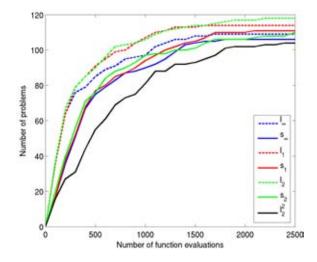
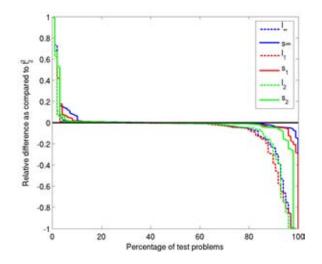


Figure 4. Number of problems that successfully exited for exact, smoothed-exact, and  $\ell_2^2$ .

In exchange for the increase in the number of function evaluations, the objective function value improves. Recall that we are only comparing problems that have achieved sufficient feasibility, i.e.,  $\eta(x) < \eta^* = 10^{-3}$ . Figure 5 shows the relative difference (as in (8)) between the final objective function values for the 98 problems that all methods were able to solve. Table 4 shows the percentage of problems that have the specified relative difference or better.

Penalty	Number	of function	n evaluations
Function	$\leq 1000$	$\leq 2500$	$\leq T_{\rm max}$
$s_{\infty}$	90	106	107
$s_1$	94	111	114
$s_2$	976	110	121

Table 3. Number of problems solved for each penalty function.



**Figure 5.** Relative difference in final objective value compared to  $\ell_2^2$ .

The smoothed-exact penalty functions found even more improved optima that the exact penalty function (these are reflected as positive relative differences in the graph). Moreover, the smoothed-exact methods obtain an objective value that was no more than 10% worse than  $\ell_2^2$  on approximately 96% of the test problems.

Smoothed-exact penalty functions offer a potential compromise between obtaining a good objective value and reducing the number of function evaluations. The smoothing parameter can potentially be adjusted to give better solution or fewer function evaluations, depending on the preferences of the user.

Penalty	Rel.	Diff.
Function	-0.1	-0.01
$s_{\infty}$	99%	85%
$s_1$	96%	80%
$s_2$	94%	79%

**Table 4.** Percentage of the 98 problems solved by all methods that have a relative difference with  $\ell_2^2$  no smaller than the specified value.

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#### 5 Theoretical underpinnings

In this section, we describe the theoretical underpinnings of penalty methods and how this relates to the penalty functions in this paper. Classical theory on penalty methods does not separate the linear and nonlinear constraints as we do here, but the theory extends to this case in a straightforward way. The following well-known theorem says that the sequence of approximate solutions to the subproblem (2) converges to the solution of (1), provided that the penalty function satisfies certain conditions.

**Theorem 5.1 (see, e.g., [22])** Assume that the penalty function  $\mathcal{P}$  satisfies the following three properties for  $\rho \geq 0$ :

- 1.  $\mathcal{P}(x,\rho)$  is continuous,
- 2.  $\mathcal{P}(x, \rho) > 0$  for all  $c^+(x) \neq 0$ , and
- 3.  $\mathcal{P}(x, \rho) = 0$  if and only if  $c^+(x) = 0$ .

Let  $\{y_k\}$  be a sequence of approximate solutions to (2) such that  $||y_k - x_k|| \to 0$ , where  $x_k$  is an exact minimizer, as  $\rho_k \to +\infty$ . Then any limit point of the sequence  $\{y_k\}$  is a solution to (1).

The penalty functions based on  $\ell_2^2$ ,  $\ell_1$ ,  $\ell_2$ , and  $\ell_{\infty}$  all satisfy the three required penalty function properties, but the smoothed variants discussed in §4 do not satisfy the third requirement.

Though the subproblems do not need to be solved exactly, Theorem 5.1 does require that the solutions must be increasingly good approximations. From [10], the measure of stationarity for (2) can be bounded as a function of the step-length stopping tolerance if the merit function,  $f(x) + \mathcal{P}(x, \rho, \alpha)$ , in (2) is continuously differentiable. Without linear constraints, this means that the norm of the gradient is bounded as a function of the stopping tolerance, i.e.,  $\delta_k$  in the outer loop. For linear constraints, the norm of the gradient does not measure stationary, but there is an equivalent measure and bound with respect to the stopping tolerance. Thus, if the merit function is continuously differentiable, the approximate solutions to the subproblems will satisfy the conditions of Theorem 5.1, i.e.,  $||y_k - x_k|| \to 0$ . If the merit function is not continuously differentiable, then the GSS method will still converge to a limit point, but it is no longer guaranteed to to have a small measure of stationarity.

In this case, the  $\ell_2^2$  penalty functions and the three smoothed penalty functions are continuously differentiable (provided f is also continuously differentiable), but the exact functions are not.

Consequently, it is well established that using the exact penalty functions may fail since there is no guarantee of obtaining a good approximate solution to the subproblem (2). Note that because the smooth penalty function are strictly greater than their exact counterparts, the third assumption of Theorem 5.1 does not hold and hence we cannot directly apply Theorem 5.1.

Many researchers have investigated the convergence theory. Liuzzi and Lucidi [20] develop convergence theory for the smoothed  $\ell_{\infty}$  penalty function in the context of pattern search methods and also handle the linear constraints explicitly. Kaplan [13] and Gonzaga and Castillo [7] develop general convergence theory for  $\ell_1$  smoothing functions in the context of nonlinear programming. Polyak [29] provides an extensive discussion on the general properties of smoothing techniques in the context of the minimax function.

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#### 6 Related Work

In §4 we described a particular choice of smoothing the  $\ell_1$  penalty function using integrals of the sigmoid function for neural networks proposed by Chen and Mangasarian [4] in the context of handling convex inequalities and linear complementarity problems. A nice feature of this approach is that the level of differentiability of the unconstrained problem is maintained. That is, the degree of differentiability of  $\mathcal{M}(x, \rho, \alpha)$  is determined by the degree of differentiability of f(x) and c(x). Another popular choice for smoothing  $\ell_1$  is the use of linear-quadratic approximation such as the Huber penalty function [12] which is popular in the statistics community. Variants of piecewise linear-quadratic penalty functions are explored in the context of nonlinear programming in [35, 27, 28]. Weber and Love [34], Kaplan [13] and Xavier [36] smooth the  $\ell_1$  penalty function using hyperboloid approximation techniques,

$$\sqrt{t^2 + \alpha}$$
 and  $t + \sqrt{t^2 + \alpha}$ ,

to approximate |t| and max $\{0, t\}$  respectively. In §4, properties of this function are used to smooth the square-root term in the  $\ell_2$  norm.

In §4, we describe a smooth approximation for the  $\ell_2$  norm. Eyster, White, and Wierwille [5] use a similar strategy for minimizing a sum of Euclidean distances of the form

$$F_w(x) = \sum_{i=1}^{K} \|x - w_i\|_2$$

in the context of solving the Euclidean Multifacility Location problem. Further properties of this function in this context are explored by Ben and Xue [31]. There does not appear to be much related work for smoothing the  $\ell_2$  norm in the context of general nonlinear programming; by far the majority of the literature focused on  $\ell_1$  and  $\ell_{\infty}$ .

Also of note is the algorithm proposed by Meng, Dang, and Yang [23] for using first and second order smoothing of the square-root exact penalty function,

$$\mathcal{M}(x,\rho) = f(x) + \rho \sum_{i=1}^{m} \sqrt{|c_i^+(x)|},$$

in the context of inequality constrained optimization.

The last smooth penalty function described in §4 approximates the  $\ell_{\infty}$  function and has been used in [30, 37, 20, 21]. Qin and Nguyen [30] first proposed using this smoothing in the context of nonlinear programming. Xu [37] later used this penalty function to solve finite minimax problems. Liuzzi, Lucidi, and Sciandrone [21] developed a GSS approach to solving a linearly constrained finite minimax problem.

We also explored a pseudo-smoothing of the  $\ell_1$  function using dynamic scaling:

$$\mathcal{P}(x,\rho) = \sum_{i=1}^{m} \underbrace{\left(1 - \frac{\eta(x) - c_i^+(x)}{\eta(x)}\right)}_{\xi_i(x)} c_i^+(x).$$

Recall that  $\eta(x)$  is the maximum constraint violation (4). The function  $\xi_i(x) = 0$  if  $c_i^+(x) = 0$ , and  $\xi_i(x) = 1$  if  $c_i^+(x) = \eta(x)$ , the maximum violation norm. An alternate formulation is given by

$$\mathcal{P}(x,\rho) = \sum_{c_i^+(x) = \eta(x)} \eta(x) + \sum_{c_i^+(x) < \eta(x)} \frac{c_i^+(x)}{\eta(x)} c_i^+(x).$$

Hence this functions grows like  $\ell_{\infty}$  for the largest constraint violations while damping the importance of less violated constraints. This penalty function seemed effective for some of the more difficult

equality constrained problems, but on average did not perform as well as the penalty functions described in  $\S4.$ 

#### 7 Conclusions

This paper focused on developing practical algorithms for solving real-world nonlinear programming problems in CS&E where the computational cost of each evaluation makes it prohibitive to perform large numbers of function evaluations. The emphasis is on algorithms that are constraint centric; i.e., methods that exit with a feasible point are preferred to those that exit with an infeasible point, even if that infeasible point is closer to a KKT point.

We explored a variety of penalty methods in the context of derivative-free optimization, using APGSS to solve the subproblems on a parallel computer. These methods were tested on a collection of CUTEr test problems with nonlinear constraints, as described in §2.

The  $\ell_2^2$  method has the best theoretical properties in that it is smooth and satisfies the requirements of Theorem 5.1. However, it requires a large number of function evaluations relative to the other penalty functions.

The exact penalty functions discussed in §3 are not smooth and so GSS may converge to a point of non-differentiability in the subproblem solution. But numerically, the exact penalty methods successfully terminated on more problems than the other methods. Successful termination means, among other things, that the constraint violation is small The final objective values were not always as good, however, as  $\ell_2^2$ .

The smoothed-exact penalty functions discussed in §4 required slightly more function evaluations, but still less than  $\ell_2^2$ . The trade-off is improved final objective values that are nearly always as accurate at  $\ell_2^2$ . The smoothing parameter can be adjusted to decide whether accuracy or efficiency is more important.

The theory of penalty methods is discussed in §5, though we do not go into full details in this paper. For future work, there are many other promising candidates (§6) for penalty functions that may be more appropriate in some application domains.

In conclusion, derivative-free penalty methods are a good option in the context of CS&E nonlinear programming problems. Using a penalty function that emphasizes constraint feasibility above all yields "usable" solutions even if they are not optimal in the KKT sense.

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#### A Detailed numerical results

Tables A.1–A.2 contain detailed numerical results for comparing the seven merit functions discussed in this paper. The code was run on five parallel processors (one controller plus four workers) on Sandia's Institutional Computing Cluster (ICC) with 3.06GHz Xeon processors and 2GB RAM per node. Because we were using an asynchronous algorithm to solve the linearly constrained subproblems, we ran each algorithm 5 times on each problem and averaged the results.

The following parameters were used for Algorithm 1:

- The starting point  $x_0$  is the default value given by CUTEr if it is feasible with respect to the linear constraints. Otherwise, it is the solution to a feasibility problem with respect to the linear constraints as in [9],
- $S_{\max} = 1000$ ,
- $T_{\rm max} = 100,000,$
- $\rho_{\rm max} = 10^8$ ,
- $\rho_0 = 1$ ,
- $\alpha_{\min} = 10^{-5}$ ,
- $\alpha_0 = 1$ ,
- $\delta^{\star} = 10^{-3}$ ,
- $\delta_{\min} = 10^{-6}$ ,
- $\delta_0 = 10^{-1}$ ,
- $\eta^{\star} = 10^{-3}$ .

Additionally, the number of outer iterations was restricted to 1000. Default values were used for APGSS, except for those parameters that are part of the algorithm; i.e., the starting point was set to the last outer iterate, the stopping tolerance for the step length was set to  $\delta_k$ , and the maximum number of function evaluations was set to  $S_{\text{max}}$ .

The columns for Tables A.1–A.2 are as follows. The first column lists the problem name and its characteristics using the notation from (1). The second column lists the best objective value found by any method that exited successfully. Note that a successful exit means that the constraints are nearly satisfied, i.e.,  $\eta(x^*) < \eta^* = 10^{-3}$ . The remaining seven columns list averaged results for each merit function. The first number is the relative difference as compared to the best minimum, i.e.,

$$\Delta f^{\star} = \frac{f(x^{\star}) - f_{\min}^{\star}}{\max\{1, |f(x^{\star})|, |f_{\min}^{\star}|\}}$$

where  $f(x^*)$  denotes the best objective value obtained by the corresponding method. The second value (nf) is the number of objective/constraint function evaluations. Recall that APGSS caches both objective and constraint values and reuses them across inner and outer iterations in the same run. Thus, these counts reflect *unique* points evaluated in the parameter space.

The seven merit functions that are compared are:

- $\ell_{\infty}$ : see (7)
- $s_{\infty}$ : see (11)

- $\ell_1$ : see (5)
- $s_1$ : see (9)
- $\ell_2$ : see (6)
- $s_2$ : see (10)
- $\ell_2^2$ : see (3)

Altogether, of the 145 problems, 128 were solved by at least one merit function, and 98 were solved by all.

	_														<u>,                                     </u>
Problem Data Name $/n/m_e/m_i/p$	Best f*	$\ell_{\odot}$ $\Delta f^{\star}$	∞ / nf	$\frac{s_0}{\Delta f^*}$	0 / nf	$\ell_1$ $\Delta f^*$	/ nf	$\frac{s_1}{\Delta f^*}$	1 / n f	$\ell$ $\Delta f^*$	2 / n f	$\Delta f^*$	2 / n f	$\ell_{\tau}^{\ell}$ $\Delta f^{\star}$	2 / nf
CANTILVR/ $5/0/1/5$	J 1.3	∆J 3e-2/	427		1108	ΔJ 3e-2/	389	v	1132	2e-2/	428	8e-6/	1065	0/	1676
CB2 / 3/0/3/ 0	2.0	2e-2/	70	40-3/	336	2e-2/	70	1e-3/	372	2e-2/	71	2e-2/	377	2e-2/	362
CB3 / 3/0/3/ 0	2.0	5e-4/	71	4e-3/	346	5e-4/	71	6e-3/	384	5e-4/	71	0/	386	0/	364
CHACONN1/ 3/0/3/ 0	2.0	4e-3/	243	0/	373	4e-3/	226	2e-3/	375	3e-3/	258	2e-3/	483	2e-3/	590
CHACONN2/ 3/0/3/ 0	2.0	5e-4/	72	5e-3/	361	5e-4/	72	6e-3/	393	5e-4/	72	0/	373	0/	374
CONGIGMZ/ 3/0/2/ 3	2.8e1	7e-5/	239	6e-5/	263	8e-5/	668	3e-5/	500	6e-5/	323	1e-5/	592	0/	487
CRESC4 / 6/0/8/ 5	1.8e1	1e-1/	876	F/	F	8e-2/	819	F/	F	F/	F	0/	816	F/	F
CSFI1 / 5/2/3/ 6	-1.7	F/	F	F/	F	1/	162	1/	2004	0/	2112	1/	2470	1/	1089
CSFI2 / 5/2/3/ 5	1.2e2	F/	F	F/	F	F/	F	F/	F	3e-2/	20407	0/:	19201	3e-2/1	18689
DEMYMALO/ 3/0/1/ 2	-3.0	3e-4/	169	1e-3/	222	3e-4/	168	1e-3/	223	2e-4/	164	5e-5/	217	0/	364
DIPIGRI / 7/0/4/ 0	6.8e2	3e-3/	1049	2e-3/	1206	2e-3/	1057	0/	1585	6e-3/	1008	5e-3/	1655	1e-3/	1627
DIXCHLNG/10/5/0/ 0	2.8e-4	4e-3/	1646	0/	1582	F/	F	7e-5/	1659	4e-3/	1766	2e-1/	2449	2e-4/	1517
GIGOMEZ1/ $3/0/1/2$	-3.0	3e-4/	189	1e-3/	234	2e-4/	183	1e-3/	230	2e-4/	184	3e-5/	234	0/	359
GIGOMEZ2/ 3/0/3/ 0	2.0	2e-2/	70	0/	326	2e-2/	65	8e-4/	360	2e-2/	66	2e-2/	376	2e-2/	364
GIGOMEZ3/ 3/0/3/ 0	2.0	5e-4/	66	4e-3/	347	5e-4/	66	6e-3/	388	5e-4/	66	0/	377	0/	363
GOTTFR / 2/2/0/ 0	0.0	0/	302	0/	250	F/	F	F/	F	0/	325	0/	355	0/	341
HATFLDF / 3/3/0/ 0	F	F/	F	F/	F	F/	F	F/	F	F/	F	F/	F	F/	F
HEART6 / 6/6/0/ 0	F	F/	F	F/	F	F/	F	F/	F	F/	F	F/	F	F/	F
HEARTS / 8/6/0/ 2	F	F/	F	F/	F	F/	F	F/	F	F/	F	F/	F	F/	F
HIMMELBC/ 2/2/0/ 0	0.0	F/	F	0/	52	0/	52	0/	51	0/	51	0/	51	0/	52 E
HIMMELBD/ 2/2/0/ 0 HIMMELBE/ 3/1/0/ 2	F	F/	F	F/	F	F/	F 23	F/	F	F/	F	F/	F	F/	F
	0.0 -6.2e1	0/	23 169	0/	23	0/		0/	23	0/	23 170	0/	23	0/	23 170
HIMMELP2/ 2/0/1/ 4 HIMMELP3/ 2/0/2/ 4	-6.2e1 -5.9e1	1e-6/	28	1e-6/	172 28	1e-6/	170 28	1e-6/	28	1e-6/ 0/	28	0/	28	0/	29
HIMMELP3/ 2/0/2/ 4 HIMMELP4/ 2/0/3/ 4	-5.9e1	0/	42	0/	41	0/	44	0/	42	0/	42	0/	48	0/	44
HIMMELP4/ 2/0/3/ 4 HIMMELP5/ 2/0/3/ 4	-5.9e1	0/	25	0/	25	0/	25	0/	42 25	0/	25	0/	48 25	0/	25
HIMMELP6/ 2/0/3/ 6	-5.9e1	0/	20	0/	22	0/	22	0/	22	0/	22	0/	22	0/	22
HS10 / 2/0/1/ 0	-1.0	3e-4/	102	4e-3/	211	3e-4/	105	4e-3/	213	3e-4/	100	1e-3/	205	0/	362
HS100 / 7/0/4/ 0	6.8e2	2e-3/	1062		1362	2e-3/			1617	2e-3/	1010	2e-3/	1449	1e-5/	1799
HS100LNP/ 7/2/0/ 0	6.8e2	5e-3/	1044		1144	1e-2/	412	,	1085	8e-3/	639	3e-3/	990	1e-2/	1711
HS100MOD/ 7/0/4/ 0	6.8e2	7e-4/	1020		1359	9e-4/	994		1377	9e-4/	1035	8e-4/	930	F/	F
HS101 / 7/0/6/ 14	1.8e3	F/	F	F/	F	2e-1/	5579	2e-1/	5633	3e-2/	7690	3e-2/	7774	0/8	80390
HS102 / 7/0/6/ 14	9.1e2	F/	F	F/	F	2e-1/	4340	3e-1/	4235	3e-2/	6826	3e-2/	6828	0/6	35614
HS103 / 7/0/6/ 14	5.5e2	F/	F	F/	F	4e-1/	3783	4e-1/	3658	7e-2/	6827	7e-2/	6631	0/2	29032
HS104 / 8/0/6/ 16	4.0	F/	F	F/	F	F/	F	F/	F	0/	924	F/	F	F/	F
HS106 / 8/0/3/ 19	7.6e3	3e-2/	687	0/	836	2e-1/	510	2e-1/	514	2e-1/	519	1e-1/	541	1e-1/	593
HS107 / 9/6/0/ 8	5.1e3	F/	F	F/	F	F/	F	F/	F	0/	7818	2e-4/	8068	F/	F
HS109 / 9/6/2/ 18	F	F/	F	F/	F	F/	F	F/	F	F/	F	F/	F	F/	F
HS11 / 2/0/1/ 0	-8.5	3e-2/	133	2e-3/	204	3e-2/	132	2e-3/	203	3e-2/	132	7e-3/	249	0/	786
HS111 /10/3/0/ 20					F		F	0/	662	F/	F			,	
, , , , ,	-4.1e1	F/	F	F/		F/				- (		F/	F	8e-2/1	17590
HS111LNP/10/3/0/ 0	F	F/	F	F/	F	F/	F	F/	F	F/	F	F/	F	8e-2/1 F/	17590 F
HS111LNP/10/3/0/ 0 HS113 /10/0/5/ 3	F 2.4e1	F/ 1e-2/	F 1182	F/ 3e-3/	F 1702	F/ 2e-2/	F 1256	0/	1650	1e-2/	1115	F/ 1e-3/	F 2778	8e-2/1 F/ 6e-3/	17590 F 2304
HS111LNP/10/3/0/ 0 HS113 /10/0/5/ 3 HS12 / 2/0/1/ 0	F 2.4e1 -3.0e1	F/ 1e-2/ 1e-5/	F 1182 55	F/ 3e-3/ 1e-5/	F 1702 55	F/ 2e-2/ 1e-5/	F 1256 55	0/ 1e-5/	1650 56	1e-2/ 1e-5/	1115 56	F/ 1e-3/ 1e-5/	F 2778 80	8e-2/1 F/ 6e-3/ 0/	F 2304 400
HS111LNP/10/3/0/ 0 HS113 /10/0/5/ 3 HS12 / 2/0/1/ 0 HS13 / 2/0/1/ 2	F 2.4e1 -3.0e1 8.1e-1	F/ 1e-2/ 1e-5/ 3e-3/	F 1182 55 180	F/ 3e-3/ 1e-5/ 2e-3/	F 1702 55 195	F/ 2e-2/ 1e-5/ 3e-3/	F 1256 55 179	0/ 1e-5/ 2e-3/	1650 56 194	1e-2/ 1e-5/ 3e-3/	1115 56 179	F/ 1e-3/ 1e-5/ 2e-3/	F 2778 80 198	8e-2/1 F/ 6e-3/ 0/ 0/	F 2304 400 641
$\begin{array}{c c} \text{HS111LNP}/10/3/0/ & 0 \\ \text{HS113} & /10/0/5/ & 3 \\ \text{HS12} & / 2/0/1/ & 0 \\ \text{HS13} & / 2/0/1/ & 2 \\ \text{HS14} & / 2/0/1/ & 1 \end{array}$	F 2.4e1 -3.0e1 8.1e-1 1.4	F/ 1e-2/ 1e-5/ 3e-3/ 3e-3/	F 1182 55 180 59	F/ 3e-3/ 1e-5/ 2e-3/ 3e-3/	F 1702 55 195 64	F/ 2e-2/ 1e-5/ 3e-3/ 3e-3/	F 1256 55 179 60	0/ 1e-5/ 2e-3/ 3e-3/	1650 56 194 64	1e-2/ 1e-5/ 3e-3/ 3e-3/	1115 56 179 59	F/ 1e-3/ 1e-5/ 2e-3/ 2e-4/	F 2778 80 198 72	8e-2/1 F/ 6e-3/ 0/ 0/	F 2304 400 641 153
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	F 2.4e1 -3.0e1 8.1e-1 1.4 3.1e2	F/ 1e-2/ 1e-5/ 3e-3/ 3e-3/ 1e-3/	F 1182 55 180 59 560	F/ 3e-3/ 1e-5/ 2e-3/ 3e-3/ 1e-3/	F 1702 55 195 64 512	F/ 2e-2/ 1e-5/ 3e-3/ 3e-3/ 1e-3/	F 1256 55 179 60 622	0/ 1e-5/ 2e-3/ 3e-3/ 1e-3/	1650 56 194 64 604	1e-2/ 1e-5/ 3e-3/ 3e-3/ 1e-3/	1115 56 179 59 560	F/ 1e-3/ 1e-5/ 2e-3/ 2e-4/ 1e-3/	F 2778 80 198 72 514	8e-2/1 F/ 6e-3/ 0/ 0/ 0/	F 2304 400 641 153 1027
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	F 2.4e1 -3.0e1 8.1e-1 1.4 3.1e2 2.5e-1	F/ 1e-2/ 1e-5/ 3e-3/ 3e-3/ 1e-3/ 0/	F 1182 55 180 59 560 36	F/ 3e-3/ 1e-5/ 2e-3/ 3e-3/ 1e-3/ 4e-5/	F 1702 55 195 64 512 142	F/ 2e-2/ 1e-5/ 3e-3/ 3e-3/ 1e-3/ 0/	F 1256 55 179 60 622 36	0/ 1e-5/ 2e-3/ 3e-3/ 1e-3/ 6e-5/	1650 56 194 64 604 177	1e-2/ 1e-5/ 3e-3/ 3e-3/ 1e-3/ 0/	1115 56 179 59 560 36	F/ 1e-3/ 1e-5/ 2e-3/ 2e-4/ 1e-3/ 0/	F 2778 80 198 72 514 36	8e-2/1 F/ 6e-3/ 0/ 0/ 0/ 0/	17590 F 2304 400 641 153 1027 36
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	F 2.4e1 -3.0e1 8.1e-1 1.4 3.1e2	F/ 1e-2/ 1e-5/ 3e-3/ 3e-3/ 1e-3/	F 1182 55 180 59 560	F/ 3e-3/ 1e-5/ 2e-3/ 3e-3/ 1e-3/	F 1702 55 195 64 512	F/ 2e-2/ 1e-5/ 3e-3/ 3e-3/ 1e-3/	F 1256 55 179 60 622	0/ 1e-5/ 2e-3/ 3e-3/ 1e-3/	1650 56 194 64 604	1e-2/ 1e-5/ 3e-3/ 3e-3/ 1e-3/	1115 56 179 59 560	F/ 1e-3/ 1e-5/ 2e-3/ 2e-4/ 1e-3/	F 2778 80 198 72 514	8e-2/1 F/ 6e-3/ 0/ 0/ 0/	F 2304 400 641 153 1027
$\begin{array}{rrrr} {\rm HS111LNP}/10/3/0/ & 0 \\ {\rm HS113} & /10/0/5/ & 3 \\ {\rm HS12} & / & 2/0/1/ & 0 \\ {\rm HS13} & / & 2/0/1/ & 2 \\ {\rm HS14} & / & 2/0/1/ & 1 \\ {\rm HS14} & / & 2/0/2/ & 1 \\ {\rm HS16} & / & 2/0/2/ & 3 \\ {\rm HS17} & / & 2/0/2/ & 3 \\ \end{array}$	F 2.4e1 -3.0e1 8.1e-1 1.4 3.1e2 2.5e-1 1.0	F/ 1e-2/ 1e-5/ 3e-3/ 3e-3/ 1e-3/ 0/ 1e-3/	F 1182 55 180 59 560 36 43	F/ 3e-3/ 1e-5/ 2e-3/ 3e-3/ 1e-3/ 4e-5/ 7e-5/	F 1702 55 195 64 512 142 212	F/ 2e-2/ 1e-5/ 3e-3/ 3e-3/ 1e-3/ 1e-3/	F 1256 55 179 60 622 36 44	0/ 1e-5/ 2e-3/ 3e-3/ 1e-3/ 6e-5/ 6e-3/	1650 56 194 64 604 177 260	1e-2/ 1e-5/ 3e-3/ 3e-3/ 1e-3/ 1e-3/	1115 56 179 59 560 36 43	F/ 1e-3/ 1e-5/ 2e-3/ 2e-4/ 1e-3/ 0/ 0/	F 2778 80 198 72 514 36 202	8e-2/1 F/ 6e-3/ 0/ 0/ 0/ 0/ 1e-4/	17590 F 2304 400 641 153 1027 36 414
$\begin{array}{rrrr} {\rm HS111LNP}/10/3/0/ & 0 \\ {\rm HS113} & /10/0/5/ & 3 \\ {\rm HS12} & / 2/0/1/ & 0 \\ {\rm HS13} & / 2/0/1/ & 0 \\ {\rm HS14} & / 2/0/1/ & 1 \\ {\rm HS14} & / 2/0/2/ & 1 \\ {\rm HS16} & / 2/0/2/ & 3 \\ {\rm HS16} & / 2/0/2/ & 3 \\ {\rm HS18} & / 2/0/2/ & 4 \\ \end{array}$	F 2.4e1 -3.0e1 8.1e-1 1.4 3.1e2 2.5e-1 1.0 5.6	F/ 1e-2/ 1e-5/ 3e-3/ 3e-3/ 1e-3/ 0/ 1e-3/ 0/	F 1182 55 180 59 560 36 43 59	F/ 3e-3/ 1e-5/ 2e-3/ 3e-3/ 1e-3/ 4e-5/ 7e-5/ 0/	F 1702 55 195 64 512 142 212 59	F/ 2e-2/ 1e-5/ 3e-3/ 3e-3/ 1e-3/ 1e-3/ 0/	F 1256 55 179 60 622 36 44 59	0/ 1e-5/ 2e-3/ 3e-3/ 1e-3/ 6e-5/ 6e-3/ 0/	1650 56 194 64 604 177 260 59	1e-2/ 1e-5/ 3e-3/ 3e-3/ 1e-3/ 1e-3/ 1e-3/ 0/	1115 56 179 59 560 36 43 60	F/ 1e-3/ 1e-5/ 2e-3/ 2e-4/ 1e-3/ 0/ 0/ 0/	F 2778 80 198 72 514 36 202 60	8e-2/1 F/ 6e-3/ 0/ 0/ 0/ 0/ 1e-4/ 0/	17590 F 2304 400 641 153 1027 36 414 59
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	F 2.4e1 -3.0e1 8.1e-1 1.4 3.1e2 2.5e-1 1.0 5.6 F	F/ 1e-2/ 1e-5/ 3e-3/ 3e-3/ 1e-3/ 0/ 1e-3/ 0/ F/	F 1182 55 180 59 560 36 43 59 F	F/ 3e-3/ 1e-5/ 2e-3/ 3e-3/ 1e-3/ 4e-5/ 7e-5/ 0/ F/	F 1702 55 195 64 512 142 212 59 F	F/ 2e-2/ 1e-5/ 3e-3/ 1e-3/ 0/ 1e-3/ 0/ F/	F 1256 55 179 60 622 36 44 59 F	0/ 1e-5/ 2e-3/ 3e-3/ 1e-3/ 6e-5/ 6e-3/ 0/ F/	1650 56 194 64 604 177 260 59 F	1e-2/ 1e-5/ 3e-3/ 3e-3/ 1e-3/ 0/ 1e-3/ 0/ F/	1115 56 179 59 560 36 43 60 F	F/ 1e-3/ 2e-3/ 2e-4/ 1e-3/ 0/ 0/ 0/ F/	F 2778 80 198 72 514 36 202 60 F	8e-2/1 F/ 6e-3/ 0/ 0/ 0/ 0/ 1e-4/ 0/ F/	17590 F 2304 400 641 153 1027 36 414 59 F
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	F 2.4e1 -3.0e1 8.1e-1 1.4 3.1e2 2.5e-1 1.0 5.6 F 3.8e1	F/ 1e-2/ 1e-5/ 3e-3/ 1e-3/ 0/ 1e-3/ 0/ F/ 1e-3/	F 1182 55 180 59 560 36 43 59 F F 264	F/ 3e-3/ 1e-5/ 2e-3/ 3e-3/ 1e-3/ 4e-5/ 7e-5/ 0/ F/ 1e-3/	F 1702 55 195 64 512 142 212 59 F 263	F/ 2e-2/ 1e-5/ 3e-3/ 1e-3/ 0/ 1e-3/ 0/ F/ 1e-3/	F 1256 55 179 60 622 36 44 59 F 250	0/ 1e-5/ 2e-3/ 3e-3/ 1e-3/ 6e-5/ 6e-3/ 0/ F/ 1e-3/	1650 56 194 64 604 177 260 59 F 240	1e-2/ 1e-5/ 3e-3/ 3e-3/ 1e-3/ 0/ 1e-3/ 0/ F/ 1e-3/	1115 56 179 59 560 36 43 60 F 263	F/ 1e-3/ 1e-5/ 2e-3/ 2e-4/ 1e-3/ 0/ 0/ F/ 1e-3/	F 2778 80 198 72 514 36 202 60 F 265	8e-2/1 F/ 6e-3/ 0/ 0/ 0/ 0/ 1e-4/ 0/ F/ 0/	17590 F 2304 400 641 153 1027 36 414 59 F 751
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	F 2.4e1 -3.0e1 8.1e-1 1.4 3.1e2 2.5e-1 1.0 5.6 F 3.8e1 1.0	F/ 1e-2/ 1e-5/ 3e-3/ 3e-3/ 1e-3/ 0/ 1e-3/ 0/ F/ 1e-3/ 2e-3/	F 1182 55 180 59 560 366 43 59 F 264 88	F/ 3e-3/ 1e-5/ 2e-3/ 3e-3/ 1e-3/ 4e-5/ 7e-5/ 0/ F/ 1e-3/ 4e-3/	F 1702 55 195 64 512 142 212 59 F 263 119	F/ 2e-2/ 1e-5/ 3e-3/ 1e-3/ 0/ 1e-3/ 0/ F/ 1e-3/ 2e-3/	F 1256 55 179 60 622 36 44 59 F 250 88	0/ 1e-5/ 2e-3/ 3e-3/ 1e-3/ 6e-5/ 6e-3/ 0/ F/ 1e-3/ 4e-3/	1650 56 194 64 604 177 260 59 F 240 119	1e-2/ 1e-5/ 3e-3/ 3e-3/ 1e-3/ 0/ 1e-3/ 0/ F/ 1e-3/ 2e-3/	1115 56 179 59 560 36 43 60 F F 263 89	F/ 1e-3/ 1e-5/ 2e-3/ 2e-4/ 1e-3/ 0/ 0/ F/ 1e-3/ 6e-4/	F 2778 80 198 72 514 36 202 60 F 265 145	8e-2/1 F/ 6e-3/ 0/ 0/ 0/ 0/ 1e-4/ 0/ F/ 0/ F/	17590 F 2304 400 641 153 1027 36 414 59 F 751 264
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	F 2.4e1 -3.0e1 8.1e-1 1.4 3.1e2 2.5e-1 1.0 5.6 F 3.8e1 1.0 9.5	F/ 1e-2/ 1e-5/ 3e-3/ 1e-3/ 0/ 1e-3/ 0/ F/ 1e-3/ 2e-3/ 5e-2/	F 1182 55 180 59 560 36 43 59 F 264 88 88 69	F/ 3e-3/ 1e-5/ 2e-3/ 3e-3/ 1e-3/ 4e-5/ 7e-5/ 0/ F/ 1e-3/ 4e-3/ 4e-2/	F 1702 55 195 64 512 142 212 59 F 263 119 64	F/ 2e-2/ 1e-5/ 3e-3/ 1e-3/ 0/ 1e-3/ 0/ F/ 1e-3/ 2e-3/ 5e-2/	F 1256 55 179 60 622 36 44 59 F 250 88 70	0/ 1e-5/ 2e-3/ 3e-3/ 1e-3/ 6e-5/ 6e-3/ 0/ F/ 1e-3/ 4e-3/ 4e-2/	1650 56 194 64 604 177 260 59 F 240 119 65	1e-2/ 1e-5/ 3e-3/ 3e-3/ 1e-3/ 0/ 1e-3/ 0/ F/ 1e-3/ 2e-3/ 5e-2/	1115 56 179 59 560 36 43 60 F 263 89 69	F/ 1e-3/ 1e-5/ 2e-3/ 2e-4/ 1e-3/ 0/ 0/ F/ 1e-3/ 6e-4/ 4e-2/	F 2778 80 198 72 514 36 202 60 F 265 145 65	8e-2/1 F/ 6e-3/ 0/ 0/ 0/ 0/ 1e-4/ 0/ F/ 0/ 0/ 0/	F 2304 400 641 153 1027 36 414 59 F 751 264 71
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	F 2.4e1 -3.0e1 8.1e-1 1.4 3.1e2 2.5e-1 1.0 5.6 F 3.8e1 1.0 9.5 1.5e-7	F/ 1e-2/ 1e-5/ 3e-3/ 1e-3/ 0/ 1e-3/ 0/ F/ 1e-3/ 2e-3/ 5e-2/ 2e-3/	F 1182 55 180 59 560 366 43 59 F 264 88 69 279	F/ 3e-3/ 1e-5/ 2e-3/ 3e-3/ 1e-3/ 4e-5/ 7e-5/ 0/ F/ 1e-3/ 4e-3/ 4e-2/ 5e-2/	F 1702 55 195 64 512 142 212 212 59 F 263 119 64 313	F/ 2e-2/ 1e-5/ 3e-3/ 1e-3/ 0/ 1e-3/ 0/ F/ 1e-3/ 2e-3/ 5e-2/ 4e-2/	F 1256 55 179 60 622 36 44 59 F 250 88 70 290	0/ 1e-5/ 2e-3/ 3e-3/ 1e-3/ 6e-5/ 6e-3/ 0/ F/ 1e-3/ 4e-3/ 4e-2/ 0/	1650 56 194 64 604 1777 260 59 F 240 119 65 215	1e-2/ 1e-5/ 3e-3/ 1e-3/ 0/ 1e-3/ 0/ F/ 1e-3/ 2e-3/ 5e-2/ 2e-3/	1115 56 179 59 560 36 43 60 F 263 89 69 313	F/ 1e-3/ 2e-3/ 2e-4/ 1e-3/ 0/ 0/ F/ 1e-3/ 6e-4/ 4e-2/ 2e-2/	F 2778 80 198 72 514 36 202 60 F 265 145 65 314	8e-2/1 F/ 6e-3/ 0/ 0/ 0/ 0/ 0/ 1e-4/ 0/ F/ 0/ 0/ 0/ 1/	17590           F           2304           400           641           153           1027           36           414           59           F           751           264           71           914
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	F 2.4e1 -3.0e1 8.1e-1 1.4 3.1e2 2.5e1 1.00 5.6 F 3.8e1 1.00 9.5 1.5e-7 4.0e-2 -2.3e1 1.0	F/ 1e-2/ 1e-5/ 3e-3/ 1e-3/ 0/ 1e-3/ 0/ F/ 1e-3/ 2e-3/ 2e-3/ 2e-3/ 3e-5/ 9e-2/ 0/	F 1182 55 180 560 366 433 59 F 264 88 69 279 69 279 69 244 160	F/ 3e-3/ 1e-5/ 2e-3/ 3e-3/ 1e-3/ 4e-5/ 7e-5/ 0/ F/ 1e-3/ 4e-3/ 4e-2/ 5e-2/ 3e-5/ 5e-3/ 0/	F 1702 55 195 64 512 142 212 59 F 263 119 64 313 69 325 165	F/ 2e-2/ 1e-5/ 3e-3/ 1e-3/ 0/ 1e-3/ 0/ F/ 1e-3/ 2e-3/ 2e-3/ 2e-3/ 3e-5/ 1e-1/ 0/	F 1256 55 179 60 622 36 44 59 F 250 88 70 290 69 228 161	0/ 1e-5/ 2e-3/ 3e-3/ 1e-3/ 6e-5/ 6e-3/ 0/ F/ 1e-3/ 4e-3/ 4e-2/ 0/ 3e-5/	1650 56 194 64 604 177 260 59 F 240 119 65 215 71 325 165	1e-2/ 1e-5/ 3e-3/ 1e-3/ 0/ 1e-3/ 0/ F/ 1e-3/ 2e-3/ 2e-3/ 2e-3/ 3e-5/ 7e-2/ 0/	1115 56 179 59 560 36 43 60 F 263 89 69 313 69 216 160	F/           1e-3/           1e-5/           2e-3/           2e-4/           1e-3/           0/           0/           0/           F/           1e-3/           6e-4/           4e-2/           2e-2/           2e-2/           0/	F 2778 80 198 72 514 36 202 60 F 265 145 65 314 69 277 161	8e-2/1 F/ 6e-3/ 0/ 0/ 0/ 0/ 1e-4/ 0/ F/ 0/ 0/ 0/ 0/ 0/ 0/ 2e-2/ 0/	7590 F 2304 400 641 153 1027 36 414 59 F 751 264 71 914 417 639 161
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	$\begin{array}{c} {\rm F} \\ 2.4e1 \\ -3.0e1 \\ 8.1e-1 \\ 1.4 \\ 3.1e2 \\ 2.5e-1 \\ 1.0 \\ 5.6 \\ {\rm F} \\ 3.8e1 \\ 1.0 \\ 9.5 \\ 1.5e-7 \\ 4.0e-2 \\ -2.3e1 \\ 1.0 \\ 6.0 \end{array}$	F/           1e-2/           1e-5/           3e-3/           3e-3/           1e-3/           0/           1e-3/           0/           1e-3/           0/           1e-3/           0/           1e-3/           0/           1e-3/           0/           F/           1e-3/           2e-3/           3e-2/           2e-3/           3e-5/           0/           7e-3/	F 1182 55 180 59 560 36 43 59 F F 4 264 88 69 279 69 2244 160 281	F/ 3e-3/ 1e-5/ 2e-3/ 3e-3/ 1e-3/ 4e-5/ 7e-5/ 0/ F/ 1e-3/ 4e-3/ 4e-2/ 3e-5/ 5e-2/ 3e-5/ 5e-3/ 0/ 8e-3/	F 1702 55 195 64 512 142 212 59 F 263 119 64 313 69 325 165 306	F/ 2e-2/ 1e-5/ 3e-3/ 1e-3/ 0/ 1e-3/ 0/ F/ 1e-3/ 2e-3/ 4e-2/ 3e-5/ 1e-1/ 0/ 6e-3/	F 1256 55 179 60 622 36 44 59 70 250 88 870 290 69 228 161 290	0/ 1e-5/ 2e-3/ 3e-3/ 1e-3/ 6e-5/ 6e-3/ 0/ F/ 1e-3/ 4e-3/ 4e-2/ 0/ 3e-5/ 0/ 0/ 0/	1650 56 194 64 604 177 260 59 F 240 119 65 215 71 325 165 303	1e-2/ 1e-5/ 3e-3/ 1e-3/ 0/ 1e-3/ 0/ F/ 1e-3/ 2e-3/ 3e-5/ 7e-2/ 0/ 7e-3/	1115 56 179 59 560 36 43 60 F 263 89 69 313 69 216 160 272	F/ 1e-3/ 1e-5/ 2e-3/ 2e-4/ 1e-3/ 0/ 0/ F/ 1e-3/ 6e-4/ 4e-2/ 2e-2/ 3e-5/ 2e-2/ 0/ 1e-4/	F 2778 80 198 72 514 36 202 60 F 265 145 65 314 69 277 161 300	8e-2/1 F/ 6e-3/ 0/ 0/ 0/ 0/ 1e-4/ 0/ F/ 0/ 0/ 1/ 0/ 2e-2/ 0/ 8e-4/	7590 F 2304 400 641 153 1027 36 414 59 F 751 264 71 914 417 639 161 962
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	$\begin{array}{c} {\rm F} \\ 2.4{\rm e1} \\ -3.0{\rm e1} \\ 8.1{\rm e-1} \\ 1.4 \\ 3.1{\rm e2} \\ 2.5{\rm e-1} \\ 1.0 \\ 5.6 \\ {\rm F} \\ 3.8{\rm e1} \\ 1.0 \\ 9.5 \\ 1.5{\rm e-7} \\ 4.0{\rm e-2} \\ -2.3{\rm e1} \\ 1.0 \\ 0.6 \\ 0 \\ 1.0 \end{array}$	F/ 1e-2/ 1e-3/ 3e-3/ 1e-3/ 0/ 1e-3/ 0/ F/ 1e-3/ 2e-3/ 3e-5/ 9e-2/ 0/ 7e-3/ 0/ 7e-3/	F 1182 55 180 59 560 36 43 59 F 264 88 69 279 69 279 69 244 160 281 27	F/ 3e-3/ 1e-5/ 2e-3/ 3e-3/ 1e-3/ 4e-5/ 7e-5/ 0/ F/ 1e-3/ 4e-2/ 5e-2/ 3e-5/ 5e-3/ 0/ 8e-3/ 0/	F 1702 555 195 64 512 212 212 59 F 263 119 64 313 69 325 165 306 27	F/ 2e-2/ 1e-5/ 3e-3/ 1e-3/ 0/ 1e-3/ 0/ F/ 1e-3/ 2e-3/ 5e-2/ 4e-2/ 3e-5/ 1e-1/ 0/ 6e-3/ 0/	F 1256 55 179 60 622 36 44 59 F 250 88 8 70 290 69 228 161 290 229	0/ 1e-5/ 2e-3/ 3e-3/ 1e-3/ 6e-5/ 6e-3/ 0/ F/ 1e-3/ 4e-3/ 4e-2/ 0/ 3e-5/ 0/ 0/ 0/ 0/	1650 56 194 604 177 260 59 F 240 119 65 215 71 325 165 303 27	1e-2/ 1e-5/ 3e-3/ 1e-3/ 0/ 1e-3/ 0/ F/ 1e-3/ 2e-3/ 3e-5/ 7e-2/ 0/ 7e-3/ 0/ 7e-3/ 0/	1115 56 179 59 560 36 43 60 F 263 89 69 313 69 216 160 272 27	F/ 1e-3/ 1e-5/ 2e-3/ 2e-4/ 1e-3/ 0/ 0/ F/ 1e-3/ 6e-4/ 4e-2/ 2e-2/ 3e-5/ 2e-2/ 0/ 1e-4/ 0/	F 2778 80 198 72 514 36 202 60 F 265 145 65 314 69 277 161 300 27	8e-2/1 F/ 6e-3/ 0/ 0/ 0/ 0/ 0/ 1e-4/ 0/ F/ 0/ 0/ 0/ 1/ 0/ 2e-2/ 0/ 8e-4/ 0/	7590 F 2304 400 641 153 1027 366 414 59 F 751 264 71 914 417 639 161 962 27
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	F 2.4e1 -3.0e1 8.1e-1 1.4 3.1e2 2.5e-1 1.0 5.6 F 3.8e1 1.0 9.5 1.5e-7 4.0e-2 -2.3e1 1.0 6.0 1.0 0 -4.6	F/           1e-2/           1e-3/           3e-3/           1e-3/           0/           1e-3/           2e-3/           3e-5/           9e-2/           0/           7e-3/           0/           1e-3/           2e-3/           3e-5/           9e-2/           0/           7e-3/           0/           1e-1/	F 1182 55 180 59 560 36 43 59 F 264 88 69 279 69 244 160 281 227 139	F/ 3e-3/ 1e-5/ 2e-3/ 3e-3/ 1e-3/ 4e-5/ 7e-5/ 0/ F/ 1e-3/ 4e-2/ 5e-2/ 3e-5/ 5e-3/ 0/ 8e-3/ 0/ 9e-4/	F 1702 55 195 64 512 142 212 212 59 F 263 119 64 313 69 325 165 306 27 289	F/ 2e-2/ 1e-5/ 3e-3/ 1e-3/ 0/ 1e-3/ 0/ F/ 1e-3/ 2e-3/ 5e-2/ 4e-2/ 3e-5/ 1e-1/ 0/ 6e-3/ 0/ 1e-1/	F 1256 55 179 60 622 36 44 59 F 250 88 8 70 290 69 228 161 290 229 139	0/ 1e-5/ 2e-3/ 3e-3/ 1e-3/ 6e-5/ 6e-5/ 6e-3/ 0/ F/ 1e-3/ 4e-3/ 4e-2/ 0/ 3e-5/ 0/ 0/ 0/ 0/ 2e-3/	1650 56 194 64 604 177 260 59 F 240 119 65 215 71 325 165 303 27 242	1e-2/ 1e-5/ 3e-3/ 1e-3/ 0/ 1e-3/ 0/ F/ 1e-3/ 2e-3/ 3e-5/ 7e-2/ 0/ 7e-3/ 0/ 1e-1/	$\begin{array}{c} 1115 \\ 56 \\ 179 \\ 59 \\ 560 \\ 36 \\ 43 \\ 60 \\ F \\ 263 \\ 89 \\ 69 \\ 313 \\ 69 \\ 216 \\ 160 \\ 272 \\ 27 \\ 139 \end{array}$	F/           F/           1e-3/           1e-3/           2e-4/           1e-3/           0/           0/           0/           0/           6e-4/           2e-2/           3e-5/           2e-2/           0/           1e-4/           0/           6e-4/	F 2778 80 198 72 514 306 202 60 F 265 145 65 314 69 277 161 300 277 131	8e-2/1 F/ 6e-3/ 0/ 0/ 0/ 0/ 1e-4/ 0/ 1e-4/ 0/ 0/ F/ 0/ 0/ 2e-2/ 0/ 8e-4/ 0/ 0/	7590 F 2304 400 641 153 1027 36 414 417 751 264 71 914 417 639 161 962 27 537
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	$\begin{array}{c} {\rm F} \\ 2.4e1 \\ -3.0e1 \\ 8.1e-1 \\ 1.4 \\ 3.1e2 \\ 2.5e1 \\ 1.0 \\ 5.6 \\ {\rm F} \\ 3.8e1 \\ 1.0 \\ 9.5 \\ 1.5e-7 \\ 4.0e-2 \\ -2.3e1 \\ 1.0 \\ 6.0 \\ 1.0 \\ -4.6 \\ -7.2e-1 \end{array}$	F/           1e-2/           1e-3/           3e-3/           1e-3/           0/           1e-3/           0/           F/           1e-3/           2e-3/           3e-3/           3e-3/           9e-2/           0/           7e-3/           0/           1e-1/	F 1182 55 180 59 560 36 36 36 36 36 39 F 264 88 69 279 69 244 160 2241 281 281	F/ 3e-3/ 1e-5/ 2e-3/ 1e-3/ 4e-5/ 7e-5/ 0/ F/ 1e-3/ 4e-2/ 3e-5/ 5e-2/ 3e-5/ 5e-3/ 0/ 8e-3/ 0/ 9e-4/ 9e-4/	F 1702 55 195 64 512 212 212 212 59 F 263 119 64 313 69 325 165 306 27 289 181	F/ 2e-2/ 1e-5/ 3e-3/ 1e-3/ 0/ 1e-3/ 0/ F/ 1e-3/ 2e-3/ 4e-2/ 3e-5/ 1e-1/ 0/ 6e-3/ 0/ 1e-1/ 7e-1/	F 1256 55 179 60 622 36 44 59 F 250 70 290 69 228 161 290 228 161 290 27 139	0/ 1e-5/ 2e-3/ 3e-3/ 1e-3/ 6e-5/ 6e-5/ 0/ 1e-3/ 4e-3/ 4e-3/ 4e-2/ 0/ 3e-5/ 0/ 0/ 0/ 0/ 2e-3/ 0/ 0/ 2e-3/ 0/ 0/ 0/ 0/ 0/ 0/ 0/ 0/ 0/ 0	1650 566 194 644 604 177 260 59 F 240 119 655 215 215 5165 303 27 242 180	1e-2/ 1e-5/ 3e-3/ 1e-3/ 0/ 1e-3/ 0/ F/ 1e-3/ 2e-3/ 3e-5/ 7e-2/ 0/ 7e-3/ 0/ 1e-1/ 7e-1/	1115 56 179 59 560 36 43 60 7 263 89 69 313 69 216 160 272 277 139 81	F/           1e-3/           1e-5/           2e-3/           2e-4/           1e-3/           0/           0/           0/           0/           6e-4/           4e-2/           2e-3/           2e-2/           3e-5/           2e-2/           0/           1e-4/           0/           6e-4/	F 2778 80 198 72 514 36 60 F 265 145 65 314 69 277 161 300 277 131	8e-2/1 F/ 6e-3/ 0/ 0/ 0/ 0/ 1e-4/ 0/ 1/ 0/ 7 F/ 0/ 0/ 2e-2/ 0/ 8e-4/ 0/ 4e-1/	17590           F           2304           400           641           153           1027           36           414           59           751           264           71           914           417           639           161           962           27           537           1065
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	$\begin{array}{c} {\rm F} \\ 2.4e1 \\ -3.0e1 \\ 8.1e-1 \\ 1.4 \\ 3.1e2 \\ 2.5e-1 \\ 1.4 \\ 3.1e2 \\ 2.5e-1 \\ 5.6 \\ {\rm F} \\ 3.8e1 \\ 1.0 \\ 9.5 \\ 1.5e-7 \\ 4.0e-2 \\ -2.3e1 \\ 1.0 \\ 6.0 \\ 1.0 \\ -4.6 \\ -7.2e-1 \\ -1.0 \end{array}$	F/ 1e-2/ 1e-5/ 3e-3/ 3e-3/ 1e-3/ 0/ 1e-3/ 0/ 1e-3/ 2e-3/ 3e-5/ 2e-3/ 3e-5/ 9e-2/ 0/ 7e-3/ 0/ 1e-3/ 0/ 1e-3/ 1e-1/	F F 1182 55 180 59 560 36 43 59 F 264 88 89 279 69 279 69 244 160 281 139 881 57 57 58 58 58 59 59 59 59 59 59 59 59 59 59 59 59 59	F//3e-3/           3e-3//1e-5/           3e-3//1e-3/           1e-5//3e-3//7e-5/           7e-5//7e-5/           0/           F//4e-3/           3e-5//3e-5/           0//0/           9e-4/           9e-4/           9e-4/           9r-4/           9r-4/           9r-4/	F 1702 55 64 512 142 212 59 F F 263 119 64 313 69 325 306 325 306 27 289 181	F//           2e-2//           2e-2//           3e-3//           3e-3//           0/           1e-3//           0/           1e-3//           5e-2/           3e-5//           1e-1/           0//           1e-1//           7e-1//           7e-1//	F 1256 55 179 60 622 36 44 59 F 250 88 70 290 69 228 161 290 27 139 83 83 F	0/ 1e-5/ 2e-3/ 3e-3/ 1e-3/ 6e-5/ 6e-3/ 0/ F/ 1e-3/ 4e-2/ 0/ 3e-5/ 0/ 0/ 0/ 0/ 0/ 2e-3/ 0/ 8e-4/ 8e-4/	1650 566 194 644 604 177 260 59 F 240 119 655 2155 2155 303 215 303 27 242 180 1429	1e-2/ 1e-5/ 3e-3/ 3e-3/ 1e-3/ 0/ F/ 1e-3/ 2e-3/ 5e-2/ 2e-3/ 7e-2/ 0/ 7e-3/ 0/ 1e-1/ 2e-3/	1115 56 179 59 560 36 43 60 7 F 7 263 89 69 313 69 216 160 272 272 277 139 81	F/ 1e-3/ 1e-3/ 2e-4/ 1e-3/ 0/ 0/ 0/ 0/ F/ 1e-3/ 6e-4/ 4e-2/ 2e-2/ 3e-5/ 2e-2/ 0/ 1e-4/ 0/ 6e-4/ 1e-3/ 2e-2/ 3e-5/ 2e-2/ 3e-5/ 2e-2/ 3e-5/ 2e-2/ 3e-5/ 2e-2/ 3e-5/ 2e-2/ 3e-5/ 2e-2/ 2e-2/ 3e-5/ 2e-2/ 3e-5/ 2e-2/ 2e-2/ 3e-5/ 2e-2/ 2e-2/ 3e-5/ 2e-2/ 2e-2/ 2e-2/ 2e-2/ 2e-2/ 2e-2/ 2e-2/ 2e-2/ 2e-2/ 2e-2/ 2e-2/ 2e-2/ 2e-2/ 2e-2/ 2e-2/ 2e-2/ 2e-2/ 2e-2/ 2e-3/	F 2778 2778 80 198 72 514 36 202 60 F F 265 5 314 65 314 69 277 161 300 277 131 113	8e-2/1           F/           6e-3/           0/           8e-4/           0/           0/           4e-1/           0/	17590           F           2304           400           641           1533           1027           36           414           59           F           751           264           417           639           161           962           27           537           1065           3417
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	$\begin{array}{c} F\\ 2.4e1\\ -3.0e1\\ 8.1e-1\\ 1.4\\ 3.1e2\\ 2.5e-1\\ 1.0\\ 5.6\\ F\\ 3.8e1\\ 1.0\\ 9.5\\ 1.5e-7\\ 4.0e-2\\ -2.3e1\\ 1.0\\ 6.0\\ 0\\ 1.0\\ -4.6\\ -7.2e-1\\ -1.0\\ 0\\ -2.5e-1 \end{array}$	F/           le-2/           le-3/           3e-3/           le-3/           0/           le-3/           0/           le-3/           0/           le-3/           0/           le-3/           0/           le-3/           0/           se-3/           3e-3/           3e-3/           3e-3/           3e-3/           3e-3/           3e-3/           3e-3/           3e-3/           9e-2/           0/           7e-3/           0/           1e-1/           7e-1/           F/           F/	F 1182 55 180 59 560 36 43 59 F 264 88 88 264 88 160 281 139 279 9 279 81 139 81 139 57 57 57 57 57 57 57 57 59 59 59 59 59 59 59 59 59 59 59 59 59	F/           3e-3/           3e-3/           2e-3//3e-3/           4e-5/           7e-5/           0/           1e-3/           4e-2/           5e-2//           3e-3/           3e-3/           1e-3/           4e-3/           5e-2//           3e-3/           0/           9e-4//           0/           9e-4//           F/           e-7/	F 1702 55 64 512 142 212 259 F F 263 119 64 313 69 325 165 306 306 59 165 306 77 289 181 F F	$\begin{array}{c} F/\\ 2e-2/\\ 3e-3/\\ 3e-3/\\ 1e-3/\\ 0/\\ 1e-3/\\ 0/\\ 1e-3/\\ 2e-3/\\ 3e-5/\\ 1e-1/\\ 0/\\ 0/\\ 1e-1/\\ 7e-1/\\ F/\\ 0/\\ \end{array}$	F 1256 55 179 60 622 36 44 55 70 290 69 228 80 290 69 228 161 290 228 161 290 69 228 161 290 57 57 57 57 57 57 57 57 57 57 57 57 57	0/ 1e-5/ 2e-3/ 3e-3/ 1e-3/ 6e-5/ 6e-5/ 0/ F/ 1e-3/ 4e-3/ 4e-2/ 0/ 3e-5/ 0/ 0/ 0/ 2e-3/ 0/ 8e-4/ F/	1650 566 194 604 177 260 59 F F 240 119 65 215 71 325 71 325 303 303 27 242 180 1429 F	$\begin{array}{c} 1e\text{-}2/\\ 1e\text{-}5/\\ 3e\text{-}3/\\ 3e\text{-}3/\\ 1e\text{-}3/\\ 1e\text{-}3/\\ 1e\text{-}3/\\ 1e\text{-}3/\\ 1e\text{-}3/\\ 1e\text{-}3/\\ 2e\text{-}3/\\ 7e\text{-}2/\\ 2e\text{-}3/\\ 7e\text{-}2/\\ 0/\\ 7e\text{-}3/\\ 1e\text{-}1/\\ 1e\text{-}1/\\ 7e\text{-}1/\\ 7e\text{-}1/\\ 2e\text{-}3/\\ 8e\text{-}4/\\ \end{array}$	$\begin{array}{c} 1115\\ 56\\ 179\\ 59\\ 59\\ 36\\ 43\\ 60\\ F\\ 263\\ 89\\ 69\\ 216\\ 160\\ 272\\ 27\\ 139\\ 81\\ 118\\ 432\\ \end{array}$	F/ 1e-3/ 1e-5/ 2e-4/ 1e-3/ 0/ 0/ F/ 1e-3/ 6e-4/ 4e-2/ 2e-2/ 3e-5/ 2e-2/ 0/ 1e-4/ 4e-2/ 2e-2/ 0/ 2e-2/	F         2778           2078         80           198         92           514         36           202         60           F         65           145         314           69         277           161         300           277         1314           113         125           441680         275	8e-2/1 F/ 6e-3/ 0/ 0/ 0/ 1e-4/ 0/ 7/ F/ 0/ 0/ 1/ 0/ 2e-2/ 8e-4/ 0/ 0/ 2e-2/ 0/ 3e-4/	17590           F           2304           400           641           153           1027           36           414           59           751           264           71           914           417           639           1065           3417           965
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	F 2.4e1 -3.0e1 8.1e-1 1.4 3.1e2 2.5e1 1.00 5.6 F 3.8e1 1.00 9.5 1.5e-7 4.0e-2 -2.3e1 1.00 6.00 1.00 -4.6 -7.2e-1 -1.00 -2.5e-1 1.4e1	$\begin{array}{c} F/\\ 1e-2/\\ 1e-5/\\ 3e-3/\\ 3e-3/\\ 1e-3/\\ 1e-3/\\ 0/\\ 1e-3/\\ 0/\\ F/\\ 1e-3/\\ 2e-3/\\ 9e-2/\\ 3e-5/\\ 0/\\ 7e-3/\\ 0/\\ 1e-1/\\ 7e-1/\\ F/\\ 7e-1/\\ F/\\ 2e-2/\\ 2e-2/\\ \end{array}$	F F 1182 555 560 36 36 36 43 59 F 264 88 88 69 279 244 160 281 139 81 160 77 58 57 57 57 57 57 57 57 57 57 57 50 50 50 50 50 50 50 50 50 50 50 50 50	F//3e-3/           3e-3/2e-3/           2e-3/2e-3/           3e-3/2e-3/           1e-3/2e-3/           1e-3/2e-3/           1e-3/2e-3/           0/7e-5/2e-3/           3e-5/2e-3/           0/7e-5/2e-3/           0/2e-3/2e-3/           0/2e-3/2e-3/           0/2e-3/2e-3/2e-3/           0/2e-3/2e-3/2e-3/           0/2e-3/2e-3/2e-3/2e-3/           0/2e-3/2e-3/2e-3/2e-3/2e-3/           0/2e-3/2e-3/2e-3/2e-3/2e-3/2e-3/2e-3/2e-3	F 1702 55 195 64 512 212 212 212 212 212 59 F 263 313 69 325 306 27 289 306 277 289 3181 F F 5 806 5 77 5 89 5 77 289 5 77 5 70 5 70 5 70 5 70 70 70 70 70 70 70 70 70 70 70 70 70	F//           2e-2/           2e-2//           3e-3//           3e-3//           1e-3//           1e-3//           1e-3//           1e-3//           5e-2//           3e-5//           3e-5//           1e-1//           0/           1e-1//           7e-1//           7e-1//           2e-2//	F 1256 55 179 60 622 36 44 4 59 59 F F 250 88 88 70 290 69 228 161 290 69 228 161 139 83 77 73 9 83 75 9 430 294	0/1e-5/ 1e-5/ 2e-3/ 1e-3/ 6e-5/ 6e-5/ 0/ 1e-3/ 1e-3/ 1e-3/ 0/ 0// 0// 0// 0// 0// 0// 0/	1650           56           194           64           604           177           260           59           F           240           119           65           215           165           303           27           242           180           1429           F           310	$\begin{array}{c} 1e\text{-}2/\\ 1e\text{-}5/\\ 3e\text{-}3/\\ 3e\text{-}3/\\ 1e\text{-}3/\\ 0/\\ 1e\text{-}3/\\ 0/\\ 1e\text{-}3/\\ 1e\text{-}3/\\ 0/\\ 1e\text{-}3/\\ 2e\text{-}3/\\ 2e\text{-}3/\\ 7e\text{-}2/\\ 0/\\ 7e\text{-}3/\\ 0/\\ 1e\text{-}1/\\ 1e\text{-}1/\\ 2e\text{-}3/\\ 2e\text{-}2/\\ 2e\text{-}2/\\$	1115 56 179 59 560 36 43 60 F 7 263 89 69 313 313 69 216 160 272 277 139 81 118 432 299	$\begin{array}{c} {\rm F}//{\rm le}{\rm -}3/{\rm le}{\rm -}5/{\rm le}{\rm -}3/{\rm le}{\rm -}5/{\rm le}{\rm -}3/{\rm le}{\rm le}{\rm -}3/{\rm le}{\rm le}{\rm -}3/{\rm le}{\rm le}{$	F 2778 2778 80 198 72 72 514 36 202 202 60 0 F F F 5 145 65 314 69 277 161 300 277 131 113 1125 41680 368	8e-2/1           F/           6e-3/           0/           0/           0/           0/           0/           0/           0/           0//	7590           F           2304           400           641           153           1027           36           414           59           751           264           71           914           417           914           417           962           27           537           1065           3417           965           1034
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	F 2.4e1 -3.0e1 8.1e-1 1.4 3.1e2 2.5e1 1.0 5.6 F 3.8e1 1.0 9.5 1.5e-7 4.0e-2 -2.3e1 1.0 6.0 1.0 -4.6 -7.2e-1 -1.0 -2.5e1 1.4e1	F/           1e-2/           1e-3/           3e-3/           3e-3/           1e-3/           0/           F//           1e-3/           0/           F//           1e-3/           0/           F//           5e-2/           2e-3//           9e-2/           0/           7e-3/           0/           7e-1/           F//           F/           2e-2/           2e-3/	$\begin{array}{c} {\rm F} \\ 1182 \\ 555 \\ 180 \\ 59 \\ 560 \\ 36 \\ 43 \\ 37 \\ 57 \\ 79 \\ 69 \\ 244 \\ 160 \\ 281 \\ 160 \\ 281 \\ 160 \\ 281 \\ 160 \\ 81 \\ {\rm F} \\ {\rm F} \\ {\rm F} \\ {\rm F} \\ 299 \\ 509 \\ 509 \\ \end{array}$	F//3e-3/           3e-3//3e-3/           2e-3//3e-3/           2e-3//3e-3/           1e-3//1e-3/           1e-3//1e-3/           1e-3//5e-2/           3e-3//5e-3/           0//1e-3//5e-3/           0//9e-4//9e-4/           9e-4//F//4e-3/           4e-3//0/	F 1702 55 195 512 142 212 259 F 263 313 69 325 165 306 27 289 181 F F 408 683	F//2e-2/           2e-2/           3e-3/3/3e-3/           3e-3/3/3e-3/           1e-3/           0/           1e-3/           0/           1e-3/           0/           1e-3/           0/           1e-3/           5e-2/           3e-5/3           3e-5/3           1e-1/           0/           1e-1/           7e-1/           F/           0/           2e-2/           8e-3/	F 1256 55 179 60 622 36 44 59 F 250 88 8 8 8 8 70 290 290 69 228 161 290 27 139 83 5 F 430 294 378	$\begin{array}{c} 0 \\ 0 \\ 1 \\ 1 \\ e \\ 5 \\ 3 \\ e \\ 3 \\ e \\ 3 \\ e \\ 3 \\ e \\ 5 \\ 1 \\ e \\ 3 \\ e \\ 5 \\ 1 \\ e \\ 3 \\ e \\ 5 \\ 1 \\ e \\ 5 \\ 1 \\ e \\ 1 \\ e \\ 1 \\ e \\ 1 \\ 1 \\ e \\ 1 \\ 1$	1650           56           194           64           604           177           260           59           F           240           119           65           215           165           303           27           242           180           1429           F           310           844	$\begin{array}{c} 1e{-}2/\\ 1e{-}5/\\ 3e{-}3/\\ 3e{-}3/\\ 1e{-}3/\\ 1e{-}3/\\ 1e{-}3/\\ 1e{-}3/\\ 1e{-}3/\\ 2e{-}3/\\ 2e{-}3/\\ 2e{-}3/\\ 7e{-}2/\\ 0/\\ 7e{-}3/\\ 1e{-}1/\\ 7e{-}1/\\ 2e{-}3/\\ 1e{-}3/\\ 1$	$\begin{array}{c} 1115\\ 56\\ 179\\ 59\\ 560\\ 36\\ 43\\ 60\\ F\\ 7\\ 263\\ 89\\ 9\\ 313\\ 69\\ 216\\ 160\\ 272\\ 27\\ 139\\ 81\\ 118\\ 432\\ 229\\ 9\\ 487\\ \end{array}$	F/           le-3/           le-3/           le-3/           le-3/           2e-4/           0/           0/           0// <td>F         2778           2078         80           198         72           514         36           202         60           60         72           145         65           314         69           277         161           300         27           131         113           1125         14680           368         874</td> <td>8e-2/1 F// 6e-3// 0// 0// 0// 1e-4// 0// 1/- 6// 0// 0// 2e-2// 0// 0// 2e-2// 0// 3e-4// 0// 0// 5// 0// 0// 0// 0// 0</td> <td>7590 F 2304 400 641 153 1027 366 414 759 F 751 751 751 751 71 914 417 639 914 417 639 161 914 916 537 7537 1065 3417 534 75 537 7 54 7 54</td>	F         2778           2078         80           198         72           514         36           202         60           60         72           145         65           314         69           277         161           300         27           131         113           1125         14680           368         874	8e-2/1 F// 6e-3// 0// 0// 0// 1e-4// 0// 1/- 6// 0// 0// 2e-2// 0// 0// 2e-2// 0// 3e-4// 0// 0// 5// 0// 0// 0// 0// 0	7590 F 2304 400 641 153 1027 366 414 759 F 751 751 751 751 71 914 417 639 914 417 639 161 914 916 537 7537 1065 3417 534 75 537 7 54 7 54
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	$\begin{array}{c} {\rm F} \\ 2.4e1 \\ -3.0e1 \\ 8.1e-1 \\ 1.4 \\ 3.1e2 \\ 2.5e-1 \\ 1.4 \\ 3.1e2 \\ 2.5e-1 \\ 1.4 \\ 3.1e2 \\ 2.5e-1 \\ 1.0 \\ 5.6 \\ {\rm F} \\ 3.8e1 \\ 1.0 \\ 9.5 \\ 1.5e-7 \\ 4.0e-2 \\ -2.3e1 \\ 1.0 \\ 0 \\ 6.0 \\ 1.0 \\ -4.6 \\ -7.2e-1 \\ 1.4e1 \\ -4.4e1 \\ 1.1e-3 \\ \end{array}$	$\begin{array}{c} F/\\ 1e-2/\\ 1e-5/\\ 1e-3/\\ 3e-3/\\ 3e-3/\\ 3e-3/\\ 1e-3/\\ 0/\\ F/\\ 1e-3/\\ 2e-3/\\ 2e-3/\\ 2e-3/\\ 2e-3/\\ 0/\\ 7e-3/\\ 0/\\ 7e-3/\\ 0/\\ 1e-1/\\ F/\\ F/\\ F/\\ F/\\ 2e-2/\\ 4e-2/\\ 4e-2/\\ \end{array}$	F 1182 555 59 560 36 43 59 560 279 264 88 69 279 244 160 281 139 81 57 F F F F 509 9438	$\begin{array}{c} F'\\ 3e-3/\\ 3e-3/\\ 3e-3/\\ 3e-3/\\ 3e-3/\\ 3e-3/\\ 1e-3/\\ 4e-5/\\ 7e-5/\\ 0/\\ F'/\\ Fe-3/\\ 3e-5/\\ 0/\\ 9e-4/\\ 9e-4/\\ F'/\\ F'/\\ F'/\\ 4e-3/\\ 0/\\ 0/\\ 3e-2/\\ 0/\\ 3e-2/\\ 0 \end{array}$	F 1702 55 195 512 142 212 59 F 263 119 64 313 69 325 165 306 27 289 181 F F F 408 8683 621	$\begin{array}{c} F'\\ 2e-2/\\ 2e-2/\\ 1e-5/\\ 3e-3/\\ 3e-3/\\ 3e-3/\\ 1e-3/\\ 1e-3/\\ 1e-3/\\ 1e-3/\\ 0/\\ F/\\ F-3/\\ 2e-3/\\ 1e-3/\\ 1e-3/\\ 1e-1/\\ F/\\ 1e-1/\\ F/\\ 0/\\ 1e-1/\\ F/\\ 2e-2/\\ 1e-1/\\ 1e-$	F 1256 555 179 600 622 366 44 599 F 7 2500 69 2288 700 2900 69 2288 161 2900 290 277 139 833 F 7 4300 83 F 7 4300 833 F 7 294 4378 835	$\begin{array}{c} 0/\\ 1e{-}5/\\ 2e{-}3/\\ 3e{-}5/\\ 6e{-}5/\\ 6e{-}5/\\ 6e{-}5/\\ 6e{-}5/\\ 6e{-}5/\\ 6e{-}5/\\ 1e{-}3/\\ 4e{-}2/\\ 0/\\ 1e{-}3/\\ 0/\\ 0/\\ 0/\\ 0/\\ 0/\\ 0/\\ 0/\\ 0/\\ 0/\\ 0$	1650 56 194 64 64 177 260 59 F 240 119 65 215 71 325 165 303 303 27 242 1429 F 1429 5 303 303 27 242 1429 5 303 303 303 27 2420 149 5 303 303 27 2420 149 5 303 303 27 2420 149 5 303 303 27 2420 149 5 303 303 27 2420 149 5 5 5 5 5 5 5 5 5 5 5 5 5	$\begin{array}{c} 1e{-}2/\\ 1e{-}5/\\ 3e{-}3/\\ 3e{-}3/\\ 1e{-}3/\\ 1e{-}3/\\ 1e{-}3/\\ 1e{-}3/\\ 1e{-}3/\\ 1e{-}3/\\ 2e{-}3/\\ 1e{-}3/\\ 2e{-}3/\\ 0/\\ 7e{-}3/\\ 2e{-}3/\\ 1e{-}1/\\ 2e{-}3/\\ 2e{-}2/\\ 1e{-}3/\\ 1e{-}1/\\ 1$	$\begin{array}{c} 1115\\ 56\\ 179\\ 59\\ 560\\ 36\\ 43\\ 36\\ 69\\ 69\\ 69\\ 69\\ 313\\ 69\\ 69\\ 216\\ 160\\ 272\\ 27\\ 139\\ 81\\ 118\\ 432\\ 299\\ 81\\ 118\\ 443\\ 229\\ 487\\ 405\\ \end{array}$	F/           1e-5/           2e-3/           2e-3/           2e-3/           0/	F 2778 80 198 72 514 36 202 514 72 514 36 55 314 69 277 161 300 277 131 113 125 41680 368 874 F	8e-2/1           F//6e-3/           0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           8e-4//0/           0//0/           3e-4//0/           0//0/           7/2e-2//	$\begin{array}{r} 7590\\ F\\ 2304\\ 400\\ 641\\ 153\\ 1027\\ 36\\ 414\\ 59\\ F\\ 751\\ 264\\ 711\\ 914\\ 417\\ 914\\ 417\\ 962\\ 277\\ 1065\\ 3417\\ 1065\\ 3417\\ 1065\\ 51034\\ F\\ F\\ 686\\ \end{array}$
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	$\begin{array}{c} {\rm F} \\ 2.4e1 \\ -3.0e1 \\ 8.1e-1 \\ 1.4 \\ 3.1e2 \\ 2.5e-1 \\ 1.0 \\ 5.6 \\ {\rm F} \\ 3.8e1 \\ 1.0 \\ 9.5 \\ 1.5e-7 \\ 4.0e-2 \\ -2.3e1 \\ 1.0 \\ 6.0 \\ 1.0 \\ 6.0 \\ 1.0 \\ -4.6 \\ -7.2e-1 \\ 1.4e1 \\ 1.4e1 \\ 1.4e3 \\ 3.4e-6 \end{array}$	$\begin{array}{c} F/\\ 1e-2/\\ 1e-5/\\ 3e-3/\\ 3e-3/\\ 0/\\ 1e-3/\\ 0/\\ F/\\ 1e-3/\\ 0/\\ F/\\ 2e-3/\\ 0/\\ F/\\ 2e-3/\\ 0/\\ 1e-1/\\ 7e-1/\\ F/\\ 7e-1/\\ F/\\ 2e-2/\\ 2e-3/\\ 4e-2/\\ 1/z(2e-3/) (4e-2) (4e$	$\begin{array}{c} {\rm F} \\ 1182 \\ 555 \\ 180 \\ 59 \\ 560 \\ 366 \\ 433 \\ 59 \\ {\rm F} \\ 264 \\ 88 \\ 69 \\ 279 \\ 69 \\ 244 \\ 160 \\ 281 \\ 160 \\ 281 \\ 160 \\ 281 \\ {\rm F} \\ {\rm F} \\ {\rm F} \\ {\rm F} \\ 299 \\ 509 \\ 509 \\ 438 \\ 81915 \end{array}$	F//3e-3/           1e-5/           3e-3/           3e-3/           3e-3/           3e-3/           3e-3/           4e-5/           0/           F//           5e-2/           0/           5e-3/           0/           9e-4/           9/           F/           9/           4e-3/           0/           F/           9e-4/           9e-4/           9e-4/           9e-4/           9e-2/           1/	$\begin{array}{c} {\rm F} \\ 1702 \\ 555 \\ 1955 \\ 64 \\ 512 \\ 212 \\ 212 \\ 212 \\ 599 \\ 64 \\ 313 \\ 69 \\ 325 \\ 165 \\ 306 \\ 277 \\ 289 \\ 181 \\ {\rm FF} \\ {\rm FF} \\ {\rm FF} \\ {\rm F} \\ {$	F//           F//           2e-2//           1e-5//           3e-3//           0/           1e-3//           0//           1e-3//           2e-3//           3e-5//           3e-5//           1e-3//           1e-3//           1e-3//           1e-1//           6e-3//           0/           1e-1//           2e-2//           2e-2//           3e-3//           3e-3//	F 1256 555 179 600 622 36 622 36 44 59 F 70 290 290 290 290 290 290 290 290 290 29	$\begin{array}{c} 0\\ 0\\ 0\\ 1\\ 1\\ 1\\ 1\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\$	1650           194           64           604           177           260           59           F           240           119           65           215           215           71           325           165           303           27           242           180           1429           F           3100           844           625           491	$\begin{array}{c} 1e{-}2/\\ 1e{-}5/\\ 3e{-}3/\\ 1e{-}3/\\ 0/\\ 1e{-}3/\\ 0/\\ 1e{-}3/\\ 0/\\ 1e{-}3/\\ 0/\\ 1e{-}3/\\ 2e{-}3/\\ 2e{-}3/\\ 0/\\ 1e{-}1/\\ 7e{-}1/\\ 2e{-}3/\\ 0/\\ 1e{-}1/\\ 1e{-}2/\\ 1e{-}3/\\ 1e{-}1/\\ 1e{-}2/\\ 1e{-}1/\\ 1e{-}1/\\ 1e{-}2/\\ 1e{-}1/\\ 1e{-}1/\\$	$\begin{array}{c} 1115\\ 56\\ 57\\ 59\\ 59\\ 560\\ 36\\ 43\\ 36\\ 69\\ 263\\ 89\\ 99\\ 216\\ 69\\ 216\\ 69\\ 216\\ 160\\ 272\\ 27\\ 27\\ 139\\ 81\\ 18\\ 432\\ 299\\ 81\\ 118\\ 432\\ 299\\ 81\\ 118\\ 432\\ 299\\ 611\\ 18\\ 56\\ 611\\ 18\\ 18\\ 18\\ 18\\ 18\\ 18\\ 18\\ 18\\ 18\\ $	$\begin{array}{c} {\rm F}//{\rm Ie}{\rm -}3/{\rm Ie}{\rm -}5/{\rm Ie}{\rm -}5/{\rm Ie}{\rm -}5/{\rm Ie}{\rm -}5/{\rm Ie}{\rm -}3/{\rm Ie}{\rm -}2/{\rm Ie}{\rm -}3/{\rm Ie}{\rm Ie$	$\begin{array}{c} {\rm F} \\ {\rm 800} \\ {\rm 198} \\ {\rm 800} \\ {\rm 722} \\ {\rm 514} \\ {\rm 366} \\ {\rm 2020} \\ {\rm 600} \\ {\rm 600} \\ {\rm FF} \\ {\rm 665} \\ {\rm 314} \\ {\rm 655} \\ {\rm 314} \\ {\rm 699} \\ {\rm 277} \\ {\rm 161} \\ {\rm 3000} \\ {\rm 277} \\ {\rm 161} \\ {\rm 133} \\ {\rm 100} \\ {\rm 277} \\ {\rm 161} \\ {\rm 113} \\ {\rm 113} \\ {\rm 113} \\ {\rm 1125} \\ {\rm 1416800} \\ {\rm 3688} \\ {\rm 874} \\ {\rm 874} \\ {\rm FF} \\ {\rm F} \end{array}$	8e-2/1           F//6e-3//           0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           3e-4//0/           0//0/           3e-4//0/           0//0/           2e-2//0/           0//0/           3e-4//0/           0//0/           2e-2//0/	17590           F           2304           2304           400           641           153           1027           36           414           59           751           264           71           914           71           914           417           639           161           962           27           537           1065           3417           965           1034           F           686           453
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	$\begin{array}{c} {\rm F} \\ 2.4e1 \\ -3.0e1 \\ 8.1e-1 \\ 1.4 \\ 3.1e2 \\ 2.5e1 \\ 1.0 \\ 5.6 \\ {\rm F} \\ 3.8e1 \\ 1.0 \\ 9.5 \\ 1.5e-7 \\ 4.0e-2 \\ -2.3e1 \\ 1.0 \\ 6.0 \\ -2.3e1 \\ 1.0 \\ -2.4e1 \\ 1.0 \\ -4.6 \\ -7.2e-1 \\ 1.4e1 \\ -4.4e1 \\ 1.1e-3 \\ 3.4e-6 \\ -3.5 \\ \end{array}$	F/           1e-2/           1e-2/           3e-3/           0/           1e-3/           0/           1e-3/           0/           1e-3/           0/           1e-3/           0/           1e-3/           0/           1e-3/           1e-3/           1e-3/           1e-3/           1e-3/           1e-3/           1e-3/           1/7e-1/	$\begin{array}{c} {\rm F} \\ 1182 \\ 515 \\ 59 \\ 560 \\ 366 \\ 43 \\ 59 \\ {\rm FF} \\ 264 \\ 88 \\ 69 \\ 279 \\ 244 \\ 160 \\ 281 \\ 160 \\ 281 \\ 160 \\ 811 \\ {\rm FF} \\ {\rm FF} \\ 299 \\ 509 \\ 438 \\ 1915 \\ 140 \end{array}$	F/           Se-3/           1e-5/           2e-3/-3           3e-3/           1e-5/           7e-5/           0/           F//           1e-3/           1e-3/           7e-5/           5e-2/           3e-5/           0/           9e-4/           9e-4/           F//           4e-3/           0//           3e-2/	F 1702 55 195 64 512 212 212 59 F F 263 119 64 313 306 325 165 306 277 289 306 277 289 181 F F F 408 868 362 171 9 5 5 5 6 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	$\begin{array}{c} {\rm F}//{\rm Ie}{\rm -5}/{\rm Ie}{\rm -1}/{\rm I$	F F 1256 555 179 60 622 36 44 59 70 290 290 228 83 70 290 228 161 290 27 139 298 335 F 430 294 378 598 140	$\begin{array}{c} 0\\ 0\\ 0\\ 1e-5\\ 2e-3\\ 3e-3\\ 1e-3\\ 3e-3\\ 1e-3\\ 1e-3\\ 1e-3\\ 1e-3\\ 1e-3\\ 1e-3\\ 1e-3\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\$	1650 56 194 64 604 177 260 59 F 240 119 65 215 711 325 303 277 242 303 277 242 180 1429 F 310 844 64 491 F 5 5 5 5 5 5 5 5 5 5 5 5 5	$\begin{array}{c} 1e-2/\\ 1e-5/\\ 3e-3/\\ 3e-3/\\ 1e-3/\\ 1e-3/\\ 1e-3/\\ 1e-3/\\ 1e-3/\\ 0/\\ 1e-3/\\ 1e-3/\\ 0/\\ 1e-3/\\ 1e-3/\\ 0/\\ 1e-3/\\ 1e-3/\\ 1e-3/\\ 1e-1/\\ 1e-1/\\ 1e-2/\\ 1e-1/\\ 1e-2/\\ 7e-1/\\ \end{array}$	$\begin{array}{c} 1115\\ 56\\ 57\\ 59\\ 59\\ 59\\ 36\\ 43\\ 36\\ 69\\ 216\\ 160\\ 272\\ 277\\ 139\\ 81\\ 18\\ 432\\ 299\\ 487\\ 405\\ 611\\ 140\\ \end{array}$	F/           Ie-3/           Ie-3/           2e-3/           O/           0/           0/           0/           0/           0/           0//      <	$\begin{array}{c} {\rm F} \\ 2778 \\ 80 \\ 198 \\ 72 \\ 514 \\ 36 \\ 202 \\ 514 \\ 36 \\ 60 \\ {\rm F} \\ {\rm F} \\ 265 \\ 314 \\ 69 \\ 277 \\ 161 \\ 300 \\ 277 \\ 161 \\ 300 \\ 277 \\ 131 \\ 113 \\ 300 \\ 277 \\ 131 \\ 113 \\ 300 \\ 277 \\ 131 \\ 133 \\ 874 \\ {\rm F} \\ {\rm$	8e-2/1           F/           6e-3/           0/           0/           0/           0/           0/           0/           0/           0//	17590           F           2304           2304           400           641           153           1027           36           414           59           F           751           264           71           914           71           639           161           965           1034           F           6866           453           3074
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	$\begin{array}{c} {\rm F} \\ 2.4e1 \\ -3.0e1 \\ 8.1e-1 \\ 1.4 \\ 3.1e2 \\ 2.5e1 \\ 1.4 \\ 3.1e2 \\ 2.5e1 \\ 1.4 \\ 1.0 \\ 5.6 \\ {\rm F} \\ 3.8e1 \\ 1.0 \\ 9.5 \\ 1.5e-7 \\ 4.0e-2 \\ -2.3e1 \\ 1.0 \\ 6.0 \\ 1.0 \\ -2.3e1 \\ 1.0 \\ 6.0 \\ 1.0 \\ -4.6 \\ -7.2e-1 \\ -1.0 \\ -4.4e1 \\ 1.4e1 \\ 1.4e3 \\ 3.4e-6 \\ -3.5 \\ 3.1e-2 \end{array}$	$\begin{array}{c} {\rm F}/\\ {\rm Ie-2}/\\ {\rm Ie-3}/\\ {\rm 3e-3}/\\ {\rm Je-3}/\\ {\rm Je-3}/\\ {\rm 3e-3}/\\ {\rm 3e-5}/\\ {\rm 3e-5$	F 1182 55 59 560 36 43 59 F 264 88 88 88 88 69 279 69 244 160 281 277 81 39 81 81 50 9 81 39 509 438 831915 140 0 55	F/           Se-3/           3e-3/           3e-3/           3e-3/           3e-3/           3e-3/           3e-3/           3e-3/           7e-5/           0/           F/           5e-2/           0/           3e-3/           5e-2/           5e-3/           0/           9e-4/           9e-6/	F 1702 555 64 512 142 212 259 F 263 119 623 305 165 306 63 305 165 306 69 325 165 306 69 325 7 289 181 F F 408 683 621 F F 5 7 289 181 5 7 5 7 5 7 5 7 5 7 5 7 5 7 5 7 5 7 5	$\begin{array}{c} F/\\ 2e-2/\\ 1e-5/\\ 2e-2/\\ 1e-3/\\ 3e-3/\\ 3e-3/\\ 3e-3/\\ 1e-3/\\ 1e-3/\\ 1e-3/\\ 1e-3/\\ 1e-3/\\ 1e-3/\\ 1e-3/\\ 1e-3/\\ 1e-1/\\ 1e-1/\\ 1e-1/\\ 1e-1/\\ 7e-1/\\ 7e-1/\\ 1e-1/\\ 7e-1/\\ 2e-2/\\ 2e-2/\\ 1e-1/\\ 1e-1/\\ 7e-1/\\ 7e-1/\\ 1e-1/\\ 7e-1/\\ 1e-1/\\ 7e-1/\\ 7e-1/\\ 1e-1/\\ 7e-1/\\ 1e-1/\\ 7e-1/\\ 1e-1/\\ 7e-1/\\ 1e-1/\\ 7e-1/\\ 1e-1/\\ 7e-1/\\ 1e-1/\\ 1e-1/$	F 1256 555 179 60 622 36 44 59 7 F 50 290 290 290 290 290 290 290 290 290 29	$\begin{array}{c} 0\\ 0\\ 0\\ 1\\ e^{-5}\\ 2e^{-3}\\ 1e^{-3}\\ 2e^{-3}\\ 1e^{-3}\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\$	$\begin{array}{c} 1650\\ 56\\ 194\\ 64\\ 177\\ 260\\ 59\\ F\\ 240\\ 119\\ 65\\ 215\\ 215\\ 215\\ 165\\ 303\\ 303\\ 17\\ 180\\ 1429\\ F\\ 310\\ 844\\ 625\\ 491\\ F\\ F\\ 566\\ \end{array}$	$\begin{array}{c} 1e-2/\\ 1e-5/\\ 3e-3/\\ 1e-3/\\ 0/\\ 1e-3/\\ 1e-3/\\ 0/\\ 1e-3/\\ 1e-3/\\ 1e-3/\\ 2e-3/\\ 2e-3/\\ 2e-3/\\ 0/\\ 7e-3/\\ 0/\\ 7e-3/\\ 0/\\ 7e-3/\\ 1e-1/\\ 1e-1/\\ 1e-1/\\ 1e-1/\\ 1e-2/\\ 1e-3/\\ 1e-1/\\ 1e-2/\\ 7e-1/\\ 7e-1/\\ 0/\\ 7e-1/\\ 1e-2/\\ 7e-1/\\ 1e-2/\\ 7e-1/\\ 0/\\ 7e-1/\\ 7e-1/\\ 1e-2/\\ 7e-1/\\ 7e-1/\\ 1e-2/\\ 7e-1/\\ 7e-1/\\ 1e-2/\\ 7e-1/\\ 1e-2/\\ 7e-1/\\ 1e-2/\\ 7e-1/\\ 1e-2/\\ 7e-1/\\ 7e-1/\\ 7e-1/\\ 1e-2/\\ 7e-1/\\ 7e-1/\\ 7e-1/\\ 7e-1/\\ 1e-2/\\ 7e-1/\\ 7e-1/\\ 7e-1/\\ 1e-2/\\ 7e-1/\\ 7e-1/$	$\begin{array}{c} 1115\\ 56\\ 179\\ 59\\ 59\\ 560\\ 36\\ 60\\ F\\ 7\\ 63\\ 89\\ 216\\ 160\\ 272\\ 277\\ 139\\ 81\\ 118\\ 81\\ 118\\ 8129\\ 9487\\ 405\\ 611\\ 140\\ 52\end{array}$	F/           1e-5/           1e-5/           2e-3/           2e-4/           1e-3/           2e-4/           0/           0//           1e-3//           1e-3//           1e-3//           1e-3//           1e-3//           1e-3//           1e-3//           1e-3//           1e-3// <tr< td=""><td>F 2778 80 198 72 514 366 F 72 60 77 145 65 314 69 9 777 161 300 277 161 300 277 161 312 5 3468 874 F F 416967 53</td><td>8e-2/1           F//6c-3/           6c-3/           0/           0/           0/           0/           0//</td><td>17590           F           2304           2404           400           641           153           1027           36           414           59           751           264           711           914           417           639           161           962           237           1005           3417           965           1034           F           686           453           3074           53</td></tr<>	F 2778 80 198 72 514 366 F 72 60 77 145 65 314 69 9 777 161 300 277 161 300 277 161 312 5 3468 874 F F 416967 53	8e-2/1           F//6c-3/           6c-3/           0/           0/           0/           0/           0//	17590           F           2304           2404           400           641           153           1027           36           414           59           751           264           711           914           417           639           161           962           237           1005           3417           965           1034           F           686           453           3074           53
$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	$\begin{array}{c} {\rm F} \\ 2.4e1 \\ -3.0e1 \\ 8.1e-1 \\ 1.4 \\ 3.1e2 \\ 2.5e1 \\ 1.0 \\ 5.6 \\ {\rm F} \\ 3.8e1 \\ 1.0 \\ 9.5 \\ 1.5e-7 \\ 4.0e-2 \\ -2.3e1 \\ 1.0 \\ 6.0 \\ -2.3e1 \\ 1.0 \\ -2.4e1 \\ 1.0 \\ -4.6 \\ -7.2e-1 \\ 1.4e1 \\ -4.4e1 \\ 1.1e-3 \\ 3.4e-6 \\ -3.5 \\ \end{array}$	F/           1e-2/           1e-2/           3e-3/           0/           3e-3/           0/           1e-3/           0/           1e-3/           0/           1e-3/           0/           1e-3/           0/           1e-3/           1e-3/           1e-3/           1e-3/           1e-3/           1e-3/           1e-3/           1/7e-1/	$\begin{array}{c} {\rm F} \\ 1182 \\ 515 \\ 59 \\ 560 \\ 366 \\ 43 \\ 59 \\ {\rm FF} \\ 264 \\ 88 \\ 69 \\ 279 \\ 244 \\ 160 \\ 281 \\ 160 \\ 281 \\ 160 \\ 811 \\ {\rm FF} \\ {\rm FF} \\ 299 \\ 509 \\ 438 \\ 1915 \\ 140 \end{array}$	F/           Se-3/           1e-5/           2e-3/-3           3e-3/           1e-5/           7e-5/           0/           F//           1e-3/           1e-3/           7e-5/           5e-2/           3e-5/           0/           9e-4/           9e-4/           F//           4e-3/           0//           3e-2/	F 1702 55 195 64 512 212 212 59 F F 263 119 64 313 306 325 165 306 277 289 306 277 289 181 F F F 408 868 362 171 9 5 5 5 6 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	$\begin{array}{c} {\rm F}//{\rm Ie}{\rm -5}/{\rm Ie}{\rm -1}/{\rm I$	F F 1256 555 179 60 622 36 44 59 70 290 290 228 83 70 290 228 161 290 27 139 298 335 F 430 294 378 598 140	$\begin{array}{c} 0\\ 0\\ 0\\ 1e-5\\ 2e-3\\ 3e-3\\ 1e-3\\ 3e-3\\ 1e-3\\ 1e-3\\ 1e-3\\ 1e-3\\ 1e-3\\ 1e-3\\ 1e-3\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\$	1650 56 194 64 604 177 260 59 F 240 119 65 215 711 325 303 277 242 303 277 242 180 1429 F 310 844 64 491 F 5 5 5 5 5 5 5 5 5 5 5 5 5	$\begin{array}{c} 1e-2/\\ 1e-5/\\ 3e-3/\\ 3e-3/\\ 1e-3/\\ 1e-3/\\ 1e-3/\\ 1e-3/\\ 1e-3/\\ 0/\\ 1e-3/\\ 1e-3/\\ 0/\\ 1e-3/\\ 1e-3/\\ 0/\\ 1e-3/\\ 1e-3/\\ 1e-3/\\ 1e-1/\\ 1e-1/\\ 1e-2/\\ 1e-1/\\ 1e-2/\\ 7e-1/\\ \end{array}$	$\begin{array}{c} 1115\\ 56\\ 57\\ 59\\ 59\\ 59\\ 36\\ 43\\ 36\\ 69\\ 216\\ 160\\ 272\\ 277\\ 139\\ 81\\ 18\\ 432\\ 299\\ 487\\ 405\\ 611\\ 140\\ \end{array}$	F/           1e-5/           1e-5/           2e-3/           2e-4/           1e-3/           2e-4/           0/           0//           1e-3//           1e-3//           1e-3//           1e-3//           1e-3//           1e-3//           1e-3//           1e-3//           1e-3// <tr< td=""><td><math display="block">\begin{array}{c} {\rm F} \\ 2778 \\ 80 \\ 198 \\ 72 \\ 514 \\ 36 \\ 202 \\ 514 \\ 36 \\ 60 \\ {\rm F} \\ {\rm F} \\ 265 \\ 314 \\ 69 \\ 277 \\ 161 \\ 300 \\ 277 \\ 161 \\ 300 \\ 277 \\ 131 \\ 113 \\ 300 \\ 277 \\ 131 \\ 113 \\ 300 \\ 277 \\ 131 \\ 133 \\ 874 \\ {\rm F} \\ {\rm</math></td><td>8e-2/1           F//6e-3/           0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           8e-4//0/           0//0/           3e-4//0/           0//1/           2e-2//0/           0//0/           8e-4//0/           0//0/           8e-4//0/           0//0/           8e-4//0/           0//0/           8e-2/0/           0//0/</td><td>17590           F           2304           2304           400           641           153           1027           36           414           59           F           751           264           71           914           71           639           161           965           1034           F           6866           453           3074</td></tr<>	$\begin{array}{c} {\rm F} \\ 2778 \\ 80 \\ 198 \\ 72 \\ 514 \\ 36 \\ 202 \\ 514 \\ 36 \\ 60 \\ {\rm F} \\ {\rm F} \\ 265 \\ 314 \\ 69 \\ 277 \\ 161 \\ 300 \\ 277 \\ 161 \\ 300 \\ 277 \\ 131 \\ 113 \\ 300 \\ 277 \\ 131 \\ 113 \\ 300 \\ 277 \\ 131 \\ 133 \\ 874 \\ {\rm F} \\ {\rm$	8e-2/1           F//6e-3/           0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           0//0/           8e-4//0/           0//0/           3e-4//0/           0//1/           2e-2//0/           0//0/           8e-4//0/           0//0/           8e-4//0/           0//0/           8e-4//0/           0//0/           8e-2/0/           0//0/	17590           F           2304           2304           400           641           153           1027           36           414           59           F           751           264           71           914           71           639           161           965           1034           F           6866           453           3074

 Table A.1. Detailed numerical results

	blem Dat	a	Best	$\ell_{\infty}$	s.	0	l l1		s		l	2	s	2	l e	2
	$/n/m_e/m$	_	<i>f</i> *	$\Delta f^* / nf$	$\Delta f^*$	/ nf	$\Delta f^{\star}$	/ nf	$\Delta f^{\star}$	/ nf	$\Delta f^{\star}$	/ nf	$\Delta f^{\star}$	/ nf	$\Delta f^{\star}$	/ nf
, HS60	/3/1/0/	6	1.4e1	0/ 401	2e-1/	444	2e-1/	446	2e-1/	444	3e-1/	512	2e-1/	442	7e-1/	766
HS61	/3/2/0/	0	-1.4e2	4e-3/ 88	6e-3/	413	4e-3/	90	7e-4/	450	4e-3/	88	0/	376	2e-4/	836
HS63	/3/1/0/	4	9.6e2	5e-4/ 177	0/	205	5e-4/	185	5e-4/	171	5e-4/	186	2e-4/	206	2e-4/	459
				,	· · ·		6e-4/		,		,		,		· ·	
HS64	/3/0/1/	3	6.3e3	6e-4/2722	F/	F	,		F/	F	6e-4/	2729	6e-4/	2700		17169
HS65	/3/0/1/	6	9.7e-1	2e-1/ 183	2e-2/	233	2e-1/	185	2e-2/	232	2e-1/	189	2e-1/	188	0/	431
HS66	/3/0/2/	6	5.3e-1	4e-2/ 100	6e-3/	639	4e-2/	100	4e-2/	138	4e-2/	99	4e-2/	139	0/	422
HS68	/4/2/0/	8	-3.7e-1	8e-4/ 195	8e-5/	452	8e-4/	201	8e-5/	457	8e-4/	192	8e-4/	195	0/	650
HS69	/4/2/0/	8	-9.5e2	F/ F	F/	F	1e-3/	624	0/	724	2e-3/	758	2e-3/	759	F/	F
HS7	/2/1/0/	0	-1.7	2e-2/ 91	2e-2/	133	2e-2/	91	1e-2/	160	2e-2/	91	2e-2/	149	0/	197
HS70	/4/0/1/	8	1.9e-1	4e-6/ 181	7e-6/	184	7e-6/	185	0/	175	0/	176	4e-6/	180	1e-5/	189
HS71	/4/1/1/	8	1.7e1	7e-2/ 352	7e-2/	186	9e-2/	328	2e-1/	465	6e-2/	344	2e-2/	302	0/	566
HS72	/4/0/2/	8	6.9e2	5e-2/ 738	6e-2/	715	6e-2/	790	6e-2/	778	3e-3/	626	3e-3/	626	0/	2873
	, , , , ,						· ·				8e-5/		,		,	
HS73	/4/0/1/	6	3.0e1	0/ 204	5e-6/	196	1e-4/	169	5e-5/	180	/	171	3e-3/	224	5e-4/	373
HS74	/4/3/0/	10	5.1e3	F/ F	F/	F	F/	F	F/	F	F/	F	F/	F	0/	1258
HS75	/4/3/0/	10	5.2e3	F/ F	F/	F	F/	F	F/	F	0/	1482	F/	F	F/	F
HS77	/5/2/0/	0	8.4e-1	3e-1/ 511	0/	1073	6e-1/	492	3e-1/	904	9e-2/	530	9e-2/	555	2e-1/	1519
HS78	/5/3/0/	0	-2.8	F/ F	F/	F	9e-2/	829	0/	991	2e-1/	921	9e-2/	960	4e-1/	1058
HS79	/5/3/0/	0	9.0e-2	4e-1/ 774	0/	743	9e-1/	511	1e-1/	986	5e-1/	681	1e-1/	815	1e-1/	946
HS8	/2/2/0/	0	-1.0	0/ 182	F/	F	F/	F	F/	F	0/	279	0/	277	0/	243
HS80	/5/3/0/	10	9.7e-2	0/1133	- /	1007	3e-1/	916	,	1127	1e-1/	1316	4e-2/	1253	3e-2/	1072
HS81	/5/3/0/	10	7.0e-2	1/1259	4e=2/ F/	F		1150	F/	F	9e-1/	1696	9e-1/	1596	0/	1012
HS83		10		9e-3/ 445	9e-3/	444	2e-4/	204	2e-4/	205		216		208		2122
	/5/0/6/		-3.1e4	,	,		,	-	,		3e-6/		3e-6/		0/	
HS84	/5/0/6/	10	-5.2e6	1e-1/1209		1205	1e-1/	881	1e-1/	857	2e-1/	699	2e-1/	695	0/	683
HS87	/6/4/0/	12	F	F/ F	F/	F	F/	F	F/	F	F/	F	F/	F	F/	F
HS88	/2/0/1/	0	1.1	4e-2/ 455	5e-2/	528	5e-2/	431	5e-2/	540	4e-2/	457	5e-2/	543	0/	1278
HS89	/3/0/1/	0	1.1	5e-2/ 640	5e-2/	679	5e-2/	666	5e-2/	699	5e-2/	662	5e-2/	680	0/	1862
HS90	/4/0/1/	0	1.1	5e-2/ 920	5e-2/	930	5e-2/	903	5e-2/	994	5e-2/	867	5e-2/	984	0/	2516
HS91	/5/0/1/	0	1.1	5e-2/1052	5e-2/	1277	5e-2/	1059	5e-2/	1337	5e-2/	1133	5e-2/	1226	0/	3094
HS92	/6/0/1/	0	1.1	5e-2/1418	· ·	1492	· · ·	1274	· ·	1554	5e-2/	1280	5e-2/	1587	0/	3676
HS93	/6/0/2/	6	F	F/ F	F/	F	F/	F	F/	F	F/	F	F/	F	F/	F
HS95	/6/0/4/	12	1.6e-2	0/ 101	1e-4/	327	0/	101	1e-4/	328	0/	101	2e-1/	101	0/	102
HS96	/6/0/4/	12	1.6e-2		1e-4/	328	0/	101		329	0/	101		101	0/	102
					,		- /		1e-4/			-	0/			-
HS97	/6/0/4/	12	4.1	1e-3/ 184	0/	177	1e-3/	184	0/	177	0/	185	1e-3/	438	2e-4/	840
HS98	/6/0/4/	12	4.1	0/ 185	0/	176	0/	185	0/	175	0/	184	1e-3/	499	1e-3/	918
HS99	/7/2/0/	14	F	F/ F	F/	F	F/	F	F/	F	F/	F	F/	F	F/	F
HYPCIR	/2/2/0/	0	0.0	F/ F	0/	254	0/	234	0/	223	0/	228	0/	245	0/	235
KIWCRES	SC/3/0/2/	0	-9.8e-4	1e-3/ 78	5e-3/	363	1e-3/	$^{78}$	8e-3/	360	1e-3/	$^{78}$	0/	364	3e-4/	485
LEWISPO	L/6/6/0/	15	1.1	3e-5/ 350	3e-5/	358	0/	338	2e-5/	336	1e-4/	349	2e-4/	342	1e-4/	354
LOOTSMA	A /3/0/2/	4	1.4	5e-1/ 50	5e-1/	50	5e-1/	50	5e-1/	50	5e-1/	50	0/	178	5e-1/	50
LSNNODO	C/5/0/0/	10	1.2e2	0/ 99	0/	101	0/	101	0/	102	0/	102	0/	100	0/	103
MADSEN	/3/0/6/	0	6.2e-1	4e-1/ 65	6e-3/	459	4e-1/	65	9e-3/	444	4e-1/	65	3e-4/	612	0/	619
MAKELA1		1	-1.4	3e-3/ 252	3e-3/	344	3e-3/	242	3e-3/	343	3e-3/	239	4e-3/	315	0/	938
MAKELA2		0	7.2	5e-1/ 164	4e-2/	711	2e-1/	118	0/	413	2e-5/	118	3e-2/	402	4e-2/	571
MARATOS		0	-1.0	3e-2/ 88	3e-2/	135	3e-2/	89	2e-2/	137	3e-2/	89	1e-3/	168	0/	199
				,			,		,		,				,	
MATRIX2		4	0.0	0/ 100	0/	100	0/	100	0/	100	0/	100	0/	100	0/	100
	1/3/0/1/	1	-1.0	2e-1/ 71	2e-4/	146	2e-1/	72	3e-4/	164	2e-1/	70	2e-4/	334		477
	12/3/0/2/	0	-1.0	8e-1/ 79	3e-3/	329	8e-1/	79							0/	
MINMAXR	B/3/0/2/	2	-9.0e-15	1/ 160	14 07				3e-3/	308	8e-1/	79	2e-4/	582	0/	620
MWRIGHT	[ /5/3/0/	0	0.00 10	1/ 100	4e-2/	1105	1/	160		308 1088	8e-1/ 1/				0/	
PFIT1		0	1.3	2e-1/ 785		$\frac{1105}{1378}$	1/ 5e-1/				1/	79	2e-4/	582	0/	620
	/3/3/0/	0						160	4e-2/	1088	1/	79 159	2e-4/	582 160	0/ 0/1	620 13442
PFIT2	/3/3/0/		1.3	2e-1/ 785	0/	1378	5e-1/	$\frac{160}{850}$	4e-2/ 4e-2/	1088 1216	1/	79 159 20577	2e-4/ 1/ 1/	582 160 26200	0/ 0/1 9e-2/	620 13442 1258
PFIT2 PFIT3	, , , , ,	0	1.3 F	2e-1/ 785 F/ F	0/ F/	1378 F	5e-1/ F/	160 850 F	4e-2/ 4e-2/ F/	1088 1216 F	1/ 1/: F/	79 159 20577 F	2e-4/ 1/ 1/ F/	582 160 26200 F	0/ 0/1 9e-2/ F/	620 13442 1258 F
	/3/3/0/ /3/3/0/	0 0 0	1.3 F F F	2e-1/ 785 F/ F F/ F F/ F	0/ F/ F/ F/	1378 F F	5e-1/ F/ F/	160 850 F F	4e-2/ 4e-2/ F/ F/	1088 1216 F F F	1/ 1/2 F/ F/ F/	79 159 20577 F F F	2e-4/ 1/ F/ F/ F/	582 160 26200 F F F	0/ 0/1 9e-2/ F/ F/ F/	620 13442 1258 F F F
PFIT3 PFIT4	/3/3/0/ /3/3/0/ /3/3/0/	0 0 0 0	1.3 F F F	2e-1/ 785 F/ F F/ F F/ F F/ F	0/ F/ F/ F/	1378 F F F F	5e-1/ F/ F/ F/	160 850 F F F	4e-2/ 4e-2/ F/ F/ F/	1088 1216 F F F F	1/ 1/: F/ F/ F/ F/	79 159 20577 F F F F	2e-4/ 1/ F/ F/ F/ F/	582 160 26200 F F F F	0/ 0/1 9e-2/ F/ F/ F/ F/	620 13442 1258 F F F F
PFIT3 PFIT4 POLAK1	/3/3/0/ /3/3/0/ /3/3/0/ /3/0/2/	0 0 0 0 0	1.3 F F F F 2.7	2e-1/ 785 F/ F F/ F F/ F F/ F 7e-1/ 744	0/ F/ F/ F/ F/ 2e-3/	1378 F F F 730	5e-1/ F/ F/ F/ 7e-1/	160 850 F F F 440	4e-2/ 4e-2/ F/ F/ F/ F/ 4e-3/	1088 1216 F F F F 872	1/ 1/2 F/ F/ F/ F/ 7e-1/	79 159 20577 F F F 502	2e-4/ 1/ F/ F/ F/ F/ 1e-4/	582 160 26200 F F F 2093	0/ 0/1 9e-2/ F/ F/ F/ F/ 0/	620 13442 1258 F F F 1484
PFIT3 PFIT4 POLAK1 POLAK4	/3/3/0/ /3/3/0/ /3/3/0/ /3/0/2/ /3/0/3/	0 0 0 0 0	1.3 F F F 2.7 -8.0e-4	$\begin{array}{ccc} 2e{-}1/ & 785 \\ \hline F/ & F \\ \hline 7e{-}1/ & 744 \\ \hline 7e{-}2/ & 216 \\ \end{array}$	0/ F/ F/ F/ 2e-3/ 8e-3/	1378 F F F 730 373	5e-1/ F/ F/ F/ 7e-1/ 7e-2/	160 850 F F F 440 235	4e-2/ 4e-2/ F/ F/ F/ 4e-3/ 1e-2/	1088 1216 F F F 872 388	1/ 1/2 F/ F/ F/ 7e-1/ 7e-2/	79 159 20577 F F F F 502 214	2e-4/ 1/ 1/: F/ F/ F/ F/ 1e-4/ 5e-4/	582 160 26200 F F F 2093 337	0/ 0/1 9e-2/ F/ F/ F/ 0/ 0/	620 13442 1258 F F F 1484 456
PFIT3 PFIT4 POLAK1 POLAK4 POLAK5	/3/3/0/ /3/3/0/ /3/3/0/ /3/0/2/ /3/0/3/ /3/0/2/	0 0 0 0 0 0 0	1.3 F F F 2.7 -8.0e-4 5.0e1	$\begin{array}{c c} 2e-1/ & 785 \\ \hline F/ & F \\ \hline 7e-1/ & 744 \\ \hline 7e-2/ & 216 \\ \hline 8e-3/1461 \end{array}$	0/ F/ F/ F/ 2e-3/ 8e-3/ 7e-4/	1378 F F 730 373 1230	5e-1/ F/ F/ F/ 7e-1/ 7e-2/ 8e-3/	160 850 F F 440 235 1561	4e-2/ 4e-2/ F/ F/ F/ 4e-3/ 1e-2/ 1e-3/	1088 1216 F F 872 388 1152	1/ 1/: F/ F/ F/ 7e-1/ 7e-2/ 4e-3/	79 159 20577 F F F 502 214 1844	2e-4/ 1/ 1/: F/ F/ F/ F/ 1e-4/ 5e-4/ 0/	582 160 26200 F F F 2093 337 1505	0/ 0/1 9e-2/ F/ F/ F/ 0/ 0/ 8e-5/	620 13442 1258 F F F 1484 456 1791
PFIT3 PFIT4 POLAK1 POLAK4 POLAK5 POLAK6	/3/3/0/ /3/3/0/ /3/3/0/ /3/0/2/ /3/0/3/ /3/0/2/ /5/0/4/	0 0 0 0 0 0 0 0	1.3 F F F 2.7 -8.0e-4 5.0e1 -4.4e1	$\begin{array}{c ccccc} 2e-1/ & 785 \\ \hline F/ & F \\ \hline 7e-1/ & 744 \\ \hline 7e-2/ & 216 \\ \hline 8e-3/1461 \\ \hline 9e-1/ & 136 \\ \end{array}$	0/ F/ F/ F/ 2e-3/ 8e-3/ 7e-4/ 2e-4/	1378 F F 730 373 1230 909	5e-1/ F/ F/ F/ 7e-1/ 7e-2/ 8e-3/ 9e-1/	160 850 F F 440 235 1561 133	4e-2/ 4e-2/ F/ F/ F/ 4e-3/ 1e-2/ 1e-3/ 0/	1088 1216 F F 872 388 1152 1022	1/ 1/3 F/ F/ F/ 7e-1/ 7e-2/ 4e-3/ 9e-1/	79 159 20577 F F F 502 214 1844 140	2e-4/ 1/ 1/2 F/ F/ F/ 1e-4/ 5e-4/ 0/ 8e-2/	582 160 26200 F F F 2093 337 1505 2136	0/ 0/1 9e-2/ F/ F/ F/ 0/ 0/ 8e-5/ 7e-2/	620 13442 1258 F F F 1484 456 1791 2503
PFIT3 PFIT4 POLAK1 POLAK4 POLAK5 POLAK6 POWELLB	/3/3/0/ /3/3/0/ /3/3/0/ /3/0/2/ /3/0/3/ /3/0/2/ /5/0/4/ 38/2/2/0/	0 0 0 0 0 0 0 0 0 0	1.3 F F F 2.7 -8.0e-4 5.0e1 -4.4e1 0.0	2e-1/         785           F/         F           F/         F           F/         F           F/         F           7e-1/         744           7e-2/         216           8e-3/1461         9e-1/           9e-1/         136           F/         F	0/ F/ F/ F/ 2e-3/ 8e-3/ 7e-4/ 2e-4/ F/	1378 F F 730 373 1230 909 F	5e-1/ F/ F/ F/ 7e-1/ 7e-2/ 8e-3/ 9e-1/ F/	160 850 F F 440 235 1561 133 F	4e-2/ 4e-2/ F/ F/ F/ 4e-3/ 1e-2/ 1e-3/ 0/ F/	1088 1216 F F 872 388 1152 1022 F	1/ 1/: F/ F/ F/ 7e-1/ 7e-2/ 4e-3/ 9e-1/ F/	79 159 20577 F F 502 214 1844 140 F	2e-4/ 1/ 1/3 F/ F/ F/ F/ 1e-4/ 5e-4/ 0/ 8e-2/ 0/	582 160 26200 F F F 2093 337 1505 2136 10281	0/ 0/1 9e-2/ F/ F/ F/ 0/ 0/ 8e-5/ 7e-2/ F/	620 13442 1258 F F F 1484 456 1791 2503 F
PFIT3 PFIT4 POLAK1 POLAK4 POLAK5 POLAK6 POWELLB	/3/3/0/ /3/3/0/ /3/3/0/ /3/0/2/ /3/0/3/ /3/0/2/ /5/0/4/	0 0 0 0 0 0 0 0	1.3 F F F 2.7 -8.0e-4 5.0e1 -4.4e1	$\begin{array}{c ccccc} 2e-1/ & 785 \\ \hline F/ & F \\ \hline 7e-1/ & 744 \\ \hline 7e-2/ & 216 \\ \hline 8e-3/1461 \\ \hline 9e-1/ & 136 \\ \end{array}$	0/ F/ F/ F/ 2e-3/ 8e-3/ 7e-4/ 2e-4/	1378 F F 730 373 1230 909	5e-1/ F/ F/ F/ 7e-1/ 7e-2/ 8e-3/ 9e-1/	160 850 F F 440 235 1561 133	4e-2/ 4e-2/ F/ F/ F/ 4e-3/ 1e-2/ 1e-3/ 0/	1088 1216 F F 872 388 1152 1022	1/ 1/3 F/ F/ F/ 7e-1/ 7e-2/ 4e-3/ 9e-1/	79 159 20577 F F F 502 214 1844 140	2e-4/ 1/ 1/2 F/ F/ F/ 1e-4/ 5e-4/ 0/ 8e-2/	582 160 26200 F F F 2093 337 1505 2136	0/ 0/1 9e-2/ F/ F/ F/ 0/ 0/ 8e-5/ 7e-2/	620 13442 1258 F F F 1484 456 1791 2503
PFIT3 PFIT4 POLAK1 POLAK4 POLAK5 POLAK6 POWELLB	/3/3/0/ /3/3/0/ /3/3/0/ /3/0/2/ /3/0/2/ /3/0/2/ /5/0/4/ 38/2/2/0/ SQ/2/2/0/	0 0 0 0 0 0 0 0 0 0	1.3 F F F 2.7 -8.0e-4 5.0e1 -4.4e1 0.0	2e-1/         785           F/         F           F/         F           F/         F           F/         F           7e-1/         744           7e-2/         216           8e-3/1461         9e-1/           9e-1/         136           F/         F	0/ F/ F/ F/ 2e-3/ 8e-3/ 7e-4/ 2e-4/ F/	1378 F F 730 373 1230 909 F	5e-1/ F/ F/ F/ 7e-1/ 7e-2/ 8e-3/ 9e-1/ F/	160 850 F F 440 235 1561 133 F	4e-2/ 4e-2/ F/ F/ F/ 4e-3/ 1e-2/ 1e-3/ 0/ F/	1088 1216 F F 872 388 1152 1022 F	1/ 1/: F/ F/ F/ 7e-1/ 7e-2/ 4e-3/ 9e-1/ F/	79 159 20577 F F 502 214 1844 140 F	2e-4/ 1/ 1/3 F/ F/ F/ F/ 1e-4/ 5e-4/ 0/ 8e-2/ 0/	582 160 26200 F F F 2093 337 1505 2136 10281	0/ 0/1 9e-2/ F/ F/ F/ 0/ 0/ 8e-5/ 7e-2/ F/	620 13442 1258 F F F 1484 456 1791 2503 F
PFIT3 PFIT4 POLAK1 POLAK4 POLAK5 POLAK6 POWELLB POWELLS RECIPE	/3/3/0/ /3/3/0/ /3/3/0/ /3/0/2/ /3/0/2/ /3/0/2/ /5/0/4/ 38/2/2/0/ SQ/2/2/0/	0 0 0 0 0 0 0 0 0 0 0	1.3 F F F -8.0e-4 5.0e1 -4.4e1 0.0 0.0	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0/ F/ F/ F/ 2e-3/ 8e-3/ 7e-4/ 2e-4/ F/ 0/	1378 F F 730 373 1230 909 F 47 59	5e-1/ F/ F/ F/ 7e-1/ 7e-2/ 8e-3/ 9e-1/ F/ 0/	160 850 F F 440 235 1561 133 F 47	4e-2/ 4e-2/ F/ F/ F/ 4e-3/ 1e-2/ 1e-3/ 0/ F/ 0/ O/	1088 1216 F F 872 388 1152 1022 F 47	1/ 1/2 F/ F/ F/ 7e-1/ 7e-2/ 4e-3/ 9e-1/ F/ 0/	79 159 20577 F F F 502 214 1844 140 F 47	2e-4/ 1/ 1/ F/ F/ F/ F/ 1e-4/ 5e-4/ 0/ 8e-2/ 0/ 0/	582 160 26200 F F F 2093 337 1505 2136 10281 47	0/ 0/1 9e-2/ F/ F/ F/ 0/ 0/ 8e-5/ 7e-2/ F/ 0/	620 13442 1258 F F F 1484 456 1791 2503 F 47
PFIT3 PFIT4 POLAK1 POLAK4 POLAK5 POLAK6 POWELLS RECIPE ROSENMM	/3/3/0/ /3/3/0/ /3/3/0/ /3/0/2/ /3/0/2/ /3/0/2/ /5/0/4/ 38/2/2/0/ 30/2/2/0/ /3/2/0/	0 0 0 0 0 0 0 0 0 0 0 0 1	1.3 F F F -8.0e-4 5.0e1 -4.4e1 0.0 0.0 0.0	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0/ F/ F/ F/ 2e-3/ 8e-3/ 7e-4/ 2e-4/ F/ 0/ 0/	1378 F F 730 373 1230 909 F 47 59	5e-1/ F/ F/ F/ 7e-1/ 7e-2/ 8e-3/ 9e-1/ F/ 0/	160 850 F F 440 235 1561 133 F 47 60	4e-2/ 4e-2/ F/ F/ F/ 4e-3/ 1e-2/ 1e-3/ 0/ F/ 0/ O/	1088 1216 F F 872 388 1152 1022 F 47 59	1/ 1/2 F/ F/ F/ 7e-1/ 7e-2/ 4e-3/ 9e-1/ F/ 0/	79 159 20577 F F 502 214 1844 140 F 47 59	2e-4/ 1/ 1/ F/ F/ F/ F/ 1e-4/ 5e-4/ 0/ 8e-2/ 0/ 0/ 0/	582 160 26200 F F 2093 337 1505 2136 10281 47 59	0/ 0/1 9e-2/ F/ F/ F/ 0/ 0/ 8e-5/ 7e-2/ F/ 0/	620 13442 1258 F F F 1484 456 1791 2503 F 47 59
PFIT3 PFIT4 POLAK1 POLAK4 POLAK5 POLAK6 POWELLS RECIPE ROSENMM S316-32	/3/3/0/ /3/3/0/ /3/0/2/ /3/0/2/ /3/0/3/ /3/0/2/ /5/0/4/ 35/2/2/0/ /3/2/0/ /3/2/0/ /3/2/0/ /3/2/0/ /3/2/0/	0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0	1.3 F F F 2.7 -8.0e-4 5.0e1 -4.4e1 0.0 0.0 0.0 0.0 0.0 0 -4.4e1 3.3e2	$\begin{array}{c c} 2e{-1}/ & 785\\ \hline F/ & F\\ F/ & F\\ F/ & F\\ F/ & F\\ \hline F/ & F\\ \hline 7e{-1}/ & 744\\ 7e{-2}/ & 216\\ 8e{-3}/ & 1461\\ \hline 8e{-3}/ & 595\\ \hline \end{array}$	0/ F/ F/ F/ 2e-3/ 8e-3/ 7e-4/ 2e-4/ F/ 0/ 0/ 2e-2/ 8e-3/	1378 F F 730 373 1230 909 F 47 59 1320 595	5e-1/ F/ F/ F/ 7e-1/ 7e-2/ 8e-3/ 9e-1/ F/ 0/ 0/ 1/ 5e-3/	$     \begin{array}{r}       160 \\       850 \\       F \\       F \\       440 \\       235 \\       1561 \\       133 \\       F \\       47 \\       60 \\       100 \\       600 \\     \end{array} $	4e-2/ 4e-2/ F/ F/ F/ 4e-3/ 1e-2/ 1e-3/ 0/ F/ 0/ 0/ 0/ 9e-3/	1088 1216 F F 872 388 1152 1022 F 47 59 1213 602	1/ 1/2 F/ F/ F/ 7e-1/ 7e-2/ 4e-3/ 9e-1/ F/ 0/ 0/ 1/ 6e-3/	79 159 20577 F F 502 214 1844 140 F 47 59 100 597	2e-4/ 1/ 1/2 F/ F/ F/ F/ 1e-4/ 5e-4/ 0/ 8e-2/ 0/ 0/ 0/ 2e-1/ 8e-3/	582 160 26200 F F 2093 337 1505 2136 10281 47 59 1622 592	0/ 0/1 9e-2/ F/ F/ F/ 0/ 0/ 8e-5/ 7e-2/ F/ 0/ 0/ 2e-1/ 0/	620 13442 1258 F F F 1484 456 1791 2503 F 47 59 1772 5811
PFIT3 PFIT4 POLAK1 POLAK4 POLAK5 POLAK6 POWELLB POWELLS RECIPE ROSENMM S316-32 S365	/3/3/0/ /3/3/0/ /3/3/0/ /3/0/2/ /3/0/2/ /5/0/4/ 38/2/2/0/ 38/2/2/0/ /3/2/0/ 13/2/0/ 13/2/0/ 13/2/0/ 13/2/0/ 13/2/0/ 17/0/5/	0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 4	1.3 F F F 7.7 -8.0e-4 5.0e1 -4.4e1 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	$\begin{array}{c ccccc} 2e{-1}/&785\\ \hline F/&F\\ F/&F\\ F/&F\\ F/&F\\ 7e{-1}/&744\\ 7e{-2}/&216\\ 8e{-3}/&1461\\ 9e{-1}/&136\\ F/&F\\ 0/&47\\ 0/&59\\ 1/&100\\ 8e{-3}/&595\\ F/&F\\ \end{array}$	0/ F/ F/ 2e-3/ 8e-3/ 7e-4/ 2e-4/ F/ 0/ 0/ 2e-2/ 8e-3/ 0/	1378 F F 730 373 1230 909 F 47 59 1320 595 164	5e-1/ F/ F/ F/ 7e-1/ 7e-2/ 8e-3/ 9e-1/ F/ 0/ 0/ 1/ 5e-3/ 0/	160 850 F F 440 235 1561 133 F 47 60 100 600 225	4e-2/ 4e-2/ F/ F/ F/ 4e-3/ 1e-2/ 1e-3/ 0/ F/ 0/ 0/ 0/ 0/ 0/ 0/ 0/ 0/	1088 1216 F F 872 388 1152 1022 F 47 59 1213 602 167	1/ 1/2 F/ F/ F/ 7e-1/ 7e-2/ 4e-3/ 9e-1/ F/ 0/ 0/ 1/ 6e-3/ 0/	79 159 20577 F F 502 214 1844 140 F 47 59 100 597 171	2e-4/ 1/ 1/: F/ F/ F/ F/ 1e-4/ 5e-4/ 0/ 8e-2/ 0/ 0/ 0/ 2e-1/ 8e-3/ 0/	582 160 26200 F F 7 2093 337 1505 2136 10281 10281 47 599 1622 592 171	0/ 0/1 9e-2/ F/ F/ F/ O/ 0/ 8e-5/ 7e-2/ F/ O/ 0/ 2e-1/ 0/ 0/	620 13442 1258 F F 1484 456 1791 2503 F 477 59 1772 5811 171
PFIT3 PFIT4 POLAK1 POLAK4 POLAK5 POLAK6 POWELLB POWELLS RECIPE ROSENNM S316-32 S365 S365MOD	/3/3/0/ /3/3/0/ /3/3/0/ /3/0/2/ /3/0/2/ /3/0/2/ /5/0/4/ 38/2/2/0/ /3/2/0/ /3/2/0/ /3/2/0/ /3/2/0/ /3/2/0/ /7/0/5/ 0/7/0/5/	0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 4 4	1.3 F F F -8.0e-4 5.0e1 -4.4e1 0.0 0.0 0.0 0.0 -4.4e1 3.3e2 0.0 0 F	$\begin{array}{c c} 2e{-1}/&785\\ \hline F/&F\\ F/&F\\ F/&F\\ F/&F\\ F/&F\\ F/&F\\ 7e{-1}/&744\\ 7e{-2}/&216\\ 8e{-3}/&1461\\ 9e{-1}/&136\\ F/&F\\ 0/&47\\ F\\ 0/&47\\ F\\ 100\\ 8e{-3}/&595\\ F/&F\\ F/&F\\ F/&F\end{array}$	0/ F/ F/ 2e-3/ 8e-3/ 7e-4/ 2e-4/ F/ 0/ 0/ 2e-2/ 8e-3/ 0/ F/	1378 F F 730 373 1230 909 F 477 599 1320 595 164 F	5e-1/ F/ F/ F/ 7e-1/ 7e-2/ 8e-3/ 9e-1/ F/ 0/ 0/ 1/ 5e-3/ 0/ F/	160 850 F F 440 235 1561 133 F 477 600 100 600 225 F	4e-2/ 4e-2/ F/ F/ F/ 4e-3/ 1e-2/ 1e-3/ 0/ F/ 0/ 0/ 0/ 0/ 9e-3/ 0/ F/	1088 1216 F F 872 388 1152 1022 F 477 59 1213 602 167 F	1/ 1/3 F/ F/ F/ 7e-1/ 7e-2/ 4e-3/ 9e-1/ F/ 0/ 0/ 6e-3/ 0/ F/	79 159 20577 F F F 502 214 1844 140 F 47 59 100 597 171 F	2e-4/ 1/ 1/: F/ F/ F/ F/ 1e-4/ 5e-4/ 0/ 8e-2/ 0/ 0/ 0/ 2e-1/ 8e-3/ 0/ F/	582 160 26200 F F F 2093 337 1505 2136 10281 47 599 1622 592 171 F	0/ 0/1 9e-2/ F/ F/ F/ 0/ 0/ 8e-5/ 7e-2/ F/ 0/ 0/ 2e-1/ 0/ 2e-1/ 0/ 5/	620 13442 1258 F F 1484 456 1791 2503 F 477 59 1772 5811 171 F
PFIT3 PFIT4 POLAK1 POLAK4 POLAK5 POLAK6 POWELLB POWELLS RECIPE ROSENMM S316-32 S365 S365MOD SNAKE	/3/3/0/ /3/3/0/ /3/0/2/ /3/0/2/ /5/0/4/ 38/2/2/0/ /3/2/0/ /3/2/0/ /3/2/0/ /3/2/0/ /7/0/5/ /2/0/2/	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1.3 F F F 2.7 -8.0e-4 5.0e1 -4.4e1 0.0 0.0 0.0 0.0 0 -4.4e1 3.3e2 0.0 F 5 3.5e-1	$\begin{array}{c c} 2e{-1}/&785\\ \hline F/&F\\ F/&F\\ F/&F\\ F/&F\\ F/&F\\ F/&F\\ 7e{-1}/&744\\ 7e{-2}/&216\\ 8e{-3}/&1461\\ 9e{-1}/&136\\ F/&F\\ 0/&47\\ F/&F\\ 0/&47\\ 59\\ 1/&100\\ 8e{-3}/&595\\ F/&F\\ F/&F\\ 2e{-1}/&177\\ \end{array}$	0/ F/ F/ 2e-3/ 8e-3/ 7e-4/ 2e-4/ F/ 0/ 2e-2/ 8e-3/ 0/ F/ F/	1378 F F 730 373 1230 909 F 477 599 1320 595 164 F F	5e-1/ F/ F/ F/ 7e-1/ 7e-2/ 8e-3/ 9e-1/ F/ 0/ 0/ 5e-3/ 0/ F/ 0/	160 850 F F 440 235 1561 133 F 47 600 100 600 225 F 203	4e-2/ 4e-2/ F/ F/ F/ 4e-3/ 1e-2/ 1e-3/ 0/ F/ 0/ 0/ 0/ 0/ 9e-3/ 0/ F/ F/	1088 1216 F F F F 872 388 1152 1022 F 47 59 1213 602 167 F F	1/ 1/ 1/3 F/ F/ F/ 7e-1/ 7e-2/ 4e-3/ 9e-1/ F/ 0/ 0/ 1/ 6e-3/ 0/ E/ 2e-1/	79 159 20577 F F F 502 214 1844 140 F 47 59 100 597 171 F 177	2e-4/ 1/ 1/ F/ F/ F/ 1e-4/ 0/ 0/ 0/ 2e-1/ 8e-3/ 0/ C/ 0/ F/ F/	582 160 26200 F F 2093 337 1505 2136 10281 47 59 1622 592 171 F F	0/ 0/1 9e-2/ F/ F/ F/ F/ 0/ 0/ 8e-5/ 7e-2/ F/ 0/ 0/ 2e-1/ 0/ 2e-1/ 0/ F/	620 13442 1258 F F 1484 456 1791 2503 F 47 59 1772 5811 171 F F
PFIT3 PFIT4 POLAK1 POLAK4 POLAK5 POLAK6 POWELLB ROWELLS RECIPE ROSENMM S316-32 S365 S365MOD SNAKE SPIRAL	/3/3/0/ /3/3/0/ /3/0/2/ /3/0/2/ /5/0/4/ 8/2/2/0/ 8/2/2/0/ 8/2/2/0/ 8/2/2/0/ 8/2/0/4/ 22/2/1/0/ /7/0/5/ 0/7/0/5/ /2/0/2/ /3/2/0/	$ \begin{array}{c} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 1 \\ 0 \\ 0 \\ 4 \\ 4 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0$	1.3 F F F F 2.7 -8.0e-4 5.0e1 5.0e1 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 1.4.4e1 3.3e2 0.0 F F 3.5e-1 -4.9e-4	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0/ F/ F/ 2e-3/ 8e-3/ 7e-4/ 2e-4/ F/ 0/ 2e-2/ 8e-3/ 0/ 2e-2/ 8e-3/ 0/ F/ F/	1378 F F 730 373 1230 909 F 477 599 1320 595 164 F F F	5e-1/ F/ F/ F/ 7e-1/ 7e-2/ 8e-3/ 9e-1/ F/ 0/ 0/ 1/ 5e-3/ 0/ 5/ 0/ F/ 0/ 1e-1/	160 850 F F 440 235 1561 133 F 477 600 1000 6000 2255 F 2033 244	4e-2/ 4e-2/ F/ F/ F/ 4e-3/ 1e-2/ 1e-3/ 1e-2/ 0/ 0/ 0/ 0/ 0/ 0/ 0/ 9e-3/ F/ F/	1088 1216 F F 872 388 1152 1022 F 47 59 1213 602 167 F F F	1/ 1/ 1/3 F/ F/ F/ 7e-1/ 7e-2/ 4e-3/ 9e-1/ 7e-2/ 4e-3/ 0/ 0/ 1/ 6e-3/ 0/ 2e-1/ 2e-1/ 1e-1/	79 159 20577 F F 502 214 1844 140 F 47 59 100 597 171 F 1777 220	2e-4/ 1/ 1/ F/ F/ F/ 1e-4/ 5e-4/ 0/ 8e-2/ 0/ 0/ 2e-1/ 8e-3/ 0/ F/ F/	582 160 26200 F F 2093 337 1505 2136 10281 47 59 1622 592 171 F F F F F F F F F F F F F	0/ 0/1 9e-2/ F/ F/ F/ 0/ 0/ 8e-5/ 7e-2/ F/ 0/ 0/ 2e-1/ 0/ 0/ F/ F/ F/	620 13442 1258 F F F F F F F 1484 456 1791 2503 F 759 1772 5811 171 F F S3125
PFIT3 PFIT4 POLAK1 POLAK4 POLAK5 POLAK6 POWELLB POWELLS RECIPE ROSENMM S316-32 S365 S365 S365 S365MOD SNAKE SPIRAL SYNTHES	/3/3/0/           /3/3/0/           /3/3/0/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/2/0/           (3/2/2/)           /3/2/0/           /3/2/0/           /3/2/0/           /3/2/0/           /3/2/0/           /3/2/0/           /3/2/0/           /3/2/0/           /3/2/0/           /3/2/0/           /3/2/0/           /3/2/0/           /3/2/0/           /3/0/2/           /3/0/2/           3/0/2/           3/16/0/2/	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	$\begin{array}{c} 1.3\\ \mathrm{F}\\ \mathrm{F}\\ \mathrm{F}\\ \mathrm{F}\\ \mathrm{F}\\ \mathrm{F}\\ \mathrm{-}\\ \mathrm{-}4.4\mathrm{e}1\\ -4.4\mathrm{e}1\\ -4.4\mathrm{e}1\\ -3.3\mathrm{e}2\\ 0.0\\ \mathrm{-}\\ \mathrm{-}4.4\mathrm{e}1\\ 3.3\mathrm{e}2\\ 0.0\\ \mathrm{F}\\ \mathrm{-}\\ 3.5\mathrm{e}-1\\ -4.9\mathrm{e}-4\\ \mathrm{-}\\ 4.9\mathrm{e}-4\\ \mathrm{-}\\ \mathrm{-}\\ 4.9\mathrm{e}-1\\ \end{array}$	$\begin{array}{c ccccc} 2e{-1}/&785\\ \hline F/&F\\ F/&F\\ F/&F\\ F/&F\\ F/&F\\ 7e{-1}/&744\\ 8e{-3}/1461\\ 9e{-1}/&136\\ 8e{-3}/1461\\ 9e{-1}/&136\\ F/&F\\ 0/&47\\ 0/&59\\ 1/&100\\ 8e{-3}/&59\\ F/&F\\ F/&F\\ F/&F\\ F/&F\\ F/&F\\ 1e{-1}/&132\\ 3e{-3}/&404 \end{array}$	0/ F/ F/ 2e-3/ 7e-4/ 2e-4/ F/ 6/ 0/ 2e-2/ 8e-3/ 0/ F/ F/ F/ F/ 3e-3/	1378 F F 730 373 1230 909 F 47 599 1320 595 164 F F F F 457	5e-1/ F/ F/ F/ F/ 7e-1/ 7e-2/ 8e-3/ 9e-1/ F/ 0/ 1/ 5e-3/ 0/ F/ 0/ 1e-1/ 3e-3/	160 850 F F 440 235 1561 133 F 477 600 600 2255 F 203 244 361	4e-2/ 4e-2/ F/ F/ F/ 4e-3/ 1e-2/ 1e-3/ 0/ F/ 0/ 0/ 0/ 9e-3/ 0/ 9e-3/ F/ F/ F/ Se-3/	1088 1216 F F 872 388 1152 1022 F 7 59 1213 602 167 F F 475	1/ 1/3 F/ F/ F/ 7e-1/ 7e-2/ 4e-3/ 9e-1/ 7/ 6e-3/ 0/ 1/ 6e-3/ 0/ F/ 2e-1/ 1e-1/ 3e-3/	799 159 20577 F F F 502 214 1844 140 F F 477 599 1000 597 1711 F F 1777 2200 386	2e-4/ 1/ 1/ F/ F/ F/ 1e-4/ 5e-4/ 0/ 8e-2/ 0/ 0/ 0/ 2e-1/ 8e-3/ 0/ F/ F/ F/ F/ 2e-4/	582 160 26200 F F F 2093 337 1505 2136 10281 47 59 1622 592 1711 F F F F F 581	0/ 0/1 9e-2/ F/ F/ F/ 0/ 0/ 2e-1/ 0/ 2e-1/ 0/ 2e-1/ 0/ 2e-1/ 0/ 5/ F/ F/ 5/ 0/ 0/ 2e-1/ 5/ 5/ 5/ 5/ 5/ 5/ 5/ 5/ 5/ 5/ 5/ 5/ 5/	620 13442 1258 F F F F 1484 4566 1791 12503 F 7 59 1772 5811 1711 F F F 5811 1711 1711 1712 1712 1711 1712 1725
PFIT3 PFIT4 POLAK1 POLAK4 POLAK5 POLAK6 POWELLB POWELLS RECIPE ROSENMM S316-32 S365 S365MOD SNAKE SPIRAL SYNTHES	/3/3/0/ /3/3/0/ /3/0/2/ /3/0/2/ /3/0/2/ /5/0/4/ 38/2/2/0/ 38/2/2/0/ /3/2/0/ xt/5/0/4/ 22/2/1/0/ /7/0/5/ /2/0/2/ /3/0/2/ /3/0/2/ /3/0/2/ /3/0/2/	$\begin{array}{c} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 $	1.3 F F F F 2.7 -8.0e-4 5.0e1 5.0e1 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 1.4.4e1 3.3e2 0.0 F F 3.5e-1 -4.9e-4	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0/ F/ F/ 2e-3/ 7e-4/ 2e-4/ 2e-4/ F/ 0/ 2e-2/ 8e-3/ 0/ F/ F/ F/ 3e-3/ F/	1378 F F 730 373 1230 909 F 477 599 1320 595 164 F F F	5e-1/ F/ F/ F/ 7e-1/ 7e-2/ 8e-3/ 9e-1/ F/ 0/ 0/ 1/ 5e-3/ 0/ 5/ 0/ F/ 0/ 1e-1/	160 850 F F 440 235 1561 133 F 47 600 200 200 225 F 203 244	4e-2/ 4e-2/ F/ F/ F/ 4e-3/ 1e-2/ 1e-3/ 1e-2/ 0/ 0/ 0/ 0/ 0/ 0/ 0/ 9e-3/ F/ F/	1088 1216 F F 872 388 1152 1022 F 47 59 1213 602 167 F F F	1/ 1/ 1/: F/ F/ F/ 7e-1/ 7e-2/ 4e-3/ 9e-1/ F/ 0/ 0/ 1/ 6e-3/ 0/ F/ 2e-1/ 1e-1/ 3e-3/ F/	79 159 20577 F F 502 214 1844 140 F 47 59 100 597 171 F 1777 220	$\begin{array}{c} 2e{-}4/\\ 1/\\ 1/\\ 1/\\ 1/\\ 1/\\ 1/\\ 1/\\ 1/\\ 1/\\ 1$	582 160 262000 F F F F 2093 337 1505 2136 10281 1622 592 171 F F F F F F F F F F F F F	0/ 0/1 9e-2/ F/ F/ F/ 0/ 0/ 2e-1/ 0/ 2e-1/ 0/ 2e-1/ 0/ 5/ F/ F/ F/ F/ 5/ 5/ 5/ 5/ 5/ 5/ 5/ 5/ 5/ 5/ 5/ 5/ 5/	620 13442 1258 F F F F F F F 1484 456 1791 2503 F 759 1772 5811 171 F F S3125
PFIT3 PFIT4 POLAK1 POLAK4 POLAK5 POLAK6 POWELLB POWELLS RECIPE ROSENMM S316-32 S365 S365 S365 S365MOD SNAKE SPIRAL SYNTHES	/3/3/0/           /3/3/0/           /3/3/0/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/2/0/           (3/2/2/)           /3/2/0/           /3/2/0/           /3/2/0/           /3/2/0/           /3/2/0/           /3/2/0/           /3/2/0/           /3/2/0/           /3/2/0/           /3/2/0/           /3/2/0/           /3/2/0/           /3/2/0/           /3/0/2/           /3/0/2/           3/0/2/           3/16/0/2/	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	$\begin{array}{c} 1.3\\ \mathrm{F}\\ \mathrm{F}\\ \mathrm{F}\\ \mathrm{F}\\ \mathrm{F}\\ \mathrm{F}\\ \mathrm{-}\\ \mathrm{-}4.4\mathrm{e}1\\ -4.4\mathrm{e}1\\ -4.4\mathrm{e}1\\ -3.3\mathrm{e}2\\ 0.0\\ \mathrm{-}\\ \mathrm{-}4.4\mathrm{e}1\\ 3.3\mathrm{e}2\\ 0.0\\ \mathrm{F}\\ \mathrm{-}\\ 3.5\mathrm{e}-1\\ -4.9\mathrm{e}-4\\ \mathrm{-}\\ 4.9\mathrm{e}-4\\ \mathrm{-}\\ \mathrm{-}\\ 4.9\mathrm{e}-1\\ \end{array}$	$\begin{array}{c ccccc} 2e{-1}/&785\\ \hline F/&F\\ F/&F\\ F/&F\\ F/&F\\ F/&F\\ 7e{-1}/&744\\ 8e{-3}/1461\\ 9e{-1}/&136\\ 8e{-3}/1461\\ 9e{-1}/&136\\ F/&F\\ 0/&47\\ 0/&59\\ 1/&100\\ 8e{-3}/&59\\ F/&F\\ F/&F\\ F/&F\\ F/&F\\ F/&F\\ 1e{-1}/&132\\ 3e{-3}/&404 \end{array}$	0/ F/ F/ 2e-3/ 7e-4/ 2e-4/ F/ 6/ 0/ 2e-2/ 8e-3/ 0/ F/ F/ F/ F/ 3e-3/	1378 F F 730 373 1230 909 F 47 599 1320 595 164 F F F F 457	5e-1/ F/ F/ F/ F/ 7e-1/ 7e-2/ 8e-3/ 9e-1/ F/ 0/ 1/ 5e-3/ 0/ F/ 0/ 1/ 5e-3/ 0/ 1/ 5e-3/ 0/ 5e-3/ 0/ 5e-3/ 0/ 5e-3/ 1/ 5e-3	160 850 F F 440 235 1561 133 F 477 600 600 2255 F 203 244 361	4e-2/ 4e-2/ F/ F/ F/ 4e-3/ 1e-2/ 1e-3/ 0/ F/ 0/ 0/ 0/ 9e-3/ 0/ 9e-3/ F/ F/ F/ Se-3/	1088 1216 F F 872 388 1152 1022 F 7 59 1213 602 167 F F 475	1/ 1/3 F/ F/ F/ 7e-1/ 7e-2/ 4e-3/ 9e-1/ 7/ 6e-3/ 0/ 1/ 6e-3/ 0/ F/ 2e-1/ 1e-1/ 3e-3/	799 159 20577 F F F 502 214 1844 140 F F 477 599 1000 597 1711 F F 1777 2200 386	2e-4/ 1/ 1/ F/ F/ F/ 1e-4/ 5e-4/ 0/ 8e-2/ 0/ 0/ 0/ 2e-1/ 8e-3/ 0/ F/ F/ F/ F/ 2e-4/	582 160 26200 F F F 2093 337 1505 2136 10281 47 59 1622 592 1711 F F F F F 581	0/ 0/1 9e-2/ F/ F/ F/ 0/ 0/ 2e-1/ 0/ 2e-1/ 0/ 2e-1/ 0/ 2e-1/ 0/ 5/ F/ F/ 5/ 0/ 0/ 2e-1/ 5/ 5/ 5/ 5/ 5/ 5/ 5/ 5/ 5/ 5/ 5/ 5/ 5/	620 13442 1258 F F F F 1484 4566 1791 12503 F 7 59 1772 5811 1711 F F F 5811 1711 1711 1712 1712 1711 1712 1725
PFIT3 PFIT4 POLAK1 POLAK4 POLAK5 POLAK6 POWELLS POWELLS S365 S365 S365 S365 S365 S365 SNAKE SPIRAL SYNTHES TRIGGER TRY-B	/3/3/0/ /3/3/0/ /3/0/2/ /3/0/2/ /3/0/2/ /5/0/4/ 38/2/2/0/ 38/2/2/0/ /3/2/0/ xt/5/0/4/ 22/2/1/0/ /7/0/5/ /2/0/2/ /3/0/2/ /3/0/2/ /3/0/2/ /3/0/2/	$\begin{array}{c} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 $	1.3 F F F 5.0e-4 5.0e1 -4.4e1 0.0 0.0 0.0 0.0 0.0 0.0 F 3.5e-1 -4.9e-4 7.6e-1 F	$\begin{array}{c c c} 2e-1/&785\\ \hline F/&F\\ F/&F\\ F/&F\\ F/&F\\ F/&F\\ 7e-1/&744\\ \hline 7e-2/&216\\ 8e-3/&1461\\ \hline 9e-1/&136\\ F/&F\\ 0/&47\\ F/&F\\ 0/&47\\ 59\\ 1/&100\\ 8e-3/&595\\ F/&F\\ F/&F\\ 2e-1/&177\\ 1e-1/&132\\ 3e-3/&404\\ F/&F\\ \end{array}$	0/ F/ F/ 2e-3/ 7e-4/ 2e-4/ 2e-4/ F/ 0/ 2e-2/ 8e-3/ 0/ F/ F/ F/ 3e-3/ F/	1378 F F 730 373 1230 909 F 477 595 1320 595 164 F F 457 F F	5e-1/ F/ F/ F/ 7e-1/ 7e-2/ 8e-3/ 9e-1/ F/ 0/ 0/ 1/ 5e-3/ 0/ F/ 0/ 1e-1/ 3e-3/ F/	160 850 F F 440 235 1561 133 F 477 600 205 F 203 244 361 F	4e-2/ 4e-2/ F/ F/ F/ 4e-3/ 1e-2/ 1e-3/ 0/ F/ 0/ 0/ 0/ 9e-3/ 0/ F/ F/ F/ 3e-3/ F/	1088 1216 F F 872 388 1152 1022 F 477 59 1213 602 167 F F 475 F	1/ 1/ 1/: F/ F/ F/ 7e-1/ 7e-2/ 4e-3/ 9e-1/ F/ 0/ 0/ 1/ 6e-3/ 0/ F/ 2e-1/ 1e-1/ 3e-3/ F/	79 159 20577 F F F F F F F F F F F F F F 7 202 214 1844 140 F 7 9 100 597 171 F 7 7 200 597 171 59 205 7 7 7 7 7 8 4 7 7 7 7 7 7 7 7 7 7 7 7 7	2e-4/ 1// F// F// F// F// F// 5e-4// 0// 0// 0// 0// 0// 2e-1/ 8e-3/ F// F// F// 2e-4// F// 2e-4// F// 2e-4// F// F// 2e-4// F// F// F// Se-4// Se-2//	582 160 262000 F F F F 2093 337 1505 2136 10281 1622 171 F F F F F F F F F F F F F	0/ 0/1 9e-2/ F/ F/ F/ 0/ 0/ 2e-1/ 0/ 2e-1/ 0/ 2e-1/ 0/ 5/ F/ F/ F/ F/ 5/ 5/ 5/ 5/ 5/ 5/ 5/ 5/ 5/ 5/ 5/ 5/ 5/	620 33442 1258 F F F F F F F F F F 1484 456 1791 2503 F F 59 1772 5811 171 F F 59 1477 59 59 1477 59 50 1477 50 50 50 50 57 57 57 57 57 57 57 57 57 57
PFIT3 PFIT4 POLAK1 POLAK4 POLAK5 POLAK6 POWELLS POWELLS S365 S365 S365 S365 S365 S365 SNAKE SPIRAL SYNTHES TRIGGER TRY-B	/3/3/0/ /3/3/0/ /3/0/2/ /3/0/2/ /3/0/2/ /5/0/4/ 15/2/2/0/ 13/2/2/0/ /3/2/2/0/ /7/0/5/ 0/7/0/5/ 0/7/0/5/ /2/0/2/ 13/0/2/ 12/2/2/2/	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1.3 F F F -8.0e-4 5.0e1 -4.4e1 0.0 0.0 0.0 0.0 0.0 -4.4e1 3.3e2 0.0 F 5 3.5e-1 -4.9e-4 7.6e-1 F 0.0	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0/ F/ F/ 2e-3/ 7e-4/ 2e-4/ F/ 0/ 2e-2/ 8e-3/ 0/ F/ F/ 5e-3/ 0/ F/ F/ 3e-3/ 0/ 0/	1378 F F 730 373 1230 909 F 477 595 1320 595 164 F F F F 457 F 88	5e-1/ F/ F/ F/ 7e-1/ 7e-2/ 8e-3/ 9e-1/ F/ 0/ 1/ 5e-3/ 0/ F/ 0/ 1e-1/ 3e-3/ F/ 1/	160 850 F F 440 235 1561 133 F 47 600 205 F 203 203 203 244 361 F 56	4e-2// 4e-2// F// F// 4e-3/ 1e-2/ 1e-3/ 0/ F// 9e-3/ 0/ 0/ 6/ 7/ 7/ 7/ 7/ 8e-3/ 3e-3/ 5/ 7/ 0/ 0/ 0/ 0/ 0/ 0/ 0/ 7/ 9e-3/ 0/ 7/ 9e-3/ 7/ 9/ 9/ 7/ 1e-2/ 1e-2/ 1e-2/ 7/ 7/ 7/ 7/ 7/ 7/ 7/ 7/ 7/ 7/ 7/ 7/ 7/	1088 1216 F F 872 388 1152 1022 F 47 59 1213 602 167 F F F F F 83	1//1/: F//F/ F//F/ 7e-1/ 7e-2/ 9e-1/ 7e-2/ 9e-1/ 0/ 0/ 0/ 0/ 6e-3/ 0/ F// 2e-1/ 1e-1//3e-3/ F// 1/:	79 159 20577 F F F F F F F F F F 7 204 1844 140 F 477 599 100 597 7171 F 177 220 386 F F 56	$\begin{array}{c} 2e{-}4/\\ 1/\\ 1/\\ -\\ -\\ -\\ -\\ -\\ -\\ -\\ -\\ -\\ -\\ -\\ -\\ -\\$	582           160           262000           F           F           F           2093           337           15056           10281           10281           10281           1622           1711           F           592           1711           F           581           759           591           1010	0/ 9e-2/ F/ F/ F/ F/ - F/ - F/ - C - - - - - - - - - - - - - - - - -	620 13442 1258 F F F F 1484 456 1791 2503 F 477 599 1772 5811 1711 F F 53125 1253 F 86
PFIT3 PFIT4 POLAK1 POLAK4 POLAK5 POLAK6 POWELLS RECIPE ROSENNM S316-32 S365 S365 S365 S365 S365 S165-32 S365 S165-32 S	/3/3/0/           /3/3/0/           /3/3/0/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/2/0/           /3/2/0/           /3/2/0/           /3/2/0/           /3/2/0/           /3/2/2/           /3/2/0/           /3/2/0/           /3/2/0/           /3/2/0/           /3/2/0/           /3/2/2/           /3/2/2/           /3/2/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /3/0/2/           /2/1/0/           /3/2/2/           /3/2/2/           /3/2/2/           /3/2/2/           /3/2/2/           /3/2/2/           /3/2/2/	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1.3 F F F 2.7 -8.0e4 -4.4e1 -4.4e1 -4.4e1 -3.3e2 0.00 F F 3.5e-1 -4.9e4 F F 0.00 1.5 -7.6e-4	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0//F/ F//F/ 2e-3/ 2e-4/ 2e-4/ 7e-7/ 7e-4/ 7e-7/ 7e-4/ 7e-7/ 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	1378 F F F 730 373 1230 909 F F 47 599 1320 595 164 F F F F F F F 888 202 424	5e-1/ F// F// F// 7e-2/ 7	160 850 F F 400 235 1561 133 F 470 600 600 600 600 600 225 F 203 244 361 F 566 126 135 100 100 100 100 100 100 100 10	$\begin{array}{c} 4e{-}2/\\ 4e{-}2/\\ F/\\ F/\\ F/\\ F/\\ F/\\ F/\\ 1e{-}2/\\ 1e{-}3/\\ 0/\\ 0/\\ F/\\ 0/\\ F/\\ 0/\\ F/\\ F/\\ F/\\ F/\\ F/\\ F/\\ 1e{-}3/\\ 1e{-}2/\\ 1e{-}$	1088 1216 F F F 872 388 1152 1022 F 477 477 602 167 F F F F F F S 300	$\begin{array}{c} 1/\\ 1/\\ 1/\\ 1/\\ 1/\\ 1/\\ 1/\\ 1/\\ 7e-1/\\ 7e-2/\\ 7e-2/\\ 7e-2/\\ 1/\\ 7e-2/\\ 9e-1/\\ 1/\\ 1/\\ 1/\\ 2e-1/\\ 1e-1/\\ 1e-2/\\ 1e-2/\\ 8e-4/\\ \end{array}$	79 159 20577 F F F F F F F F F F 702 214 1844 140 F 79 100 597 171 F 77 220 386 F f 55 6 6 56 6 56 6 56 6 6 6 6 6 7 7 7 7 7	2e-4/ 1// F// F// F// F// F// F// 6-2/ 0// 0// 2e-1// F// 2e-4/ F// F// 2e-4/ F// C2e-3/ 0// 2e-3/ 0// 2e-3/ 0// 2e-3/ 0// 2e-3/ 0// 2e-3/ 0// 2e-3/ 0// 2e-3/ 0// 2e-3/ 0// 2e-3/ 0// 2e-3/ 0// 2e-3/ 0// 2e-3/ 0// 2e-3/ 0// 2e-3/ 0// 2e-3/ 0// 2e-3/ 2e-	582           160           262000           F           F           F           7           3037           1505           2136           10281           477           599           1622           592           1711           F           F           581           F           100           289           719	0/ 01/19e-2/ F/ F/ F/ 0/ 0/ 2e-1/ 0/ 2e-1/ 0/ 2e-1/ 0/ 5/ - 7/ 0/ 5/ - 0/ - 9/ - 0/ - 9/ - 0/ - 2/ - 2/ - 2/ - 2/ - 2/ - 2/ - 2	620 33442 1258 F F F F 1484 4566 1791 2503 F 477 599 1772 5811 1711 F F 53125 12553 F F 866 5477 633
PFIT3 PFIT4 POLAK1 POLAK4 POLAK6 POWELLS POWELLS POWELLS RECIPE ROSENMM S316-32 S365 S365 S365 S365 S365 S365 S365 S365	/3/3/0/ /3/3/0/ /3/0/2/ /3/0/2/ /3/0/2/ /5/0/4/ 18/2/2/0/ 13/2/0/ 13/2/0/ 13/2/0/ 13/2/0/ 13/2/0/ 13/2/0/ 13/2/0/ 2/2/1/0/ 13/0/2/ 13/6/0/2/ 13/6/0/2/ 13/6/0/2/ 13/0/2/2/ 13/0/2/ 13/	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1.3 F F F 5.0e1 -8.0e-4 5.0e1 -4.4e1 0.0 0.0 0.0 -4.4e1 3.3e2 0.0 F F 3.5e-1 -4.9e-4 7.6e-4 F 0.0 0 1.5 F	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	0//F/ F//F/ 2e-3/ 7e-4// 2e-4/ 0// 2e-2// 2e-2// 2e-2/ 7e-4// F// 7e-4// 0// 3e-3// F// F// 1e-2/ 1e-2/ 1e-2/	1378 F F 730 373 373 1230 909 F 477 599 1320 595 595 164 F F 4577 F F 888 202 202 424 207	$\begin{array}{c} 5e{-}1/\\ F/\\ F/\\ F/\\ F-\\ F-\\ F-\\ F-\\ F-\\ F-\\ F-\\ F-\\ F-\\ F-$	160 850 F F F 440 235 1561 133 F 477 600 600 600 600 600 600 600 7 F 203 244 361 F 126 126 129 129 129	$\begin{array}{c} 4e{-}2/\\ 4e{-}2/\\ F/\\ F/\\ F/\\ F/\\ F/\\ F/\\ F/\\ 1e{-}2/\\ 1e{-}3/\\ 0/\\ 0/\\ F/\\ 0/\\ F/\\ F/\\ F/\\ F/\\ F/\\ F/\\ 1e{-}3/\\ 1e{-}2/\\ $	1088 1216 F F F 872 388 1152 1022 F 477 599 1213 602 167 F F F F F S 3 155 5 300 210	$\begin{array}{c} 1/\\ 1/:\\ F/\\ F/\\ F/\\ F/\\ F/\\ F-\\ 7e-1/\\ F-2/\\ 4e-3/\\ 0/\\ 1/\\ 1/\\ 6e-3/\\ 0/\\ F/\\ 1/\\ 1e-1/\\ 3e-3/\\ F/\\ 1e-1/\\ 1e-2/\\ 2e-2/\\ 2e-2/$	79 159 20577 F F F F F F F F F F 702 214 1844 140 F 759 700 597 171 177 7220 386 F F 556 126 122 122 122 122 122 122 122 123 123 123	$\begin{array}{c} 2e{-}4/\\ 1/\\ 1/\\ 1/\\ F/\\ F/\\ F/\\ F/\\ F/\\ F/\\ F/\\ F/\\ 5e{-}4/\\ 0/\\ 0/\\ 0/\\ 0/\\ 0/\\ 0/\\ 0/\\ 0/\\ 0/\\ 0$	582           1600           262000           F           F           F           337           1505           21366           10281           47           592           593           600           769           204	0/ 01/01/01 9e-2/ F/ F/ 0/ 8e-5/ 7e-2/ F/ 0/ 2e-1/ 0/ 2e-1/ 0/ 2e-1/ F/ 9/ 0/ 0/ 7 5/ 9/ 0/ 0/ 0/ 0/ 2e-2/ 2 2 2 2e-2/ 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	620 620 33422 1258 F F F F F F F F 7 7 7 7 7 7 7 7 7 7 7 7 7
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 Table A.2.
 Detailed numerical results

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