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Theory and Construction Methods for Large Regular Resolution IV Designs

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Robert M. Block

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Dedication

To my family, thank you for all the love and support.

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Abstract

We define 2^{k-p} fractional factorial designs which use all of their degrees of freedom to estimate main effects and two-factor interactions as *second order saturated* (sos) designs. We prove that resolution IV sos designs project to every other resolution IV design, and show the details of these projections for every $n = 32$ and $n = 64$ run fraction. For $k > (5/16)n$, all resolution IV designs are a projection from the even sos design at $k = n/2$. For $k \leq (5/16)n$ the minimum aberration design resolution IV designs are projections of sos designs with both even and odd words in the defining relation. While even resolution IV designs are limited to estimating fewer than $n/2$ two-factor interactions (in addition to the k main effects), resolution IV designs with odd-length words in the defining relation may devote more than half of their degrees of freedom to two-factor interactions. We propose a method to search for good resolution IV designs using naïve projections from even/odd sos designs. We introduce the alias length pattern as a tool to help characterize designs. We describe how the matrix $T = DD'$ for a design D is useful in searching for designs. We list the resolution IV even/odd minimum aberration designs for $n = 128$ and provide a catalog of the best resolution IV even/odd designs for $n = 128$. These results are based on an isomorphic check using a convenient function of T, as well as the set of projections of a design. Finally, we suggest a new method for finding good regular resolution IV designs for large n (> 128) and provide a preliminary table of good resolution IV even/odd designs for $n = 256$.

Key words: alias length pattern, defining contrast subgroup, Hamming distance matrix, isomorphism, minimum aberration, projection, regular designs, word length pattern.

Disclaimer

The views expressed in this dissertation are those of the author and do not reflect the official policy or position of the United States Air Force, Department of Defense, or the U.S. Government.

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1. Introduction

Two-level fractional factorial designs are widely used to investigate the effect of large numbers of parameters for complex computer models. Each parameter is varied over a high and low setting of possible operating conditions to build a model to help explain the relationship of the parameters to the outcome of the computer model. A 2^{k-p} fractional factorial design with k parameters or factors at two levels will consist of $n = 2^{k-p}$ runs. This design is a 2^{-p}th fraction of the 2^k full factorial design where the fraction is determined by p defining words. A "word" consists of "letters" which are the names of the factors denoted by A, B, ... (or 1, 2, ...,). The number of letters in a word is the word length. The group formed by the p defining words and their generalized interactions is called the defining contrast subgroup (Wu and Hamada 2000, p.157). The defining contrast subgroup consists of 2^p -1 words plus the identity column (commonly denoted as I). The defining contrast subgroup can be used to study all the aliasing relations among effects.

Every regular design can be categorized by the word length pattern of its defining contrast subgroup. For a 2^{k-p} design, let w_i denote the number of words of length i in its defining contrast subgroup. The vector wlp = $(w_1, \ldots, w_k)$ is called the word length pattern of the design. The resolution of a 2^{k-p} design is defined to be the smallest r such that $w_r \geq 1$. This means the length of the shortest word defines the resolution. Box and Hunter (1961) proposed the maximum resolution criterion as a method to categorize and compare designs. Later, Fries and Hunter (1980) introduced the minimum aberration criteria. This criterion allows any two designs to be rank ordered according to their word length patterns. This is the most common criterion used today to judge the goodness of designs.

In addition to wlp, we introduce a new criterion based on the alias length pattern to help find and characterize resolution IV designs. We define the alias length pattern as the frequencies of the lengths of the alias sets for two-factor interactions: alp$=(a_1, a_2, \ldots, a_l)$ where a_1 is the number of clear two-factor interactions, a_2 is the number of pairs of aliased two-factor interactions, etc., up to a_l which is the number of the largest set of l aliased two-factor interactions $\left(l \leq \left\lfloor \frac{k}{2} \right\rfloor\right)$, we define this value as $L_{\max}$.

The alias length pattern (alp) also contains other important information:

- The number of degrees of freedom for two-factor interactions: $\sum_{i=1}^{l} a_i$
- The number of length four words in the defining relation: $w_4 = \sum_{i=2}^{l} \binom{i}{2} a_i / 3$.

All regular 2_{IV}^{k-p} designs of size $n = 64$ or less have been identified previously; see Chen, Sun and Wu (CSW) (1993) and Sun (2001). However, for $n = 128$, all possible resolution IV designs have not been identified. Butler (2003) provided theory for constructing regular minimum aberration designs with n runs and $5n/16 < k < n$ factors. We have identified all remaining minimum aberration designs for $n = 128$, that is, for $k \leq 5n/16$.

For cases with $n = 128$ or more, search algorithms are currently used to identify attractive fractional factorial designs having the specified size and other characteristics.

For example, PROC FACTEX in SAS/QC® software (SAS Institute Inc., 1999) searches for minimum aberration designs for any given $k < 2^r$. However, due to the magnitude of the computation for large *n* and certain values of *k*, exhaustive searches are not feasible given current computing speeds. The FACTEX procedure returns the best design it finds in the allotted search time. It does not necessarily find the minimum aberration design. This paper will propose an alternative search method for tabulating good designs for *n* = 256 and larger.

It is well known that, for $k \le n/2$ factors and *n* = 8, 16, 24, 32, …, there exist resolution IV designs. When *k* = *n*/2, the design is known as a *minimal design* of resolution IV (Montgomery 2001, p. 347). These minimal designs may be obtained by foldover of a saturated orthogonal main effects design of size *n*/2. For any $n = 2^r$ (with $r \ge 3$), a regular minimal design may be constructed by using all the odd interactions of the *r* basic columns as generators. For example, for *r* = 5, the 11 generators for the 2_{IV}^{16-11} design are the $\binom{5}{3} = 10$ three-factor interactions and the single five-factor interaction.

Alternatively one may arrange the *n* – 1 columns of a saturated main effects design in Yates order (e.g., see Appendix A), and:

- select every other column starting with the first or
- select the last *n*/2 columns.

Li and Mee (2002) present an alternative set of *n*/2 columns to create this minimal design. For the remainder of this article, we restrict our attention to regular resolution IV designs.

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The minimal 2_{IV}^{k-p} designs are even designs, in that every word in the defining relation is of even length. Li and Mee (2002) showed that every 2_{IV}^{k-p} design with $5n/16 < k \leq n/2$ must be an even design. Even designs:

- alias even effects with other even effects, and odd effects with odd.
- allocate $n/2$ degrees of freedom to odd effects, and $n/2 - 1$ degrees of freedom to even effects
- provide at most $n/2 - 1$ degrees of freedom for estimating two-factor interactions, and at least $n/2$ - k degrees of freedom for three-factor or higher-order interactions.

For instance, the minimum aberration 2_{IV}^{11-6} design - an even design – permits estimation of 11 main effects, 15 two-factor interactions, while leaving five degrees of freedom for aliased three-factor interactions.

By contrast, 2_{IV}^{k-p} designs with half of the words in the defining relation with odd length may provide more than $n/2 - 1$ degrees of freedom for two-factor interactions. For instance, the minimum aberration 2_{IV}^{10-5} design supports estimation of all 10 main effects and 21 two-factor interactions. Because of this greater capacity for estimating two-factor interactions, this work will focus on the construction of even/odd 2_{IV}^{k-p} designs. While such designs do not exist for $n = 16$ and are rather rare for $n = 32$, even/odd designs are common for larger n if $k \leq 5n/16$.

One of the challenging aspects of searching for new designs is determining when two designs are equivalent or isomorphic. (Two designs are isomorphic if the defining relation of one can be mapped into the defining relation of the other through a relabeling of the factors and level exchanges.) Draper and Mitchell (1967, 1968, 1970) wrote a series of three articles which used an algorithm to determine isomorphic designs. Their original method, called "sequential conjecture" (1967) found a relabeling map for isomorphic designs. They noted in their next paper (1968) that word length pattern did not uniquely identify designs but it provided an alternative to their permutation subroutine (sequential conjecture procedure) for testing isomorphic designs when the time required to conduct the isomorphic checks become prohibitive. The trade-off of using word length pattern is that the designs found may not be a complete set. Draper and Mitchell (1970) introduced the "letter pattern comparison" (now commonly known as the letter pattern matrix) as a way to identify designs instead of the computationally burdensome sequential conjecture procedure. They make the conjecture that the letter pattern matrix approach uniquely determines designs. Chen and Lin (1991) provide a counter-example to this conjecture. Additional counter-examples appear later in section 11 in this dissertation.

Chen, Sun, and Wu (1993) developed an algorithm for constructing regular fractional factorial designs that required a complete mapping for each design that shared word length pattern. This method insured that no non-isomorphic designs were lost, but became computationally infeasible for $n = 128$ or larger.

Sun, Li, and Ye (2002) proposed a sequential method for constructing non-isomorphic orthogonal designs and an algorithm for detecting isomorphic designs for both regular and non-regular designs. Their algorithm is based on the concept of *minimal column base.* A column base is a subset of columns of a design, such that no two rows are identical to each other. A minimal column base is the smallest possible number of columns for a given design. Sun, Li, and Ye check the mapping for the minimal column bases for two designs with the same word length pattern. They repeat this until an isomorphic mapping is found or all the possible minimal bases for the two designs have been checked. See Sun, Li, and Ye (2002) for details. This method is successful for both regular and non-regular designs and especially useful for designs with small n.

In the following section, we focus on the structure of even/odd resolution IV designs of size 32 and 64. We use these known cases to introduce some definitions and indicate the structure one could exploit in the larger cases where all designs are not known.

2. Resolution IV Designs of Size 32 and 64

Only five even/odd 2_{IV}^{k-p} designs of size 32 exist; refer to Table 2.1. For convenience, we use Chen, Sun, and Wu's method of labeling designs where 10-5.1 designates the first (best) 32 run design with ten factors and five generators. Two of these designs (10-5.1 and 9-4.2) utilize all 31 degrees of freedom for estimating main effects and two-factor interactions. We will refer to any 2_{IV}^{k-p} design (both even and even/odd designs) that uses all of its degrees of freedom for estimating main effects and two-factor interactions as a *second order saturated* (*sos*) *design*. Each of the non-sos designs is a projection of at least one of these sos designs. For instance, delete any column from 10-5.1 and one obtains design 9-4.1.

Theorem 2.1: Every 2^{k-p} non-sos resolution IV design is the projection of at least one sos resolution IV parent design.

Suppose there exists a 2_{IV}^{k-p} non-sos design. A non-sos design is defined as a design that does not utilize all $2^{k-p} - 1$ degrees of freedom for estimating main effects and two-factor interactions.

Table 2.1: Even-Odd Resolution IV Designs of Size 32

Design	Generators	df	wlp	alp	E/O Projections
10-5.1	7, 11, 19, 29, 30	31	10,16,0,0,5	0,20,0,0,1	9-4.1
9-4.1	7, 11, 29, 30	30	6,8,0,0,1	8,12,0,1	8-3.1
9-4.2	7, 11, 13, 30	31	7,7,0,0,0,1	15,0,7	8-3.1
8-3.1	7,11,29	29	3,4	13,6,1	7-2.1
7-2.1	7, 27	25	1,2	15,3	

A non-sos design therefore has "available columns" for the unused degrees of freedom. An available column is any column that is not aliased with a main effect or two-factor interaction.

Suppose we add a new factor to our design, with an available column as its generator. The new factor "z" multiplied by its generator will appear as an additional word in the defining contrast subgroup. The new word is necessarily of length four or more and the resulting design with $k + 1$ factors must be resolution IV for the reason given below.

Suppose it is not resolution IV; then this would mean there is a word in the defining contrast subgroup of length three or less. This implies that a new word contains z (since z appears in all the new words) plus two or fewer other letters. This implies that z is aliased with either a main effect or two-factor interaction, which contradicts the fact that the generator was an "available column". Therefore the resulting $k + 1$ factor design must be resolution IV.

Now this $k + 1$ factor resolution IV design is either a second order saturated design with no more available columns, or a non-sos design with an available column. If not sos, the process can be repeated until the design becomes a second order saturated design. Therefore, all non-sos 2_{IV}^{k-p} designs have at least one resolution IV sos parent.

<u>Corollary 2.1</u>: All non-sos even/odd resolution IV designs are the projection of an even/odd resolution IV sos design.

Even/odd designs may project to either an even design or an even/odd design while even designs only project to other even designs (see Figure 2.1).

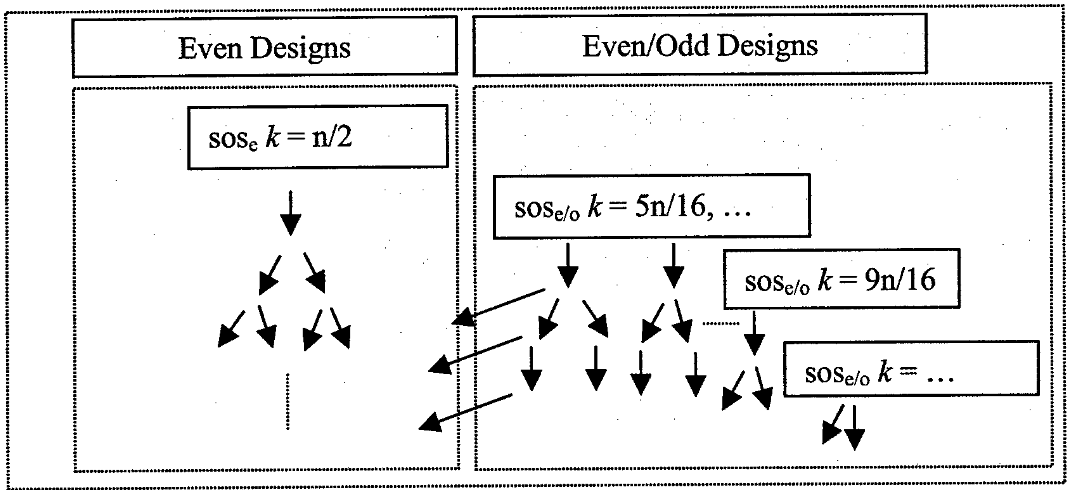

Figure 2.1: Schematic of Projections

<u>Lemma 2.1:</u> If the delete-one-column projections of an even/odd resolution IV design include multiple even designs, the even designs must be isomorphic.

We know that an even design will have all even length words in the defining relation while an even/odd design has 2^{p-1} odd-length words and $2^{p-1}-1$ even-length words. If an even/odd design projects to an even design, then all the odd length words have been removed. Note that the projected even design may be written as a $2^{(k-1)-(p-1)}$; so half of the words in the defining relation have been removed. Therefore all the odd length words must contain the deleted column. Any other even projection must be isomorphic.

Table 2.1 includes the generators, degrees of freedom (for main effects and two-factor interactions), word length pattern (wlp) and the alias length pattern (alp) for each of the 32-run even/odd designs. For example, design 9-4.1 has $a_1 = 8$ clear two-factor interactions, $a_2 = 12$ pairs of aliased two-factor interactions, $a_4 = 1$ set of four aliased two-factor interactions, and 9 + 21 = 30 degrees of freedom for main effects and two-factor interactions.

The catalog of designs in Appendix B shows all 148 even/odd 2_{IV}^{k-p} designs of size 64. Here we use our own notation to identify the designs since CSW (1993) did not list all the $n = 64$ designs in their catalog and their ordering did not accord with any obvious criteria. We rank the alternative 2_{IV}^{k-p} designs for a given k using the following criterion:

1. Smaller w_4
2. For designs with the same w_4, smaller w_5
3. For designs with the same (w_4, w_5), larger a_1

To avoid confusion with the CSW numbering, we use the letters a, b, ... rather than numerals to index the designs. Table B.1 does include a column identifying the CSW number for those designs that are included in their 1993 catalog.

We make the following observations regarding the catalog in Appendix B. First, there are only eight even/odd second order saturated resolution IV designs of size 64:

- 20-14.a
- 18-12.c
- 17-11.b,d,e,g,j
- 13-7.b

Second, a non-sos design in Appendix B may be the projection of more than one sos design. For instance, 16-10.b is the projection of either sos design 17-11.b or 17-11.d.

Note that each $n = 8, 16, 32, \ldots$ there is only one even resolution IV second-order saturated (sos) design, the minimal design with $k = n/2$. Thus, the following results are apparent:

- For $n = 8$ and 16, there exists only the unique even sos design with $k = n/2$.
- For $n = 32$, there exist three sos designs, with $k = 9$, 10, and 16.
- For $n = 64$, there exist nine sos designs, with $k = 13$, 17, 18, 20, and 32.

The sos designs with the smallest k are of particular interest because these designs provide the most degrees of freedom for two-factor interactions. We examine the 9-4.2 and 13-7.b designs now. Design 9-4.2 has $w_4 = 7$, and these length-four words involve only seven of the nine factors. Thus, all the interactions involving two factors are clear. This design is structured as $\frac{1}{2}\left[2_{IV}^{7-3} \times 2^2\right]$, where the one-half fraction of the product array is obtained by dividing each smaller design into two blocks and then taking only two of the four block combinations (see Figure 2.2) where the 2_{IV}^{7-3} has generators 6 = 123, 7 = 124, 8 = 134. Note that the product array above is fractionated using I = +23459.

Design 13-7.b has similar structure: $\frac{1}{4}\left[2_{IV}^{7-3} \times 2_{IV}^{6-2}\right]$, with each 16-run sub-design divided into four blocks (see Figure 2.3). Butler (2002a) describes these types of designs as joint designs; see also Miller (1997).

		2^2	
		I = -59 (2 runs)	I = 59 (2 runs)
2_{IV}^{7-3} with	I = -234 (8 runs)	8x2=16 runs	
	I = 234 (8 runs)		8x2=16 runs

Figure 2.2: Design Structure for 9-4.2

		2_{IV}^{6-2} with $\underline{11} = 56\underline{10}$ and $\underline{13} = 56\underline{12}$			
		$6\underline{11} = +$ $6\underline{10}\underline{13} = +$	$6\underline{11} = +$ $6\underline{10}\underline{13} = -$	$6\underline{11} = -$ $6\underline{10}\underline{13} = +$	$6\underline{11} = -$ $6\underline{10}\underline{13} = -$
2_{IV}^{7-3} with 7=123, 8=124, 9=134	$1 = +$ $234 = +$	$4 \times 4 = 16$ runs			
	$1 = +$ $234 = -$		$4 \times 4 = 16$ runs		
	$1 = -$ $234 = +$			$4 \times 4 = 16$ runs	
	$1 = -$ $234 = -$				$4 \times 4 = 16$ runs

Figure 2.3: Design Structure for 13-7.b

3. Projection Design Search Method

The difficulty of finding minimum aberration designs (and other good designs) increases dramatically as the size of the designs grows. As n becomes larger, it is no longer feasible to conduct exhaustive searches. One option is to intelligently reduce the number of designs that must be investigated. The value of sos designs is they represent a small fraction of all possible resolution IV designs and project to all the remaining possible resolution IV designs. Thus from these designs one can project to minimum aberration and other good designs. If all the sos designs for a given n can be found and identified, then we have the starting points for all resolution IV even or even/odd designs for a given n.

Our first attempt to find minimum aberration and other good designs was to find all the sos designs for a given run size n and then project from those designs to identify the best designs. To accomplish this requires the ability to find sos designs, distinguish non-isomorphic sos designs, and then to determine the best projections.

The first issue is feasible at $n = 128$. It appears to be possible to find the sos designs at $n = 128$. Projections of these sos designs lead to weak minimum aberration designs and careful evaluation of all sos designs would determine minimum aberration for any $k \leq 64$ at $n = 128$. There are 88 unique sos designs at $n = 128$. However to find the minimum aberration design, one must evaluate all possible sequence of projections; this combinatorial problem currently becomes computationally infeasible beyond ten or more projections. Therefore the projection search method is limited in its usefulness for conducting an exhaustive search; in addition, the number of sos designs explodes at higher n. For instance, there are at least 34,015 (and possibly twice that many) sos designs at $n = 256$ (see section 13). Thus we found it necessary to pursue alternative methods.

4. Detecting Isomorphic Designs

To successfully find minimum aberration designs requires a computationally fast and efficient method to find and compare designs, as well as some ability to quickly identify isomorphic designs.

When searching for designs, most of the time is spent evaluating isomorphic designs. CSW (1993) were not able to distinguish all $n = 128$ designs beyond $k = 11$ because of the time required to find a complete relabeling of columns for every isomorphic design check. At $n = 128$ with $k = 11$ factors, there are 2,597 sets of four generators that produce a resolution IV designs. Of these designs, there are only 92 non-isomorphic designs. This is the last step CSW completed (Sun 2001). Consider at $k = 17$ we have found 14,438 unique resolution IV designs, and a total of 302,384 sets of ten generators producing a resolution IV design. Thus, on average, there are more than 20 ways to construct each unique design and the number of designs to compare is two orders of magnitude greater.

Two fractional factorial designs are isomorphic ($D_1 \cong D_2$) if one design can be obtained from the other design by relabeling the factors, reordering the runs, or switching the levels of factors (Chen and Lin 1991). Clark and Dean (2001) present a necessary and sufficient condition for two designs to be isomorphic based on a geometrical representation of the designs. Let D represent an $n \times k$ design matrix with n runs, k factors, and levels ± 1. Let $T(D) = DD'$, which is related to the Hamming distance matrix *H*, since $T = kJ_k - 2H$ where J_k is a $k \times k$ matrix of unit elements. Note that for any design *D*, the $(i, j)^{\text{th}}$ element of *T*, denoted as $T_{ij}(D)$, is equal to the inner product of the i^{th} and j^{th} rows of D. Clearly $T_{ij}(D) = k$ for $i = j$. Other properties of T are discussed in sections five and six. We now describe a result from Clark and Dean (2001) and introduce more notation:

Clark and Dean's Corollary 2.2: Designs D_1 and D_2 are isomorphic if and only if there exists an $n \times n$ permutation matrix R and a permutation $\{c_1, c_2, \ldots, c_k\}$ of $\{1,2,\ldots,k\}$ such that, for $q = 1,2,\ldots,k$: $T(D_1^{\{1,2,\cdots,q\}}) = RT(D_2^{\{c_1,c_2,\cdots,c_q\}})R'$ where $D^{\{1,2,\ldots,q\}}$ denotes a q-factor subset of the full design including just the listed columns.

We will say that $T(D_1)$ is equivalent to $T(D_2)$ [denoted as $T(D_1) \equiv T(D_2)$] if for some permutation matrix R, $T(D_1) = RT(D_2)R'$. Define $D_i^{\{q\}}$ to represent the design with only the q^{th} column from D_i. Similarly, $D_i^{\{\bar{q}\}}$ is the design matrix with all the columns of D_i except for column q. Observe that $T_{ij}(D^{\{\bar{q}\}}) = (k-1)$ for $i = j$. Based on Clark and Dean's Corollary, we have Lemma 4.1:

Lemma 4.1: $D_1 \cong D_2$ if and only if $T(D_1) \equiv T(D_2)$ and $D_1^{\{\bar{q}\}} \cong D_2^{\{\bar{c}_q\}}$ for some integers q and c_q.

Note that by Clark and Dean's Corollary 2.2 $D_1^{\{\bar{k}\}} \cong D_2^{\{\bar{c}_k\}}$ if and only if there exists R and $\{c_1, \cdots, c_{k-1}\}$ such that

$T(D_1^{\{\bar{k}\}}) = RT(D_2^{\{\bar{c}_k\}})R'$, $T(D_1^{\{\overline{k,k-1}\}}) = RT(D_2^{\{\bar{c}_k,\bar{c}_{k-1}\}})R', \cdots, T(D_1^{\{1\}}) = RT(D_2^{\{c_1\}})R'$. Then $D_1 \cong D_2$, if and only if $T(D_1) \equiv T(D_2)$ and $D_1^{\{\bar{q}\}} \cong D_2^{\{\bar{c}_q\}}$ for some integers q and c_q.

Lemma 4.2: $\{T(D^{\{\bar{1}\}}), \cdots, T(D^{\{\bar{k}\}})\}$ determines $T(D)$.

We show this result for an arbitrary element $T_{ij}(D)$. Suppose we have a design D, with k factors and we know the T matrices for the k projections $\{T(D^{\{\bar{1}\}}), \cdots, T(D^{\{\bar{k}\}})\}$

for D. Define $r = \frac{T_{ij}(D)+k}{2}$. Then for r values of $l = 1,2,\cdots,k$, $T_{ij}(D^{\{\bar{l}\}}) = T_{ij}(D) - 1$,

and for $k - r$ values of l, $T_{ij}(D^{\{\bar{l}\}}) = T_{ij}(D) + 1$. There are two possibilities for $T_{ij}(D)$:

The set $\{T_{ij}(D^{\{\bar{1}\}}),\cdots,T_{ij}(D^{\{\bar{k}\}})\}$ will contain both $T_{ij}(D)$ – 1 and $T_{ij}(D)$ + 1 values, in which case they bound $T_{ij}(D)$; or the set will contain one constant value, in which case $T_{ij}(D)$= $T_{ij}(D^{\{\bar{l}\}})$ + 1 if $T_{ij}(D^{\{\bar{l}\}})$ is positive, or $T_{ij}(D^{\{\bar{l}\}})$ – 1 if $T_{ij}(D^{\{\bar{l}\}})$ is negative.

Q.E.D.

Lemma 4.2 states that the set of $\{T(D^{\{\bar{1}\}}),\cdots,T(D^{\{\bar{k}\}})\}$ determines $T(D)$. If we are missing one of the projections from that set, we can still determine $T(D)$.

<u>Corollary 4.1:</u> $k - 1$ members from $\{T(D^{\{\bar{1}\}}),\cdots,T(D^{\{\bar{k}\}})\}$ determine $T(D)$.

The proof is as follows: Suppose we have design D_i, with k factors and we know $k - 1$ of the members from $\{T(D^{\{\bar{1}\}}),\cdots,T(D^{\{\bar{k}\}})\}$. $T_{ij}(D^{\{\bar{q}\}})$ will either increase or decrease the value of $T_{ij}(D)$ by one. Recall that $r = \frac{T_{ij}(D)+k}{2}$ and for r values of $l = 1,2,\cdots,k$, $T_{ij}(D^{\{\bar{l}\}}) = T_{ij}(D) - 1$, and for $k - r$ values of l, $T_{ij}(D^{\{\bar{l}\}}) = T_{ij}(D) + 1$. If we are missing one projection, we can still determine $T_{ij}(D)$. There are two possibilities for $T_{ij}(D)$: The set will contain both $T_{ij}(D)$ – 1 and $T_{ij}(D)$ + 1 values, in which case they bound $T_{ij}(D)$; or the set will contain one constant value, in which case $T_{ij}(D)$= $T_{ij}(D^{\{\bar{l}\}})$ + 1 if $T_{ij}(D^{\{\bar{l}\}})$ is positive, or $T_{ij}(D^{\{\bar{l}\}})$ – 1 if $T_{ij}(D^{\{\bar{l}\}})$ is negative.

Now we make two conjectures regarding isomorphism of two designs based on isomorphism of their delete-one-factor projections. Let D_1 and D_2 be any regular 2^{k-p} designs with no repeat rows (runs).

<u>Conjecture 4.1:</u> If $D_1^{\{\bar{i}\}} \cong D_2^{\{\bar{c}_i\}}$ with $i = 1,2,\cdots,k$, where $\{c_1, c_2, \cdots, c_k\}$ is any permutation of the integers $\{1,2,\cdots,k\}$, then $D_1 \cong D_2$.

We know under the following conditions that the conjecture is true: Note that $T(D_1^{\{\bar{1}\}}) + \cdots + T(D_1^{\{\bar{k}\}}) = (k-1)T(D_1)$ and $T(D_2^{\{\bar{1}\}}) + \cdots + T(D_2^{\{\bar{k}\}}) = (k-1)T(D_2)$.

Without loss of generality, assume the columns of D_2 are ordered such that $D_1^{\{\bar{i}\}} \cong D_2^{\{\bar{i}\}}\ \forall i$. Then there exists an $R_i \ni T(D_1^{\{\bar{i}\}}) = R_i T(D_2^{\{\bar{i}\}}) R_i'$. If $R_1 = \cdots = R_k = R$ then $T(D_1^{\{\bar{i}\}}) = RT(D_2^{\{\bar{i}\}})R' \forall i$ and $\sum T(D_1^{\{\bar{i}\}}) = \sum RT(D_2^{\{\bar{i}\}})R'$. Then $(k-1)T(D_1) = (k-1)T(D_2)$. Thus $T(D_1) = T(D_2)$ and $\therefore D_1 \cong D_2$.

The key requirement of the conjecture is that $\{D_1^{\{\bar{i}\}}\} \cong \{D_2^{\{\bar{i}\}}\}$ for $i = 1,\cdots,k$ implies $T(D_1) \equiv T(D_2)$. We know this requirement is not true in general. In fact, we know that a non-simple design may share the same set of projections as a simple design, but will have a different T matrix. For example consider the 2^4 full factorial design and the replicated 2_{IV}^{4-1} fractional factorial design. While they share the same projections, they have different T matrices.

Define $S \subset \{1,2,\cdots,k\}$ with cardinality s. If Conjecture 4.1 is true, then we suppose that the following stronger conjecture may also be true.

<u>Conjecture 4.2</u> If two designs D_1 and D_2, have s projections in common, and these s projections of D_1, $\{D_1^{\{\bar{i}\}} : i \in S\}$ determine $T(D_1)$, then $D_1 \cong D_2$.

Assume we have two designs, D_1 and D_2, with s projections in common, $D_1^{\{\bar{i}\}} \cong D_2^{\{\bar{c}_i\}}$ for $i \in S$. If the s projections of D_1, $\{D_1^{\{\bar{i}\}} : i \in S\}$ determine $T(D_1)$, then they also determine $T(D_2)$ and we suppose $D_1 \cong D_2$.

5. Advantages and Uses of the *T* Matrix

Hedayat, Sloane, and Stufken's definition 3.4 (1999) states that an orthogonal array OA(*N, k,* 2, *t*) with levels from GF(2) is said to be linear if it is simple (runs are distinct) and if, when considered as *k*-tuples from GF(2), its N runs form a vector space over GF(2) (i.e., satisfy the condition that if R_1 and R_2 are any two runs of the array then every *k*-tuple $c_1R_1 + c_2R_2$ is also a run, for any choice of $c_1, c_2 \in GF(2)$).

It is known that all two-level regular fractional factorial designs are OA(*N, k,* 2, *t*) with t = (resolution – 1). All regular fractional factorial designs without repeat runs are simple. Fractional factorial designs with a defining relation (regular design) are a subclass of orthogonal arrays and are linear codes (Hedayat, Sloane, and Stufken p.276). Therefore we can take the sum of any two rows from a regular fractional factorial design and using modulus(2) arithmetic it will equal another row in the design. Note that the element-wise product for two runs with levels ± 1 is equivalent to modulus(2) arithmetic for the same two runs with levels 0 and 1. Hence, for regular two level fractional factorial design with levels of ± 1, any two rows multiplied element-wise will result in another row of the design.

For example consider a 2_{III}^{5-2} regular fractional factorial design where:

$$D = \begin{matrix} -1 & -1 & -1 & -1 & 1 \\ -1 & -1 & 1 & 1 & -1 \\ -1 & 1 & -1 & 1 & 1 \\ -1 & 1 & 1 & -1 & -1 \\ 1 & -1 & -1 & 1 & -1 \\ 1 & -1 & 1 & -1 & 1 \\ 1 & 1 & -1 & -1 & -1 \\ 1 & 1 & 1 & 1 & 1 \end{matrix}$$

and the T matrix is:

$$T(D) = DD' = \begin{matrix} 5 & -1 & 1 & -1 & -1 & 1 & -1 & -3 \\ -1 & 5 & -1 & 1 & 1 & -1 & -3 & -1 \\ 1 & -1 & 5 & -1 & -1 & -3 & -1 & 1 \\ -1 & 1 & -1 & 5 & -3 & -1 & 1 & -1 \\ -1 & 1 & -1 & -3 & 5 & -1 & 1 & -1 \\ 1 & -1 & -3 & -1 & -1 & 5 & -1 & 1 \\ -1 & -3 & -1 & 1 & 1 & -1 & 5 & -1 \\ -3 & -1 & 1 & -1 & -1 & 1 & -1 & 5 \end{matrix} .$$

Note that each column (and row) of T have the same distribution of values. For instance, each column contains the values -3, -1, 1, and 5 with frequencies 1, 4, 2, and 1, respectively.

Theorem 5.1: Any two-level regular factorial design D will have a constant column distribution in $T(D)$.

We now show that the elements of t_i^D are a permutation of the elements of t_j^D for arbitrary i and j from {1, …, n}. We know that $x_i x_j = x_l$ for some $l \in \{1,2,...,n\}$, where $x_i x_j$ is defined as the element-wise product of the i^{th} and j^{th} rows. Hence, $x_i x_l = x_j$.

Now define $t_j^D = D \cdot x_j$ where x_j' is the j^{th} row of D, and rewrite $t_j^D = \begin{bmatrix} x_1' x_j \\ \vdots \\ x_n' x_j \end{bmatrix}$ using the specified i^{th} and j^{th} rows above as $t_j^D = \begin{bmatrix} x_1'(x_i x_l) \\ \vdots \\ x_n'(x_i x_l) \end{bmatrix} = \begin{bmatrix} (x_1 x_l)' x_i \\ \vdots \\ (x_n x_l)' x_i \end{bmatrix}$. From the definition of a group we know that any element from a group multiplied by the group results in the original group. Therefore this implies that the matrix $= \begin{bmatrix} (x_1 x_l)' x_i \\ \vdots \\ (x_n x_l)' x_i \end{bmatrix}$ contains all the elements of t_i^D. Q.E.D.

6. Functions of the T Matrix

We know from Theorem 5.1 that $t_1^D, \cdots, t_n^D$ are simply different permutations of the same vector. Butler (2003) states that $T_{ij}(D)$ measures the confounding between the i^{th} and j^{th} rows. He defines $\mu_k = n^{-2}\sum_{i=1}^{n}\sum_{j=1}^{n} T_{ij}^k(D)$ as the k^{th} moment of the elements of the T matrix. Therefore, the moments $\mu_0, \cdots, \mu_k$ provide an overall measure of the confounding between rows of the design (Butler 2003). By Theorem 5.1 we can use any one column of the T matrix to calculate the moments of a regular design. When our use of t_i^D does not depend on the subscript i, we simply write t^D to represent an arbitrary column of T. We know from Butler (2003) that the design moments for D can be used to compare and rank designs. The design moments method results in an identical ranking of designs that results from using the word length pattern for designs (Butler 2003). Since the word length pattern and moments of T are both functions of t^D, it is possible that t^D might be more discriminating than the moments of a design or equivalently the word length pattern. However; by Theorem 6.1, the frequencies of t^D can be written as a function of the moments, so t^D is no more discriminating than is the word length pattern.

Let $f_0, \ldots, f_k$ represent the frequency of values for $-k$, $(-k+2)$, … , k, respectively, in t^D.

<u>Theorem 6.1:</u> The frequencies $f_0, \ldots, f_k$ are a function of the moments $\mu_0, \cdots, \mu_k$.

We can write $n\mu_j = \sum_{i=0}^{k}(2i-k)^j f_i$ for $j \in \{0,1,\cdots,k\}$

Note that: $n\mu_0 = \sum_{i=0}^{k}(2i-k)^0 f_i = \sum_{i=o}^{k} f_i = n$. Define $\mu_j' = \sum_{i=0}^{k} i^j f_i / n$ and let

$M = \begin{bmatrix} \mu_0 \\ \vdots \\ \mu_k \end{bmatrix}$ and $M^* = \begin{bmatrix} \mu_0' \\ \vdots \\ \mu_k' \end{bmatrix}$. Note that $M = BM^*$ where B is a lower triangular matrix

with positive values on the diagonal since $\mu_r = E[2i-k]^r = 2^r E[i^r] - 2^{r-1} rkE[i^{r-1}] + \ldots$

$= 2^r \mu_r' - 2^{r-1} rk\mu_{r-1} + \ldots$. We know that the determinant of a triangular matrix is equal to the product of the elements along the diagonal (Eves, p123). Hence, $M^* = B^{-1}M$ since the matrix B is nonsingular and can be inverted.

Now write the moments of a design, $\mu_0', \cdots, \mu_k'$, as a system of equations

$nM^* = AF$ where $F = \begin{bmatrix} f_0 \\ \vdots \\ f_k \end{bmatrix}_{(k+1)\times 1}$ and the coefficient matrix A is:

$$A = \begin{bmatrix} 1 & 1 & 1 & 1 \ldots & 1 \\ 0 & 1 & 2 & 3 \ldots & k \\ 0 & 1 & 2^2 & 3^2 \ldots & k^2 \\ \vdots & \vdots & \vdots & \vdots \ldots & \vdots \\ 0 & 1 & 2^k & 3^k \ldots & k^k \end{bmatrix}_{(k+1)\times(k+1)}$$

The determinant of matrix A can be described as a Vandermonde determinant (Eves p.127). From this literature, it is known that A is nonsingular (since the values of A are integer and increasing [0, 1, …,k]). Thus A can be inverted, so we can rewrite our system of equations in terms of $F = A^{-1}nM^*$ and $F = nA^{-1}B^{-1}M$. This means the frequencies, F, are a function of the moments M. Therefore the probabilities that generate those moments are unique and the moments are unique in the sense that any two designs with the same moments M must have identical t^D frequencies F.

Since word length pattern, or equivalently t^D, is unsuccessful in distinguishing many designs at $n = 64$ and larger, we are interested in creating a more discriminating function from pairs of columns of T. Let $T2^D$ represent the set of n pairs of columns of T for D where $T2^D = \{(t_1^D, t_1^D), (t_1^D, t_2^D), \cdots, (t_1^D, t_n^D)\}$.

Define $G(T2^D) = \{g(t_1^D, t_1^D), g(t_1^D, t_2^D), \cdots, g(t_1^D, t_n^D)\}$, where $g(t_1^D, t_v^D) = \sum_{r=1}^{n} h(T_{r1}T_{rv})$ and $h(x) = 0$ when $x \le 0$, and $h(x) = x^{-1}$ when $x > 0$. For example, consider the 2_{III}^{5-2} regular design again. The t^D vector contains the values -3, -1, 1, and 5, with frequencies 1, 4, 2, and 1, respectively. Figure 6.1 shows the four bivariate frequency distributions that occur for the pairs of columns for T. While the columns of T have identical frequency distributions, the pairs of columns for T do not. For the n pairs (t_1^D, t_j^D) $j = 1, 2, \cdots, n$, four possibilities occur with frequencies 1, 4, 2, and 1, respectively (see Figure 6.1). Therefore, $G(T2^D) = \{6.1511, 0.667, 4.4, 0.667, 0.667, 4.4, 0.667, 6.0\}$ for this design. We sort this set for our convenience in comparing designs so that $G(T2^D) = \{0.667, 0.667, 0.667, 0.667, 4.4, 4.4, 6.0, 6.1511\}$.

We chose to define $T2^D$ above pairing each of the n columns of T with t_1^D. We now show that the set $G(T2^D)$ is invariant to the choice of which column we fix.

<u>Lemma 6.1:</u> For any $i \in (1, \cdots, n)$, $\{g(t_i^D, t_j^D)\ j = 1, \cdots, n\} = \{g(t_n^D, t_{r_j}^D)\ j = 1, \cdots, n\}$ where $(r_1, \cdots, r_n)$ is a permutation of $(1, \cdots, n)$.

(1, *j*) Pairs of *T* matrix columns:	Bivariate distribution:	$g(t_1^D, t_j^D)$

(1, 1)

	-3	-1	1	5	totals
-3	1				1
-1		4			4
1			2		2
5				1	1
totals	1	4	2	1	8

= 6.1511

(1, 2)
(1, 4)
(1, 5)
(1, 7)

	-3	-1	1	5	totals
-3		1			1
-1	1		2	1	4
1		2			2
5		1			1
totals	1	4	2	1	8

= 0.667

(1, 3)
(1, 6)

	-3	-1	1	5	totals
-3			1		1
-1		4			4
1	1			1	2
5			1		1
totals	1	4	2	1	8

= 4.4

(1, 8)

	-3	-1	1	5	totals
-3				1	1
-1		4			4
1			2		2
5	1				1
totals	1	4	2	1	8

= 6.0

Figure 6.1: 2_{III}^{5-2} *T* Matrix, Pairs of Columns

Without loss of generality, assume x_n is the treatment combination with all +1 levels. Then the element-wise product of $x_i x_j = x_n x_{r_j} = x_{r_j}$ for some $r_j \in \{1,\cdots,n\}$. Hence, Lemma 6.1. By this lemma, $\{g(t_i^D, t_j^D)\ j=1,\cdots,n\}$ is invariant to the choice of i. We defined $T2^D$ with $i = 1$.

<u>Theorem 6.2:</u> $D_1 \cong D_2 \Rightarrow G(T2^{D_1}) = G(T2^{D_2})$

Since $D_1 \cong D_2$, there exists $\{r_1,\cdots,r_n\}$, a permutation of $\{1,\cdots,n\}$, such that $T(D_1) = RT(D_2)R'$ where R is the permutatin matrix defined as $R_{ij} = 1$ if $j = r_i$, and zero otherwise. Then $(t_1^{D_1}, t_j^{D_1}) = (Rt_{r_1}^{D_2}, Rt_{r_j}^{D_2})$ for j = (1, …, n). So $g(t_1^{D_1}, t_j^{D_1}) = g(t_{r_1}^{D_2}, t_{r_j}^{D_2})$ for j = (1, …, n), because the permutation matrix R does not affect the computation of $g(\cdot,\cdot)$ since we are summing the rows. Then by Lemma 6.1, $\{g(t_{r_1}^{D_2}, t_{r_j}^{D_2})\ j=1,\cdots,n\} = G(T2^{D_2})$ and so $G(T2^{D_1}) = G(T2^{D_2})$. Q.E.D.

The set $G(T2^D)$ uniquely identifies all regular resolution IV designs for $n < 128$. At $n = 128$, $G(T2^D)$ uniquely identifies 296,958 of the 296,960 even/odd designs (it does not uniquely identify 2 even/odd designs) which differ based on their delete-one-factor projections. However, it does distinguish the two 2_{VII}^{31-16} regular designs that are commonly cited from Chen and Lin (1991) as an example of non-isomorphic designs with common letter pattern matrices. See Section 11 for more comparisons with other common criterion.

7. Exhaustive Even/Odd Design Search Method

We now present a new method for finding minimum aberration designs using a build up and delete-one-factor projection strategy. As noted previously, CSW were unable to fully enumerate designs beyond $k = 11$ at $n = 128$, due to the enormous computations required to perform their isomorphism checks. Our approach for regular factorial designs attempts to take advantage of a simplified isomorphism check. Using Conjecture 4.1 we replace the permutation check for isomorphism from Clark and Dean and check the set of delete-one-factor projections for each design. We save only the unique sets of delete-one-factor projections and the $G(T2^D)$ set, thus determining our non-isomorphic designs.

If Conjecture 4.1 is not true, then there could exist designs with non-equivalent T matrices that have a common set of delete-one-factor projections. We differentiated designs based on their delete-one-factor projections. We did not check $G(T2^D)$ simultaneously with the delete-one-factor projections and therefore did not have the occasion to find any designs with isomorphic delete-one-factor projections but different sets of $G(T2^D)$, which would provide a counter-example to Conjecture 4.1 for $n = 128$.

The approach is as follows: begin with all non-isomorphic resolution IV designs with k factors. Consider all possible $k + 1$ factor designs obtained by adding a generator to each k factor design. We then check the $k + 1$ delete-one-factor projections. If the $k + 1$ delete-one-factor projections for design D_1 are equal to the $k + 1$ one-factor projections for D_2 then the designs are considered isomorphic by Conjecture 4.1; otherwise they are non-isomorphic. This process can be repeated as we increase k by one factor at a time.

Using this approach allowed us to complete an "exhaustive" search of even/odd designs at $n = 128$ for $k \leq 40$.

Another step to reduce the computational burden at $n = 128$ was the elimination of the requirement to retain even designs past $k = 22$. This was possible for the following reasons. Resolution IV 2^{k-p} even/odd designs project to a set of $k - m$ $2^{(k-1)-(p-1)}$ even/odd designs and m isomorphic $2^{(k-1)-(p-1)}$ even designs (by Lemma 2.1), where m is defined as the multiplicity for the number of delete-one-factor projections from a 2^{k-p} design that project to a $2^{(k-1)-(p-1)}$ even design.

We classify m into three cases: When $m = 0$, the set of k projections are all $2^{(k-1)-(p-1)}$ even/odd designs and by Lemma 4.2 we can determine $T(D)$. When $m = 1$, we use Conjecture 4.2, motivated by Corollary 4.1 and the set of $k - 1$ even/odd $2^{(k-1)-(p-1)}$ designs to determine D. The last case, when $m > 1$, is determined as follows: We know $k - m$ projections are $2^{(k-1)-(p-1)}$ even/odd designs and m projections are isomorphic $2^{(k-1)-(p-1)}$ even designs. Without loss of generality, suppose $D^{\{\bar{i}\}}$ $i = 1,\cdots,m$ are $2^{(k-1)-(p-1)}$ even designs, and the remaining $k - m$ projections are $2^{(k-1)-(p-1)}$ even/odd designs. Then $G(T2^{D^{\{\bar{1}\}}})$, m, and $D^{\{\bar{i}\}}$ $(i > m)$ determine D (up to isomorphism). The reason is as follows: for n = 8, 16, 32, and 64, we know that $G(T2^D)$ uniquely distinguishes all 2_{IV}^{k-p} designs. For $n = 128$, even $2_{IV}^{(k-1)-(p-1)}$ designs projected from 2_{IV}^{k-p} designs with $m \geq 2$, permit us to distinguish D by $G(T2^D)$ since the even $2_{IV}^{(k-1)-(p-1)}$ designs can be written as the product array $2^1 \times 2^{(k-2)-(p-1)}$ and so all are uniquely distinguished by $G(T2^D)$.

8. Resolution IV Designs of Size 128

We characterize the even/odd resolution IV design for n = 128 using five criterion:

- wlp (minimum aberration)
- Maximum degrees of freedom used for main effects and two-factor interactions
- Minimium L_{max} (the length of the longest two-factor interaction alias chain)
- Maximum number of clear two-factor interactions
- Minimum CD2 (the unique portion of the centered L2 discrepancy from Ma, Fang, and Lin 2001).

The minimum aberration designs for $k \leq 40$ at $n = 128$ are listed in Table 8.1 along with the above criteria and their respective ranking. The complete alp is also provided for each design. Appendix C contains a catalog of the best even/odd designs and their rankings for $k = 8, \ldots, 40$ with respect to our various criteria.

Our exhaustive search of even/odd designs found not only the minimum aberration designs, but also a number of interesting results. All minimum aberration designs from $10 \leq k \leq 40$ are even/odd designs. We found that the uniform centered design criteria (Ma, Fang, and Lin 2001) is closely related to the word length pattern. Our calculation of the minimum CD2* value agreed with the minimum aberration design in all but four cases; in those cases, the minimum aberration value was the second smallest CD2* value.

Table 8.1: Minimum Aberration Regular Resolution IV (or higher) Designs for $n = 128$

Design	wlp w_4	w_5	w_6	w_7	w_8	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2* rank
8-1.1	0	0	0	0	1	28	36	28	1	1	1	1	55.09	1
9-2.1	0	0	3			36	45	36	1	1	1	1	49.59	1
10-3.1	0	3	3			45	55	45	1	1	1	1	44.63	1
11-4.1	0	6	6			55	66	55	1	1	1	1	40.17	1
12-5.1	1	8	12			60 3	75	60	2	1	1	1	36.16	1
13-6.1	2	16	18			66 6	85	66	2	1	1	1	32.55	1
14-7.1	3	24	36			73 9	96	73	2	1	1	1	29.30	1
15-8.1	7	32	52			63 21	99	63	2	2	11	1	26.39	1
16-9.1	10	48	72			60 30	106	60	2	2	24	1	23.77	1
17-10.1	15	60	130			46 45	108	46	2	53	1594	1	21.42	1
18-11.1	20	80	200			33 60	111	33	2	209	10601	1	19.30	1
19-12.1	27	120	235			36 54 9	118	36	3	22	5807	1	17.40	1
20-13.1	36	152	340			24 60 14 1	119	24	4	111	28084	1	15.69	1
21-14.1	51	200	414			26 54 15 4 3	123	26	5	23	17819	45	14.17	2
22-15.1	65	248	572			25 36 32 8 0 1	124	25	6	20	14585	942	12.80	1
23-16.1	83	316	744			12 52 24 9 2 2 1	125	12	7	10	32307	5495	11.57	1
24-17.1	102	384	992			0 54 16 24 0 4	122	0	6	120	27865	4	10.46	1
25-18.1	124	482	1312			0 64 0 18 20	127	0	5	1	20240	1	9.469	1
26-19.1	152	568	1704			0 29 41 4 16 8	124	0	6	13	13068	1	8.579	1
27-20.1	180	690	2200			0 15 55 0 12 16	125	0	6	6	7696	1	7.779	1
28-21.1	210	840	2800			0 0 70 0 0 28	126	0	6	2	3930	1	7.061	1
29-22.1	266	945	3472			0 0 70 0 0 0 28	127	0	7	1	1914	1	6.431	1
30-23.1	335	972	4662			0 0 0 40 40 0 0 0 0 2 5	117	0	11	773	799	182	5.866	1
31-24.1	391	1134	5826			0 0 0 24 48 8 0 0 0 0 3 4	118	0	12	323	331	96	5.352	1
32-25.1	452	1322	7219			0 0 0 12 48 19 1 0 0 0 0 4 3	119	0	13	130	125	46	4.891	2
33-26.1	518	1543	8863			0 0 0 4 40 33 3 0 0 0 0 0 5 2	120	0	14	67	67	27	4.478	2
34-27.1	589	1800	10788			0 0 0 0 24 50 6 0 0 0 0 0 0 6 1	121	-	15	11	-	1	4.108	2
35-28.1	665	2100	13020			0 0 0 0 0 70 10 0 0 0 0 0 0 0 7	122	-	15	3	-	1	3.776	1
36-29.1	756	2401	15736			0 0 0 0 0 42 38 0 0 0 0 0 0 0 0 7	123	-	16	2	-	1	3.481	1
37-30.1	854	2744	18886			0 0 0 0 0 21 51 8 0 0 0 0 0 0 0 0 7	124	-	17	1	-	1	3.216	1
38-31.1	959	3136	22512			0 0 0 0 0 7 49 24 0 0 0 0 0 0 0 0 0 7	125	-	18	1	-	1	2.979	1
39-32.1	1071	3584	26656			0 0 0 0 0 0 32 48 0 0 0 0 0 0 0 0 0 0 7	126	-	19	1	-	1	2.767	1
40-33.1	1190	4096	31360			0 0 0 0 0 0 0 80 0 0 0 0 0 0 0 0 0 0 0 7	127	-	20	1	-	1	2.576	1

wlp – word length pattern; alp – alias length pattern of two-factor interactions; df – total degrees of freedom used for main effects and two-factor interactions
C2FI – clear two-factor interactions; Lmax – length of longest alp chain; CD2* - unique portion of uniformity measure value from Ma, Fang, Lin (2001)

No minimum aberration designs have any clear two-factor interactions beyond $k = 23$, although we found designs with clear two-factor interactions up to $k = 33$. We know from Chen and Hedayat (1998) that designs with clear two-factor interactions exist only if $k \leq n/4 + 1$. In general, as the number of factors increases, the number of good designs (based on word length pattern) with clear two-factor interactions decreases.

There exist 296,960 even/odd non-isomorphic resolution IV (or higher) designs for $n = 128$ (see Table 8.2). There are also 88 resolution IV sos designs, and all but one of the sos designs are even/odd designs. We also now know that sos designs may have the same word length patterns but different alp and may even share the same word length pattern as other non-sos designs. For instance, consider the three designs at $k = 33$, where the two sos designs 33-26.42b and 33-26.42c share identical word length patterns with design 33-26.42a which is not an sos design. All three designs have different alias length patterns.

We also found two notably good sos designs: $k = 29$, and $k = 40$. The design at $k = 40$ is well known and many of its projections lead to other minimum aberration designs. The sos design at $k = 29$ has a remarkably smaller number of length-four words than any other $k = 29$ design and several of the sos design's projections are also minimum aberration designs. In particular, the minimum aberration designs can be found by projecting from sos designs at $k = 29$ or $k = 40$ for $k = 40, 39, \ldots, 26, 24, 16, 13, 11, 10$, and 9 (see Section 12).

It is interesting to note that for $k \leq 40$, the minimum aberration design word length pattern for each k is indeed unique, which supports the conjecture that the word length pattern is unique for minimum aberration resolution IV designs. In fact, only

Table 8.2: Existence of Resolution IV$^+$ designs

k	# of even/odd designs, $n = 64$	# of even designs, $n = 64$	# of even/odd designs, $n = 128$	# of even designs, $n = 128$
7	2	2	-	-
8	3	4	2	3
9	6	6	7	6
10	12	12	19	14
11	20	14	62	30
12	22	21	180	69
13	24	23	487	136
14	20	29	1,240	295
15	15	29	2,926	596
16	11	37	6,208	1,292
17	10	30	11,787	2,651
18	3	30	19,466	5,598
19	1	24	27,994	11,341
20	1	23	35,192	22,728
21	-	16	39,201	43,516
22	-	15	38,847	79,603
23	-	9	34,868	?
24	-	8	28,133	?
25	-	5	20,569	?
26	-	4	13,498	?
27	-	2	8,075	?
28	-	2	4,284	?
29	-	1	2,149	?
30	-	1	976	?
31	-	1	433	?
32	-	1	197	?
33	-	-	101	?
34	-	-	31	?
35	-	-	13	?
36	-	-	8	?
37	-	-	3	?
38	-	-	2	?
39	-	-	1	?
40	-	-	1	?

at $k = 31$, does one have to go beyond length-5 words in the defining relation to differentiate minimum aberration designs from weak minimum aberration designs.

Finally, the L_{max} results show that it is impossible to create an $n = 384$ ¾-design (John 1962) for $k \geq 20$ from resolution IV fractions, since $L_{max} > 3$. Also many of the better designs based on word length pattern are also ranked in the best designs according to L_{max}. For example, the top eight designs based upon word length pattern are also the top eight ranked designs for L_{max} at $k = 18$.

9. Incomplete Enumeration of Designs Based on Word Length Pattern

As the size of n increases, more and more computer resources are required to fully enumerate designs. The next two sections explore computationally simpler (imperfect) isomorphism checks in order to evaluate their potential merit for $n = 256$ and beyond.

Butler developed an algorithm using a flawed isomorphic rule based on the moments of the designs (word length pattern) that starts with a basic set of factors and then adds one generator at a time to construct new designs. He describes his approach as follows:

> "The iterative algorithm uses all the designs with distinct wordlength patterns (or equivalently, distinct T moments) for k factors and adds an extra factor to each to form designs for $k + 1$ factors. Only designs with distinct wordlength patterns are retained for the next stage of the algorithm. At each stage, the wordlength pattern is determined from the elements of T. The algorithm does not recognize that on rare occasions designs with the same wordlength pattern are not necessarily isomorphic. However, a design for k factors can be formed from any of the k projections involving $k - 1$ factors and so designs are highly unlikely to be lost altogether." (Butler 2002b)

Using Butler's methodology, we were able to easily search for even/odd resolution IV designs using Matlab version 6.5 on a Pentium III and IV computer.

Our program constructed a full factorial in seven basic factors for $n = 128$ runs and then constructed a generator matrix of all possible generators (based on the 120 different interactions involving the basic columns). We then started with the seven basic factors and added one generator at a time. We calculated t^D for each design and retained only one design for each distinct t^D vector. This method does not distinguish between non-isomorphic designs with identical design moments (word length patterns). In our implementation, this method was successful in finding all minimum aberration designs except at $k = 24$, where we found only the weak minimum aberration design. In general, we lost about two percent of the word length patterns using this approach at $n = 128$ runs (see Table 10.1). However, we only identified 20% of the even/odd designs that exist. Thus having non-isomorphic designs with the same wlp is a very common occurrence at $n = 128$. For example, the word length pattern (0, 0, 0, 8, 34, 42, …) at $k = 15$, occurs for four designs (see p. 106). Another word length pattern (0, 0, 0, 21, 0, 80, …) at $k = 15$, occurs for 48 non-isomorphic designs.

10. An Improved Imperfect Isomorphic Rule Approach

In an effort to find a more discriminating function than t^D (or equivalently, wlp) for our imperfect isomorphic rule approach to determining isomorphic designs, we turned to the $G(T2^D)$ vector. $G(T2^D)$ uniquely determined the same designs cataloged by Sun (2001) and CSW (1993) for $n = 128$ and $k = 8, 9, 10, 11$ as well as all designs at $n = 64$. Although we know that several non-isomorphic designs do have identical $G(T2^D)$ sets, this happened in only rare instances (see Table 10.1). This means that only those designs with unique $G(T2^D)$ vectors are kept as we sequentially build up our designs. While this method does miss some designs, the $G(T2^D)$ vector is much more discriminating than t^D.

The empirical results at $n = 128$ show that the designs that were lost were not the better designs in terms of word length pattern, and that although a few (57) non-isomorphic designs were missed, other designs with identical word length pattern, alias length pattern, and number of clear two-factor interaction effects were found.

Table 10.1 lists the number of even/odd designs found using several different isomorphic checks for $n = 128$ and $k \leq 40$. We show the number of even/odd designs found using the word length pattern as a simple but flawed isomorphic rule, and the number of even/odd designs found using $G(T2^D)$ as a flawed isomorphic rule. We also show the complete enumeration of all even/odd designs and the number of unique word length patterns that exist among the exhaustive list obtained based on delete-one-factor projections. We also provide percentages of designs found using the different

Table 10.1: Comparison of Methods for Finding Even/Odd Resolution IV$^+$ Designs

k	# of e/o designs by projections	# of unique e/o wlp by projections	t^D # of e/o designs found	% found of e/o unique wlp	% found of total e/o designs	$G(T2^D)$, # of e/o designs found	% found of total e/o designs
8	2	2	2	100	100	2	100
9	7	7	7	100	100	7	100
10	19	18	18	100	94.7	19	100
11	62	48	48	100	77.4	62	100
12	180	118	118	100	65.6	180	100
13	487	243	243	100	49.9	487	100
14	1,240	448	444	99.1	35.8	1,240	100
15	2,926	777	765	98.5	26.1	2,925	99.9
16	6,208	1,278	1,257	98.4	20.2	6,208	100
17	11,787	1,996	1,946	97.5	16.5	11,787	100
18	19,466	2,890	2,825	97.8	14.5	19,466	100
19	27,994	4,051	3,937	97.2	14.1	27,993	99.9
20	35,192	5,211	5,109	98	14.5	35,192	100
21	39,201	6,237	6,086	97.6	15.5	39,201	100
22	38,847	6,546	6,422	98.1	16.5	38,847	100
23	34,868	6,361	6,226	97.9	17.8	34,868	100
24	28,133	5,656	5,578	98.6	19.8	28,133	100
25	20,569	4,709	4,629	98.3	22.5	20,569	100
26	13,498	3,575	3,516	98.4	26.0	13,498	100
27	8,075	2,611	2,547	97.5	31.5	8,075	100
28	4,284	1,720	1,691	98.3	39.5	4,284	100
29	2,149	1,119	1,099	98.2	51.1	2,149	100
30	976	632	620	98.1	63.5	976	100
31	433	340	332	97.6	76.7	433	100
32	197	177	175	98.9	88.8	197	100
33	101	90	90	100	89.1	101	100
34	31	30	30	100	96.8	31	100
35	13	13	13	100	100	13	100
36	8	8	8	100	100	8	100
37	3	3	3	100	100	3	100
38	2	2	2	100	100	2	100
39	1	1	1	100	100	1	100
40	1	1	1	100	100	1	100

approaches. In no cases did the sets of delete-one-factor projections fail to distinguish designs with different t^D or $G(T2^D)$.

11. Interesting Designs of Size 128

While letter pattern and $G(T2^D)$ are more discriminating than wlp, neither is universally more successful. For example, at $k = 11$ we found non-isomorphic designs with distinct $G(T2^D)$ values and identical letter pattern matrices, while at $k = 15$ we found non-isomorphic designs with identical $G(T2^D)$ (and identical bivariate distributions) but distinct letter pattern matrices.

During the exhaustive search for designs, a number of interesting designs were encountered in trying to determine non-isomorphic designs. We describe four problem cases of interest. Below is a sample of some of the designs encountered along with a short description of the designs and their properties.

Problem Case 1:

The first case occurs at $k = 11$. Let pc11a, pc11b, and pc11c represent the three problem designs. All three even/odd designs have the same word length pattern and the same alias length pattern. The first design, pc11a, has a different letter pattern matrix than pc11b and pc11c. The other two designs, pc11b and pc11c, have identical letter pattern matrices. All three designs have unique $G(T2^D)$ values. Table 11.1 lists the generators for these designs.

Table 11.1: $k = 11$, $n = 128$ Problem Designs

Design	Generators
pc11a	7 25 43 116
pc11b	7 45 56 91
pc11c	7 56 77 91

Problem Case 2:

The second case occurs at $k = 15$. These even/odd designs have identical $G(T2^D)$ values, identical word length patterns, and identical alias length patterns. However, the letter pattern matrix for each design is different. Table 11.2 lists the generators for these designs.

Problem Case 3:

The third case occurs at $k = 16$. There are 18 pairs of designs that have various $G(T2^D)$ values. Each pair of designs also have identical word length patterns and identical letter pattern matrices respectively. The designs do have different alias length patterns. The first four designs listed below are even/odd designs (a1 through b2) and the remaining designs are even. Table 11.3 lists the generators for these designs.

Table 11.2: $k = 15$, $n = 128$ Problem Designs

Design	Generators
pc15a	7 11 19 38 59 73 100 120
pc15b	7 11 19 38 62 73 97 120

Table 11.3: **k = 16, n = 128 Problem Designs**

Design	Generators								
pc16a1	7	11	19	41	52	61	74	101	120
pc16a2	7	11	19	35	61	62	73	85	120
pc16b1	7	11	21	38	57	73	82	93	120
pc16b2	7	11	19	38	57	73	84	93	120
pc16c1	7	11	21	26	31	112	121	122	124
pc16c2	7	11	21	25	31	112	121	122	124
pc16d1	7	25	42	55	79	112	121	122	124
pc16d2	7	25	31	42	52	112	121	122	124
pc16e1	7	11	21	26	52	84	121	122	124
pc16e2	7	25	26	47	79	112	121	122	124
pc16f1	7	13	21	104	110	112	118	121	122
pc16f2	7	11	13	19	100	103	121	122	124
pc16g1	7	13	28	35	62	104	112	121	122
pc16g2	7	19	28	41	79	112	121	122	124
pc16h1	7	13	28	38	59	104	112	121	122
pc16h2	7	19	31	41	79	112	121	122	124
pc16i1	7	13	38	61	91	104	112	121	122
pc16i2	7	13	22	38	59	104	112	121	122
pc16j1	7	13	44	55	104	110	112	121	122
pc16j2	7	13	38	59	61	104	112	121	122
pc16k1	7	13	44	79	104	110	112	121	122
pc16k2	7	13	38	59	91	104	112	121	122
pc16l1	7	38	61	69	94	104	112	121	122
pc16l2	7	13	22	59	91	104	112	121	122
pc16m1	7	13	22	44	49	62	112	121	122
pc16m2	7	13	44	59	91	104	112	121	122
pc16n1	7	13	22	44	49	82	112	121	122
pc16n2	7	13	44	55	59	104	112	121	122
pc16o1	7	19	28	35	61	76	112	121	122
pc16o2	7	28	38	47	61	104	112	121	122
pc16p1	7	21	25	47	55	84	112	121	122
pc16p2	7	28	38	47	59	104	112	121	122
pc16q1	7	11	19	38	44	52	100	121	122
pc16q2	7	13	21	38	59	104	112	121	122
pc16r1	7	11	19	38	44	100	103	121	122
pc16r2	7	13	21	59	91	104	112	121	122

Problem Case 4:

The fourth case occurs at $k = 19$. The following two pairs of designs have identical $G(T2^D)$ values, word length pattern, alias length pattern, and letter pattern matrices respectively. They are only distinguished by their sets of delete-one-factor projections. The first pair (pc19a1 and pc19a2) are even designs, the second pair are even/odd designs. Table 11.4 lists the generators for these designs.

Table 11.4: $k = 19$, $n = 128$ Problem Designs

Design	Generators											
pc19a1	7	13	22	44	49	62	91	98	112	118	121	122
pc19a2	7	13	22	44	49	62	91	98	112	121	122	124
pc19b1	7	11	25	31	35	50	85	104	112	121	122	124
pc19b2	7	11	25	31	35	50	86	104	112	121	122	124

12. Finding Good Designs Using Naïve Projections

As noted previously, the difficulty of finding minimum aberration designs (and other good designs) increases as n becomes larger. Examining the case of $n = 64$ suggests that sequentially eliminating factors to minimize the number of length four words in the resulting design (ties broken by the minimization of length-five words, then length-six words, etc.) from a relatively few sos designs present a few design arrays from which good (minimum aberration) designs are found. This method will be referred to as the naïve projection approach.

Table 12.1 lists the number of length-four words (w_4) for minimum aberration designs and for the naïve projections from each of the eight even/odd sos designs for $n = 64$. The naïve projections that result in the minimum aberration design are marked with "*", while those projections resulting in a weak minimum aberration design are marked with "**".

Table 12.1: Number of Length-Four Words for SOS Naïve Projections, $n = 64$

k	MA	sos20	sos18	sos17b	sos17d	sos17e	sos17g	sos17j	sos13
20	125	125*							
19	100	100*							
18	78	78*	92						
17	59	59*	68	60	65	68	73	105	
16	43	43*	49	45	45	49	53	77	
15	30	30*	34	33	33	33	37	55	
14	22	22*	22**	23	23	23	24	38	
13	14	15	14*	15	15	15	16	25	14**
12	6	9	8	10	10	10	10	15	6*
11	4	5	4*	6	6	6	5	9	4*
10	2	2*	2*	3	3	3	3	5	2*
9	1	1*	1*	1*	1*	1*	1*	2	1*
8	0,2	0*	0*	0*	0*	0*	0*	0*	0*

* = minimum aberration; ** = weak minimum aberration

It is interesting to note that the 20-factor sos design projects to the minimum aberration design for $k = 14, 15, \ldots, 20$ (and also 8, 9, and 10); the 13-factor sos design is weak minimum aberration at $k = 13$, and its naïve projections are minimum aberration for $k = 8, 9, \ldots, 12$. The weak minimum aberration sos design at $k = 13$ has 36 clear two-factor interactions, 16 more than the minimum aberration design and is arguably preferred over the minimum aberration design due to the more clear two-factor interactions.

Since sequential projection from just two $n = 64$ run designs provide attractive designs for all $k = 8, 9, \ldots, 20,$ we list these two sos designs in Table 12.2, arranging the design columns so that one only needs to include the number of generators that correspond to the desired number of factors. For instance, for the minimum aberration 18-factor design, simply omit the last two columns of the 20-factor design. The 20-14.a sos design is recommended for $k = 14, \ldots, 20$ and the 13-7.b design for $k = 8, \ldots, 13$. These designs and their embedded projections are the minimum aberration or most preferred designs available for every $k \in [8, 20]$. Figures 12.1 and 12.2 show the aliasing of two-factor interactions for these two sos designs, with generators as specified in Table 12.2. By arranging into columns the interactions in these tables, we conveniently and compactly present the aliasing for each of the embedded designs. These tables enable a practitioner to visualize the additional confusion regarding two-factor interactions that result from adding, e.g., two or three more factors to a 10-factor design.

SOS designs represent a small fraction of all possible resolution IV designs and yet they project to all remaining resolution IV designs. Thus from this subset one can project to all minimum aberration and other good designs. Complete enumeration of

Table 12.2: Generators for SOS Embedded Projection Designs of Size 64

Design	Generators for Factors 7-20 (identified by Yates column number)													
20-14.a	31	39	43	61	49	54	13	21	14	19	25	28	44	58
13-7.b	31	39	43	61	51	62	28							

Design 13-7.b Generators (Yates column number)

	31	39	43	61	51	62	28

Singularity Details (All interactions not listed are clear for designs with k ≤ 13)

***k*:**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
		3*8 =	4*9 =		5*11		
	6*7 =			2*10 =		1*12	
		4*8 =	3*9 =				11*13
3*4 =			8*9 =				5*13
	2*7 =			6*10 =			1*13
2*6 =				7*10 =			12*13
		5*8 =			3*11 =		9*13
			5*9 =		4*11 =		8*13
3*5 =					8*11 =		4*13
4*5 =					9*11 =		3*13
				1*10 =		2*12 =	6*13
	1*7 =					6*12 =	2*13
1*6 =						7*12 =	10*13
1*2 =						10*12 =	7*13

Figure 12.1: Design 13-7.b Generators and Aliasing for Embedded Projections

Design 20-14.a Generators (Yates column number)

31 39 43 61 49 54 13	21	14	19	25	28	44	58
Singularity Details *k*:	**14**	**15**	**16**	**17**	**18**	**19**	**20**
1*5 = 6*11 = 8*12 =	3*14 =	7*15 =	2*16 =	4*17 =	13*18 =	10*19 =	9*20
2*7 = 6*10 = 9*12 = 5*13 =	4*14 =		15*16 =	3*17 =	1*18 =	11*19 =	8*20
3*4 = 8*9 = 10*11 = 1*13 =		2*15 =	7*16 =	14*17 =	5*18 =	6*19 =	12*20
6*8 = 11*12 =						9*19 =	10*20
6*9 = 10*12=						8*19 =	11*20
8*10 = 9*11 =						12*19 =	6*20
1*9 = 8*13 =					12*18 =		5*20
5*8 = 1*12 =					9*18 =		13*20
5*9 = 12*13 =					8*18 =		1*20
3*8 = 4*9 =	12*14 =						17*20
4*12 =	9*14 =			8*17 =			3*20
3*9 = 4*8 =				12*17 =			14*20
7*8 =		12*15 =	9*16 =				2*20
7*9 = 2*12 =			8*16 =				15*20
2*8 =		9*15 =	12*16 =				7*20
2*9 = 7*12 =		8*15 =					16*20
9*10 = 8*11 = 6*12 =							19*20
1*8 = 5*12 = 9*13 =							18*20
3*12 =	8*14 =			9*17 =			4*20
3*6 =	11*14 =			10*17 =		4*19	
3*10 = 4*11 =				6*17 =		14*19	
4*6 =	10*14 =			11*17 =		3*19	
4*10 = 3*11 =	6*14 =					17*19	
7*11 =		6*15 =	10*16 =			2*19	
1*6 = 5*11 =					10*18 =	13*19	
1*10 = 11*13=					6*18 =	5*19	
5*10 = 6*13 =					11*18 =	1*19	
5*6 = 1*11 = 10*13 =						18*19	
2*6 = 7*10 =			11*16 =			15*19	
6*7 = 2*10 =		11*15 =				16*19	
2*11 =		10*15 =	6*16 =			7*19	
1*2 =		13*15 =	5*16 =		7*18		
1*7 =		5*15 =	13*16 =		2*18		
1*3 = 4*13 =	5*14 =				17*18		
1*4 = 3*13 =				5*17 =	14*18		
3*5 =	1*14 =			13*17 =	4*18		
4*5 =	13*14 =			1*17 =	3*18		
5*7 = 2*13 =		1*15 =			16*18		
2*5 = 7*13 =			1*16 =		15*18		
3*7 =		14*15 =	4*16 =	2*17			
2*3 =		4*15 =	14*16 =	7*17			
2*4 =	7*14 =	3*15 =		16*17			
4*7 =	2*14 =		3*16 =	15*17			

Figure 12.2: Design 20-14.a Generators and Aliasing for Embedded Projections

these projections is prohibitive for large n. However, we have found that naïve projections from sos designs at $n = 64$ and $n = 128$ identify the best resolution IV designs.

It is known from projective geometry that for $n = 16, 32, 64, \ldots$, sos designs exist at $k = n/4 + 1$ (Cheng 2002). Furthermore any sos design D with k factors, and n runs can be doubled by the construction method $\begin{bmatrix} D & D \\ D & -D \end{bmatrix}$ to produce a sos design of size $2k$ factors and $2n$ runs (Cheng 2002). For $k > n/4 + 1$, all sos designs are doubled sos designs. To construct sos designs for $k = n/4 + 1$, see Cheng (2003). Unfortunately, these designs only represent a small fraction of the total sos designs that exist for any given n.

Complementing Cheng's theoretical results, we have determined for $n = 128$ that there exist 88 resolution IV sos designs, 50 with $k \geq n/4+1$, and 38 with $k < n/4$. Figure 12.3 summarizes these findings. Naïve projections of these sos designs lead to minimum aberration designs. Table 12.3 lists the length four words resulting from the naïve projections for $k = 24$, 22, and 21 sos designs. Table 12.4 lists the naïve projections for the $k = 25$ sos designs. Table 12.5 lists the naïve projections for $k = 29$, 28, 27, and 26 sos designs. Table 12.6 lists the naïve projections for the top ten sos designs at $k = 33$. Table 12.7 lists the naïve projections for $k = 40$, 36, 34, and 31 sos designs.

We have found 88 sos designs at 14 different values of k at $n = 128$. Four of these sos designs are the minimum aberration design; this occurs at $k = 25$, 29, 40, and 64. It is interesting to note that even some of the less desirable (in terms of wlp) sos designs often project to minimum aberration designs and other good designs. For instance, at $k = 28$, the sos design 28-21.1157 (ranked number 1157 in terms of wlp) naively projects to the

$n = 8$	$n = 16$	$n = 32$	$n = 64$	$n = 128$	k/n
$k = 4$	$k = 8$	$k = 16$	$k = 32$	$k = 64$	1/2
	$k = 5_{\text{(res. V)}}$	$k = 10$	$k = 20$	$k = 40$	5/16
		$k = 9$	$k = 18$	$k = 36$	9/32
			$k = 17_{\text{(5 types)}}$	$k = 34_{\text{(5 types)}}$	17/64
				$k = 33_{\text{(42 types)}}$	33/128
					65/256
					⋮
				$k = 31$	
				$k = 29$	
				$k = 28$	
				$k = 27$	
			$k = 13$	$k = 26$	38 designs
				$k = 25$	
				$k = 24$	
				$k = 22$	
				$k = 21$	

Note: All sos designs below the dashed line are even/odd designs.

Figure 12.3: Existence of SOS Designs

Table 12.3: $k = 24, 22$, and 21 SOS Designs Naïve Projections Length-4 Words ($w_4,\ldots$), $n = 128$

k	MA	sos24a	sos24b	sos24c	sos24d	sos24e	sos24f	sos22a	sos22b	sos21a	sos21b	sos21c	sos21d	sos21e
24	102	103	104	109	111	115	115							
23	83	84	85	88	88	92	92							
22	65	68	68	70	68	72	72	69	85					
21	51	53	54	53	52	58	56	53	66	52	56	64	80	112
20	36	41	41	41	38	44	42	41	50	40	44	48	60	80
19	27	30	30	31	28	33	30	30	37	30	34	36	44	58
18	20	22	22	23	20**	23	21	23	27	23	25	27	31	41
17	15	15**	15**	16	15**	17	15**	17	18	17	19	19	21	28
16	10	11	11	11	11	12	11	12	12	12	13	12	13	18
15	7	7**	7**	7**	7*	8	7*	8	8	8	8	8	8	12
14	3	4	4	4	3*	5	3*	5	4	5	5	5	4	8
13	2	2*	2*	2*	2**	3	2**	3	2*	3	2*	2*	2*	5
12	1	1**	1**	1**	1**	1**	1**	1**	1**	1**	1**	1**	1**	3
11	0,6	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	1
10	0,3	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
9	0,0,3	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*

Table 12.4: $k = 25$ SOS Designs Naïve Projections Length-4 Words ($w_4,\ldots$), $n = 128$

k	MA	sos25a	sos25b	sos25c	sos25d	sos25e	sos25f	sos25g	sos25h	sos25i	sos25j	sos25k	sos25l	sos25m
25	124	124*	125	138	142	143	146	146	147	154	155	155	155	163
24	102	102**	105	107	114	111	115	115	115	119	123	119	119	127
23	83	83**	86	83*	89	85	89	89	89	93	97	95	93	99
22	65	66	68	65**	70	65*	68	72	69	75	76	76	76	78
21	51	51**	54	51*	53	52	52	57	54	59	58	60	60	61
20	36	39	41	40	40	40	40	44	41	44	44	46	47	47
19	27	30	31	30	28	30	30	33	31	32	32	35	35	35
18	20	22	22	23	20**	22	22	25	23	23	24	25	26	25
17	15	15**	16	17	15**	16	16	18	16	16	17	17	18	16
16	10	11	11	12	11	11	11	12	11	11	11	12	12	11
15	7	7**	7**	8	7*	7**	7**	7**	7**	7**	7**	7**	7**	7**
14	3	4	4	5	3*	4	4	4	4	4	4	4	4	4
13	2	2*	2*	3	2**	2*	2*	2*	2*	2*	2*	2*	2*	2*
12	1	1**	1**	1**	1**	1**	1**	1**	1**	1**	1**	1**	1**	1**
11	0,6	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
10	0,3	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
9	0,0,3	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*

Table 12.5: $k = 29, 28, 27$, and 26 SOS Designs Naïve Projections Length-4 Words ($w_4,\ldots$), $n = 128$

k	MA	sos29a	sos29b	sos29c	sos28	sos27a	sos27b	sos27c	sos27d	sos26a	sos26b
29	266	266*	306	370							
28	210	210*	250	308	290						
27	180	180*	208	254	237	202	207	210	234		
26	152	152*	173	207	191	168	163	176	190	181	190
25	124	126	141	167	153	137	133	145	153	143	146
24	102	102*	114	135	121	111	105	117	122	113	114
23	83	85	90	107	94	88	86	92	96	91	95
22	65	69	71	83	71	70	68	73	76	70	77
21	51	56	56	63	52	54	53	57	59	54	62
20	36	44	43	48	36*	42	41	45	44	39	48
19	27	34	32	35	27*	32	30	34	33	30	37
18	20	25	23	25	20**	24	22	24	24	22	27
17	15	17	15**	17	15**	17	16	18	17	16	20
16	10	10*	11	11	11	11	11	12	12	11	14
15	7	7**	7*	7**	7*	7**	7**	8	8	7**	9
14	3	4	3*	4	3*	4	4	5	5	4	5
13	2	2*	2**	2*	2**	2*	2*	3	2*	2*	3
12	1	1**	1**	1**	1**	1**	1**	1**	1**	1**	1*
11	0,6	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
10	0,3	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*
9	0,0,3	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*

Table 12.6: Top Ten $k = 33$ SOS Designs Naïve Projections Length-4 Words (w_4,...), $n = 128$

k	MA	sos33a	sos33b	sos33c	sos33d	sos33e	sos33f	sos33g	sos33h	sos33i	sos33j	
33	518	592	592	597	600	600	600	605	605	605	605	
32	452	517	509	517	525	525	521	525	521	525	521	Plus
31	391	447	434	447	453	455	449	457	453	455	445	32
30	335	386	366	386	392	392	386	395	392	392	376	more…
29	266	330	308	330	334	334	330	338	334	334	318	
28	210	280	256	280	285	285	280	289	285	285	266	
27	180	235	210	235	239	240	235	244	239	240	220	
26	152	198	174	198	200	200	198	205	200	200	182	
25	124	165	142	165	165	165	165	169	165	165	149	
24	102	136	113	136	137	137	136	138	137	137	120	
23	83	110	91	112	112	112	110	110	112	112	97	
22	65	90	71	90	90	90	90	90	90	90	76	
21	51	72	53	71	71	72	72	72	72	71	59	
20	36	57	42	56	56	56	57	57	56	56	46	
19	27	45	32	43	43	43	43	43	43	43	34	
18	20	34	24	32	32	32	33	33	32	32	25	
17	15	25	18	23	23	23	24	24	23	23	18	
16	10	17	13	15	15	15	17	17	15	15	12	
15	7	11	8	11	11	11	11	11	11	11	8	
14	3	7	5	7	7	7	7	7	7	7	5	
13	2	3	2*	3	3	3	3	3	3	3	2**	
12	1	2	1**	2	2	2	2	2	2	2	1**	
11	0,6	1	0*	1	1	1	1	1	1	1	0*	
10	0,3	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	
9	0,0,3	0*	0*	0*	0*	0*	0*	0*	0*	0*	0*	

Table 12.7: k = 40, 36, 34, and 31 SOS Designs Naïve Projections Length-4 Words (w_4,…), n = 128

K	MA	sos40	sos36	sos34a	sos34b	sos34c	sos34d	sos34e	sos31a	sos31b
40	1190	1190*								
39	1071	1071*								
38	959	959*								
37	854	854*								
36	756	756*	889							
35	665	665*	776							
34	589	589*	674	616	656	680	720	976		
33	518	518*	582	540	560	588	624	848		
32	452	452*	499	471	480	503	537	733		
31	391	391*	426	408	417	432	458	630	410	439
30	335	335*	360	350	359	366	391	538	345	371
29	266	289	302	300	306	312	330	456	287	310
28	210	248	254	254	261	262	276	384	238	259
27	180	210	213	214	219	222	231	321	195	213
26	152	175	177	177	183	185	190	265	161	176
25	124	145	145	145	150	154	155	217	130	143
24	102	121	117	116	121	126	126	176	105	117
23	83	99	94	95	96	101	100	140	86	94
22	65	79	73	76	78	81	77	109	68	74
21	51	61	59	59	62	63	61	85	55	56
20	36	45	47	44	47	50	48	64	43	44
19	27	36	36	31	36	38	36	46	32	33
18	20	28	27	20*	26	28	26	34	23	24
17	15	21	20	15*	18	20	19	24	16	17
16	10	15	14	11	11	13	13	16	11	11
15	7	10	10	7*	7*	8	9	11	7**	7**
14	3	6	6	3*	3*	5	6	7	4	4
13	2	4	3	2**	2**	2**	3	4	2*	2*
12	1	2	1**	1**	1**	1**	1**	2	1*	1*
11	0,6	1	0*	0*	0*	0*	0*	1	0*	0*
10	0,3	0*	0*	0*	0*	0*	0*	0*	0*	0*
9	0,0,3	0*	0*	0*	0*	0*	0*	0*	0*	0*

minimum aberration design for $k = 20$, 19, and 15; and the weak minimum aberration design for $k = 18$ and 17.

13. Preliminary Results for Resolution IV Designs of Size 256

While identifying almost 300,000 even/odd designs at $n = 128$ was challenging, this pales with the challenge of exhaustively enumerating all designs for $n = 256$ due to the great number of designs. For example, while only 88 sos designs exist at $n = 128$, we have found over 34,000 sos designs in random searches at $n = 256$ (See Table 13.1).

To aid in finding good designs, we implemented a method that combined some of our more successful strategies for finding good designs at $n = 64$ and $n = 128$. Our search at $n = 256$ used two basic approaches. The first approach consists of a random search for sos designs by starting with a design whose columns formed a full factorial and then randomly adding generators to available columns one at a time until an sos design is discovered (stopping if $k > 65$ since all 50 sos designs in this range are already known). Then from these sos designs, we find good designs from the sos designs by naïve projection. The second approach was to find new designs by sequentially building up a factor at a time using t^D as a flawed isomorphic rule to check for isomorphism and retaining the top 2,000 designs from each sequential search and building up from those 2,000 designs.

Table 13.1: Number of Regular Resolution IV$^+$ designs

n	# of even/odd sos designs	# of even/odd designs	# of even designs	# of even sos designs
16	1	1	4	1
32	2	5	20	1
64	8	150	349	1
128	87	$\geq$296,960	$> 10^6$	1
256	> 34,015	?	?	1

For naïve projection from sos designs approach, there are at least three ways to find sos designs:

- Double the sos designs at $n = 128$
- Random addition of eligible columns until an sos design is found
- Find good designs using software for fixed k and then build up to an sos design

For the sequential buildup technique the issue of which subset of designs to retain at each step is critical. For instance, if only the top 1,000 designs are retained at each buildup step for $n = 256$, then all the designs buildup to sos designs with $k \leq 40$. Future work will explore this issue.

From Franklin (1984) we know the minimum aberration values for designs with up to $k = 17$ factors for $n = 256$. We also know that as early as $k = 11$, we will lose some designs using t^D as a flawed isomorphic rule. However, we still find all the known minimum aberration designs. At $k = 17$, we found 33,142 resolution IV designs with different t^D. Of those, 32,126 are even/odd designs. The 1,016 even designs will continue to grow in number, approximately doubling at each factor until they reach $k =$ 64. Based upon our results as $n = 128$, we would expect the number of even/odd designs to increase for each factor until $k = 44$, and then gradually decline at each factor until $k =$ 80. (See Table 13.2).

Table 13.2: Existence of Regular Resolution IV$^+$ designs

k	# of even/odd designs, $n = 64$	# of even designs, $n = 64$	# of even/odd designs, $n = 128$	# of even designs, $n = 128$	# of e/o designs based on $t^D / G(T2^D)$, $n = 256$	# even designs based on $t^D / G(T2^D)$, $n = 256$
7	2	2	-	-	-	-
8	3	4	2	3	-	-
9	6	6	7	6	3 / 3	3 / 3
10	12	12	19	14	12 / 12	9 / 9
11	20	14	62	30	44 / 50	17 / 24
12	22	21	180	69	153 / 231	44 / 80
13	24	23	487	136	536 / 1,188	89 / 241
14	20	29	1,240	295	1,690 / 6,505	176 / 839
15	15	29	2,926	596	4,668 / 54,269	312 / 3,467
16	11	37	6,208	1,292	12,598 / ?	564 / ?
17	10	30	11,787	2,651	32,126 / ?	1,016 / ?
18	3	30	19,466	5,598	?	?
19	1	24	27,994	11,341	?	?
20	1	23	35,192	22,728	?	?
21	-	16	39,201	43,516	?	?
22	-	15	38,847	79,603	?	?
23	-	9	34,868	?	?	?
24	-	8	28,133	?	?	?
25	-	5	20,569	?	?	?
26	-	4	13,498	?	?	?
27	-	2	8,075	?	?	?
28	-	2	4,284	?	?	?
29	-	1	2,149	?	?	?
30	-	1	976	?	?	?
31	-	1	433	?	?	?
32	-	1	197	?	?	?
33	-	-	101	?	?	?
34	-	-	31	?	?	?
35	-	-	13	?	?	?
36	-	-	8	?	?	?
37	-	-	3	?	?	?
38	-	-	2	?	?	?
39	-	-	1	?	?	?
40	-	-	1	?	?	?

The sheer number of designs that exist at larger n shows the value of the naïve projection method. We are able to rather efficiently evaluate the naïve projections of sos designs at $n = 256$. Table 13.3 below shows the best designs found (based on wlp) for each respective k, and the corresponding alp, number of degrees of freedom used for main effects and two-factor interactions, the number of clear two-factors, and L_{max} for each design. The Yates ordered columns for those designs are listed in Table 13.4.

We have found over 34,015 sos designs at $n = 256$. The sos designs found occur at $k = 33, \ldots, 66, 68, 72, 80$, and 128 at $n = 256$. Future work will involve improving methods of finding good sos designs.

Additional future work will involve looking at ways to refining the naïve projection method to possibly including additional projections. It is no surprise that empirical evidence at $n = 128$ demonstrated at times the second best (or worse) projection for one design, could eventually lead to a better design a few projections later. Consider the even/odd 2_{IV}^{40-33} design. The naïve projections based on minimizing t^D lead to a different design at $k' = 16$ than if the criteria looked at only minimizing the length-4 and length-5 words with ties broken arbitrarily. The hope would be to find a method to identify which small set of projections lead to good designs. We would want as small a set of projections as possible that lead to good designs to avoid the combinatorial problem of having to look at all possible combinations of projections.

Table 13.3: Characterization of Good Designs for $n = 256$

k	w_4	w_5	w_6	df	C2FI	L_{max}	alp
9	0	0	0	45	36	1	36
10	0	0	1	55	45	1	45
11	0	0	6	66	55	1	55
12	0	0	12	78	66	1	66
13	0	3	12	91	78	1	78
14	0	9	18	105	91	1	91
15	0	15	30	120	105	1	105
16	0	24	44	136	120	1	120
17	0	34	68	153	136	1	136
18	3	36	114	162	135	2	135 9
19	4	48	168	178	147	2	147 12
20	5	64	240	195	160	2	160 15
21	9	104	268	206	162	3	162 21 2
22	14	137	346	218	168	3	168 21 7
23	20	172	450	217	136	3	136 57 1
24	27	214	582	221	120	3	120 75 2
25	34	266	752	227	108	3	108 90 4
26	43	325	963	231	94	3	94 102 9
27	53	395	1224	235	80	4	80 114 13 1
28	64	476	1550	239	66	4	66 126 16 3
29	78	579	1908	246	73	3	73 99 45
30	95	686	2340	245	55	4	55 105 50 5
31	113	792	2928	242	21	6	21 140 41 6 1 2
32	133	932	3576	245	19	6	19 124 57 9 2 2
33	153	1095	4360	248	17	6	17 106 75 13 2 2
34	176	1280	5272	252	15	6	15 97 80 21 2 3
35	200	1488	6360	254	9	6	9 88 88 28 2 4

Table 13.3 (Continued)

k	w_4	w_5	w_6	df	C2FI	L_{max}	alp
36	225	1728	7632	255	0	6	0 81 96 36 0 6
37	264	2004	8928	252	2	8	2 50 102 56 0 2 2 1
38	297	2304	10592	253	1	8	1 33 104 72 0 2 0 3
39	333	2632	12512	254	1	8	1 21 92 96 0 0 2 3
40	370	3008	14720	255	0	8	0 10 80 120 0 0 0 5
41	482	3048	17583	253	10	10	10 25 59 56 39 9 6 5 2 1
42	545	3388	20650	254	10	10	10 24 56 43 45 16 6 9 2 1
43	619	3818	23512	250	0	13	0 22 30 100 27 0 0 23 3 1 0 0 1
44	685	4290	27229	251	0	13	0 17 21 102 39 0 0 12 14 0 1 0 1
45	760	4792	31458	252	0	13	0 16 12 92 59 0 0 6 14 6 0 1 1
46	838	5352	36209	253	0	13	0 16 0 84 79 0 0 2 12 10 2 0 2
47	926	5980	41305	254	0	14	0 16 0 52 110 1 0 2 6 12 5 1 0 2
48	1019	6648	47182	255	0	15	0 16 0 24 132 7 0 2 0 18 0 6 0 0 2
49	1154	7383	52815	253	0	15	0 0 0 36 119 27 0 5 0 0 0 0 6 8 3
50	1257	8200	60044	254	0	15	0 0 0 16 120 46 0 5 0 0 0 0 0 10 7
51	1365	9100	68068	255	0	15	0 0 0 0 112 70 0 5 0 0 0 0 0 0 17
52	1500	9264	80976	249	0	24	0 0 0 6 102 32 0 0 0 48 0 8 0 0 0 0 0 0 0 0 0 0 0 1
53	1632	10164	91572	250	0	25	0 0 0 3 81 56 0 0 0 24 24 8 0 0 0 0 0 0 0 0 0 0 0 0 1
54	1769	11152	103232	251	0	26	0 0 0 1 57 82 0 0 0 8 32 16 0 0 0 0 0 0 0 0 0 0 0 0 0 1
55	1911	12240	116000	252	0	27	0 0 0 0 30 110 0 0 0 0 24 32 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
56	2058	13440	129920	253	0	28	0 0 0 0 0 140 0 0 0 0 0 56 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
57	2282	14280	146272	254	0	28	0 0 0 0 0 140 0 0 0 0 0 0 56 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
58	2534	15120	164304	255	0	29	0 0 0 0 0 140 0 0 0 0 0 0 0 56 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
59	2870	14256	197856	234	0	22	0 0 0 0 0 0 48 112 0 0 0 0 0 0 0 0 0 0 0 11 4
60	3075	15552	219840	235	0	22	0 0 0 0 0 0 0 160 0 0 0 0 0 0 0 0 0 0 0 0 15
61	3307	16848	244344	236	0	23	0 0 0 0 0 0 0 112 48 0 0 0 0 0 0 0 0 0 0 0 3 12

Table 13.3 (Continued)

k	w_4	w_5	w_6	df	C2FI	L_{max}	alp
62	3548	18252	270960	237	0	24	0 0 0 0 0 0 0 0 72 79 9 0 0 0 0 0 0 0 0 0 0 0 0 0 6 9
63	3798	19773	299796	238	0	25	0 0 0 0 0 0 0 0 40 93 27 0 0 0 0 0 0 0 0 0 0 0 0 0 0 9 6
64	4057	21420	330960	239	0	26	0 0 0 0 0 0 0 0 16 90 54 0 0 0 0 0 0 0 0 0 0 0 0 0 0 12 3
65	4325	23203	364560	240	0	26	0 0 0 0 0 0 0 0 0 70 90 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 15
66	4619	24989	401898	241	0	27	0 0 0 0 0 0 0 0 0 42 94 24 0 0 0 0 0 0 0 0 0 0 0 0 0 0 2 13
67	4924	26912	442160	242	0	28	0 0 0 0 0 0 0 0 0 21 87 48 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4 11
68	5240	28982	485484	243	0	29	0 0 0 0 0 0 0 0 0 7 69 72 12 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 6 9
69	5567	31210	532008	244	0	30	0 0 0 0 0 0 0 0 0 0 40 96 24 a_{29}=8 a_{30}=7
70	5905	33612	581862	245	0	31	0 0 0 0 0 0 0 0 0 0 0 120 40 a_{30}=10 a_{31}=5
71	6273	36014	636851	246	0	32	0 0 0 0 0 0 0 0 0 0 0 72 80 8 a_{31}=11 a_{32}=4
72	6654	38586	695799	247	0	33	0 0 0 0 0 0 0 0 0 0 0 36 96 27 1 a_{32}=12 a_{33}=3
73	7048	41343	758875	248	0	34	0 0 0 0 0 0 0 0 0 0 0 12 88 57 3 a_{33}=13 a_{34}=2
74	7455	44296	826252	249	0	35	0 0 0 0 0 0 0 0 0 0 0 0 56 98 6 a_{34}=14 a_{35}=1
75	7875	47460	898100	250	0	35	0 0 0 0 0 0 0 0 0 0 0 0 0 150 10 a_{35}=15
76	8330	50625	976808	251	0	36	0 0 0 0 0 0 0 0 0 0 0 0 0 90 70 a_{36}=15
77	8800	54000	1060766	252	0	37	0 0 0 0 0 0 0 0 0 0 0 0 0 45 99 16 a_{37}=15
78	9285	57600	1150184	253	0	38	0 0 0 0 0 0 0 0 0 0 0 0 0 15 97 48 a_{38}=15
79	9785	61440	1245272	254	0	39	0 0 0 0 0 0 0 0 0 0 0 0 0 0 64 96 a_{39}=15
80	10300	65536	1346240	255	0	40	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 160 a_{40}=15

Table 13.4: Generators for Table 13.3 Designs for $n = 256$

k	Design columns (Yates standard order)
9	1 2 4 8 16 32 64 128 255
10	1 2 4 8 16 32 63 64 128 199
11	1 2 4 8 16 32 64 127 128 143 179
12	1 2 4 8 16 32 64 127 128 143 179 213
13	1 2 4 8 16 32 64 105 127 128 143 179 213
14	1 2 4 8 16 27 32 64 105 127 128 143 179 213
15	1 2 4 8 16 27 32 46 64 105 127 128 143 179 213
16	1 2 4 8 16 32 64 75 85 108 127 128 143 150 179 189
17	1 2 4 8 16 32 64 75 85 108 127 128 143 150 179 189 229
18	1 2 4 8 16 27 32 46 64 92 105 127 128 143 179 182 194 213
19	1 2 4 8 16 27 32 46 64 92 105 127 128 143 179 182 194 213 229
20	1 2 4 8 16 27 32 46 64 92 105 127 128 143 179 182 194 213 229 248
21	1 2 4 8 16 23 27 32 46 64 92 105 127 128 143 173 179 213 217 227 254
22	1 2 4 8 16 27 32 46 64 77 88 105 127 128 143 158 164 179 185 201 213 234
23	1 2 4 7 8 16 27 32 46 64 77 105 127 128 143 158 179 185 201 213 220 228 234
24	1 2 4 7 8 16 27 32 46 64 77 94 105 127 128 143 158 179 185 201 213 220 228 234
25	1 2 4 8 16 27 32 46 64 77 87 105 112 127 128 143 158 166 179 180 185 213 220 232 237
26	1 2 4 8 16 27 32 46 64 77 87 105 112 124 127 128 143 158 166 179 180 185 213 220 232 237
27	1 2 4 8 16 27 32 46 64 77 87 105 112 124 127 128 143 158 166 179 180 185 213 219 220 232 237
28	1 2 4 8 16 27 32 46 64 77 87 105 112 124 127 128 143 158 166 179 180 185 213 219 220 232 237 25
29	1 2 4 8 16 23 27 32 39 46 58 64 77 84 105 124 127 128 143 145 146 179 185 200 213 217 225 228 234
30	1 2 4 8 16 27 32 35 46 64 77 87 88 105 112 127 128 143 158 166 179 180 185 193 210 213 219 220 232 237
31	1 2 4 8 16 32 43 50 62 64 75 78 83 85 88 108 113 118 127 128 138 143 149 150 162 173 179 201 232 239 244
32	1 2 4 8 16 32 43 50 62 64 75 78 83 85 88 108 113 118 127 128 138 140 143 149 150 162 173 179 201 232 239 244
33	1 2 4 8 16 32 43 50 62 64 75 78 83 85 88 108 113 118 127 128 138 140 143 149 150 155 162 173 179 201 232 239 244
34	1 2 4 8 16 23 32 43 50 62 64 75 78 83 85 88 108 113 118 127 128 138 140 143 149 150 162 173 179 185 201 232 239 244
35	1 2 4 8 16 23 32 43 50 62 64 75 78 83 85 88 108 113 118 127 128 138 140 143 149 150 162 173 179 185 201 208 232 239 244
36	1 2 4 8 16 23 32 43 50 62 64 75 78 83 85 88 108 113 118 127 128 138 140 143 149 150 162 173 179 185 201 208 229 232 239 244
37	1 2 4 8 16 27 28 32 35 37 46 55 64 70 77 87 105 106 112 124 127 128 137 143 158 166 179 180 185 202 213 219 220 231 232 237 25
38	1 2 4 8 16 27 28 32 35 37 46 55 64 70 77 87 88 105 106 112 124 127 128 137 143 158 166 179 180 185 202 213 219 220 231 232 237 250
39	1 2 4 8 16 27 28 32 35 37 46 55 64 70 77 87 88 105 106 112 124 127 128 137 143 158 166 179 180 185 193 202 213 219 220 231 232 237 250

Table 13.4 (Continued)

k	Design columns (Yates standard order)
40	1 2 4 8 16 27 28 32 35 37 46 55 64 70 77 87 88 105 106 112 124 127 128 137 143 158 166 179 180 185 193 202 210 213 219 220 231 232 237 250
41	1 2 4 8 14 16 32 39 42 50 53 57 62 64 67 70 74 76 81 84 87 91 93 128 138 151 157 166 171 177 188 196 199 203 210 216 226 233 239 243 244
42	1 2 4 8 14 16 32 39 42 50 53 57 62 64 67 70 74 76 81 84 87 91 93 128 138 151 157 166 171 177 188 196 199 203 210 216 223 226 233 239 243 244
43	1 2 4 8 11 16 19 22 32 35 38 49 61 62 64 71 90 93 106 109 114 117 120 127 128 131 141 153 154 159 170 175 181 182 187 193 198 200 207 212 227 250 253
44	1 2 4 8 11 16 19 22 32 35 38 49 61 62 64 71 90 93 106 109 114 117 120 127 128 131 141 153 154 159 169 170 175 181 182 187 193 198 200 207 212 227 250 253
45	1 2 4 8 11 16 19 22 32 35 38 49 61 62 64 71 90 93 106 109 114 117 120 127 128 131 141 153 154 159 169 170 175 181 182 187 193 198 200 207 211 212 227 250 253
46	1 2 4 8 11 16 19 22 32 35 38 49 61 62 64 71 90 93 106 109 114 117 120 127 128 131 141 153 154 159 169 170 175 181 182 187 193 198 200 207 211 212 227 228 250 253
47	1 2 4 8 11 16 19 22 32 35 38 49 52 61 62 64 71 90 93 106 109 114 117 120 127 128 131 141 153 154 159 169 170 175 181 182 187 193 198 200 207 211 212 227 228 250 253
48	1 2 4 8 11 16 19 22 32 35 38 49 52 61 62 64 71 90 93 106 109 114 117 120 127 128 131 141 153 154 159 169 170 175 181 182 184 187 193 198 200 207 211 212 227 228 250 253
49	1 2 4 7 8 13 14 16 21 26 31 32 42 49 50 52 55 56 59 62 64 75 83 88 101 110 118 125 128 133 143 147 150 156 163 166 169 172 176 181 191 193 202 210 217 228 239 247 252
50	1 2 4 7 8 13 14 16 21 26 31 32 42 49 50 52 55 56 59 62 64 75 83 88 101 110 118 125 128 133 143 147 150 156 163 166 169 172 176 181 186 191 193 202 210 217 228 239 247 252
51	1 2 4 7 8 13 14 16 21 26 31 32 42 47 49 50 52 55 56 59 62 64 75 83 88 101 110 118 125 128 133 143 147 150 156 163 166 169 172 176 181 186 191 193 202 210 217 228 239 247 252
52	1 2 4 8 16 21 30 32 37 43 51 54 57 58 60 64 75 78 86 90 92 95 98 103 104 109 117 123 126 128 131 133 137 142 146 159 167 170 173 177 193 198 204 208 215 219 221 222 224 239 243 244
53	1 2 4 8 16 21 30 32 37 43 51 54 57 58 60 64 75 78 86 90 92 95 98 100 103 104 109 117 123 126 128 131 133 137 142 146 159 167 170 173 177 193 198 204 208 215 219 221 222 224 239 243 244
54	1 2 4 8 16 21 30 32 37 43 51 54 57 58 60 64 75 78 86 90 92 95 98 100 103 104 109 117 123 126 128 131 133 137 142 146 159 167 170 173 177 190 193 198 204 208 215 219 221 222 224 239 243 244
55	1 2 4 8 16 21 30 32 37 43 51 54 57 58 60 64 75 78 86 90 92 95 98 100 103 104 109 117 123 126 128 131 133 137 142 146 152 159 167 170 173 177 190 193 198 204 208 215 219 221 222 224 239 243 244
56	1 2 4 8 16 21 30 32 37 43 51 54 57 58 60 64 75 78 86 90 92 95 98 100 103 104 109 117 123 126 128 131 133 137 142 146 152 159 167 170 173 177 190 193 198 204 208 215 219 221 222 224 239 243 244 249
57	1 2 4 8 16 21 30 32 37 43 51 54 57 58 60 64 75 78 86 90 92 95 98 100 103 104 109 117 123 126 128 131 133 137 142 146 152 159 167 170 173 177 187 190 193 198 204 208 215 219 221 222 224 239 243 244 249

Table 13.4 (Continued)

k	Design columns (Yates standard order)
58	1 2 4 8 16 21 30 32 37 43 51 54 57 58 60 64 75 78 86 90 92 95 98 100 103 104 109 117 123 126 128 131 133 137 142 146 152 159 167 170 173 177 187 190 193 198 204 208 215 219 221 222 224 229 239 243 244 249
59	1 2 4 8 13 14 16 23 27 32 38 42 44 51 52 56 64 71 81 82 88 93 94 99 100 104 111 112 117 118 121 122 128 131 133 137 140 145 150 154 157 161 164 167 168 173 178 185 193 198 205 208 213 220 223 226 233 238 251
60	1 2 4 8 13 14 16 23 27 32 38 42 44 51 52 56 64 71 81 82 88 93 94 99 100 104 111 112 117 118 121 122 128 131 133 137 140 145 150 154 157 161 164 167 168 173 178 185 193 198 205 208 213 220 223 226 233 238 251 253
61	1 2 4 8 13 14 16 23 27 32 38 42 44 51 52 56 64 71 81 82 88 93 94 99 100 104 111 112 117 118 121 122 128 131 133 137 140 145 150 154 157 161 164 167 168 173 178 185 193 198 205 208 213 217 220 223 226 233 238 251 253
62	1 2 4 8 13 14 16 23 27 32 38 42 44 51 52 56 64 71 81 82 88 93 94 99 100 104 111 112 117 118 121 122 128 131 133 137 140 143 145 150 154 157 161 164 167 168 173 178 185 193 198 205 208 213 217 220 223 226 233 238 251 253
63	1 2 4 8 13 14 16 23 27 32 38 42 44 51 52 56 64 71 81 82 88 93 94 99 100 104 111 112 117 118 121 122 128 131 133 137 140 143 145 150 154 157 161 164 167 168 173 178 185 193 198 202 205 208 213 217 220 223 226 233 238 251 253
64	1 2 4 8 13 14 16 23 27 32 38 42 44 51 52 56 64 71 81 82 88 93 94 99 100 104 111 112 117 118 121 122 128 131 133 137 140 143 145 150 154 157 161 164 167 168 173 178 181 185 193 198 202 205 208 213 217 220 223 226 233 238 251 253
65	1 2 4 8 13 14 16 23 27 32 38 41 42 44 51 52 56 64 71 81 82 88 93 94 99 100 104 111 112 117 118 121 122 128 131 133 137 140 143 145 150 154 157 161 164 167 168 173 178 181 185 193 198 202 205 208 213 217 220 223 226 233 238 251 253
66	1 2 4 8 13 14 16 23 27 32 38 41 42 44 51 52 56 63 64 71 81 82 88 93 94 99 100 104 111 112 117 118 121 122 128 131 133 137 140 143 145 150 154 157 161 164 167 168 173 178 181 185 193 198 202 205 208 213 217 220 223 226 233 238 251 253
67	1 2 4 8 13 14 16 23 27 32 37 38 41 42 44 51 52 56 63 64 71 81 82 88 93 94 99 100 104 111 112 117 118 121 122 128 131 133 137 140 143 145 150 154 157 161 164 167 168 173 178 181 185 193 198 202 205 208 213 217 220 223 226 233 238 251 253
68	1 2 4 8 13 14 16 23 27 32 37 38 41 42 44 51 52 56 63 64 71 81 82 88 93 94 99 100 104 111 112 117 118 121 122 128 131 133 137 140 143 145 150 154 157 161 164 167 168 173 178 181 185 193 198 202 205 208 211 213 217 220 223 226 233 238 251 253
69	1 2 4 8 13 14 16 23 27 32 37 38 41 42 44 51 52 56 63 64 71 81 82 88 93 94 99 100 104 111 112 117 118 121 122 124 128 131 133 137 140 143 145 150 154 157 161 164 167 168 173 178 181 185 193 198 202 205 208 211 213 217 220 223 226 233 238 251 253
70	1 2 4 8 13 14 16 23 27 28 32 37 38 41 42 44 51 52 56 63 64 71 81 82 88 93 94 99 100 104 111 112 117 118 121 122 124 128 131 133 137 140 143 145 150 154 157 161 164 167 168 173 178 181 185 193 198 202 205 208 211 213 217 220 223 226 233 238 251 253
71	1 2 4 8 16 23 25 26 28 32 39 43 45 46 51 53 54 56 64 71 73 74 76 81 82 84 88 95 99 101 102 104 111 112 119 123 125 126 128 131 133 137 142 145 150 152 155 157 161 166 170 172 175 178 180 183 185 190 193 198 200 203 205 208 211 217 226 228 233 238 241
72	1 2 4 8 16 23 25 26 28 32 39 43 45 46 51 53 54 56 64 71 73 74 76 81 82 84 88 95 99 101 102 104 111 112 119 123 125 126 128 131 133 137 142 145 150 152 155 157 161 166 170 172 175 178 180 183 185 190 193 198 200 203 205 208 211 213 217 226 228 233 238 241

Table 13.4 (Continued)

k	Design columns (Yates standard order)
73	1 2 4 8 16 23 25 26 28 32 39 43 45 46 51 53 54 56 63 64 71 73 74 76 81 82 84 88 95 99 101 102 104 111 112 119 123 125 126 128 131 133 137 142 145 150 152 155 157 161 166 170 172 175 178 180 183 185 190 193 198 200 203 205 208 211 213 217 226 228 233 238 241
74	1 2 4 8 16 23 25 26 28 32 39 43 45 46 51 53 54 56 63 64 71 73 74 76 81 82 84 88 95 99 101 102 104 111 112 119 123 125 126 128 131 133 137 142 145 150 152 155 157 161 166 170 172 175 178 180 183 185 190 193 198 200 203 205 208 211 213 217 222 226 228 233 238 241
75	1 2 4 8 16 23 25 26 28 32 39 43 45 46 51 53 54 56 63 64 71 73 74 76 81 82 84 88 95 99 101 102 104 111 112 119 123 125 126 128 131 133 137 142 145 150 152 155 157 161 166 170 172 175 178 180 183 185 190 193 198 200 203 205 208 211 213 217 222 226 228 231 233 238 241
76	1 2 4 8 15 16 23 25 26 28 32 39 43 45 46 51 53 54 56 63 64 71 73 74 76 81 82 84 88 95 99 101 102 104 111 112 119 123 125 126 128 131 133 137 142 145 150 152 155 157 161 166 170 172 175 178 180 183 185 190 193 198 200 203 205 208 211 213 217 222 226 228 231 233 238 241
77	1 2 4 8 15 16 23 25 26 28 32 39 43 45 46 51 53 54 56 63 64 71 73 74 76 81 82 84 88 95 99 101 102 104 111 112 119 123 125 126 128 131 133 137 142 145 150 152 155 157 161 166 170 172 175 178 180 183 185 190 193 198 200 203 205 208 211 213 217 222 226 228 231 233 238 241 246
78	1 2 4 8 15 16 23 25 26 28 32 39 43 45 46 51 53 54 56 63 64 71 73 74 76 81 82 84 88 95 99 101 102 104 111 112 119 123 125 126 128 131 133 137 142 145 150 152 155 157 161 166 170 172 175 178 180 183 185 190 193 198 200 203 205 208 211 213 217 222 226 228 231 233 238 241 246 250
79	1 2 4 8 15 16 23 25 26 28 32 39 43 45 46 51 53 54 56 63 64 71 73 74 76 81 82 84 88 95 99 101 102 104 111 112 119 123 125 126 128 131 133 137 142 145 150 152 155 157 161 166 170 172 175 178 180 183 185 190 193 198 200 203 205 208 211 213 217 222 226 228 231 233 238 241 246 250 252
80	1 2 4 8 15 16 23 25 26 28 32 39 43 45 46 51 53 54 56 63 64 71 73 74 76 81 82 84 88 95 99 101 102 104 111 112 119 123 125 126 128 131 133 137 142 145 150 152 155 157 161 166 170 172 175 178 180 183 185 190 193 198 200 203 205 208 211 213 217 222 226 228 231 233 238 241 246 250 252 255

14. Conclusions

This dissertation has introduced the alp which provides another useful characterization of designs. The alp of a design contains the number of clear two-factor interactions, the number of degrees of freedom used for main effects and two-factor interactions, and lists the length of the largest set of aliased two-factor interactions. The alp can be used to calculate the number of length-four words, and is helpful in differentiating designs.

We have also studied projections of designs. We now know that all regular resolution IV designs have at least one sos parent. We know an examination of projections from all the sos designs will result in a complete set of regular resolution IV designs. We have introduced a method to find good designs using naïve projections from sos designs instead of an exhaustive search.

We have examined some of the properties of the T matrix and demonstrated its usefulness in searching for good designs. We have found the minimum aberration designs for $n = 128$ based upon our isomorphic conjecture. We list not only these designs and their properties, but provide a catalog of designs with respect to word length pattern, degrees of freedom used, clear two-factor interactions, and minimizing the length of the longest set of aliased two-factor interactions.

We know that the naïve projections from sos designs leads to all the minimum aberration values for $n = 32$, 64, and 128. We know that the number of regular resolution IV designs increases at a rate that makes exhaustive searches infeasible beyond $n = 128$ using current technology. We know that projections from the doubled sos design at $k = (5/16)n$ results in excellent (and very often minimum aberration) designs. We provide a number of interesting designs at $n = 128$ that are alike in several (sometimes all) characterization criteria, yet non-isomorphic.

Finally, we have found over 34,015 sos designs for $n = 256$. We show how the magnitude of the number of designs increases with larger n. We use naïve projections and build up using the best 2,000 designs to provide a preliminary table of the best designs at $n = 256$.

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Appendices

Appendix A: Yates Column Order Design Matrix

Yates Column Order Generator Matrix, For r > 129,…,255 $i_r = i_{128} + i_{r-128}$

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0
0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	1
0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
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	0	0	0	0	0	0	0	0	0	0	0	0	0

21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0
1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0
0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1
1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0
0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	1
1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1
0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0
1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0
1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0
1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Yates Column Order Generator Matrix (Continued), For r > 129,…,255 $i_r = i_{128} + i_{r-128}$

81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0
0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	1
0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0
1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	0
0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

121	122	123	124	125	126	127	128
1	0	1	0	1	0	1	0
0	1	1	0	0	1	1	0
0	0	0	1	1	1	1	0
1	1	1	1	1	1	1	0
1	1	1	1	1	1	1	0
1	1	1	1	1	1	1	0
1	1	1	1	1	1	1	0
							1

Appendix B: Catalog of Even/Odd Resolution IV Design for $n = 64$

Even-Odd Resolution IV Designs of Size 64

Design	csw #	Generators	d.f.	$w_4, w_5, w_6, \ldots$	Alias Length Pattern	E/O Proj.
20-14.a	1	7,11,13,14,19,21,22,35,37,38,57,58,60,63	63	125, 256, 480,…	0,0,0,40,0,0,0,0,0,3	a
19-13.a	1	7 11 13 14 19 21 22 35 37 38 57 58 60	62	100, 192, …	0,0,16,24,0,0,0,0,3	a, b
18-12.a	1	7 11 13 14 19 21 22 35 37 57 58 60	61	78, 144, …	0,3,25,12,0,0,0,3	a, c
18-12.b	2	7 11 13 14 19 21 22 35 37 38 57 58	61	84, 128, …	0,16,0,24,0,0,0,2,1	c, h
18-12.c	3	7 11 13 14 19 21 22 25 26 35 60 63	63	92, 112, …	0,30,0,0,0,14,0,0,1	f, i
17-11.a	1	7 11 13 14 19 21 35 37 57 58 60	60	59, 108, …	0, 9, 27, 4, 0, 0, 3	a, c
17-11.b	2	7 11 19 29 37 41 47 49 55 59 62	63	60, 80, …	16, 0, 0, 30	b
17-11.c	*	7 11 13 14 19 21 22 35 37 57 58	60	64, 96, …	2, 14, 12, 12, 0, 0, 2, 1	c, f, g, i
17-11.d	3	7 11 13 19 21 25 35 37 41 49 63	63	65, 75, …	16, 0, 15, 0, 15	b, d
17-11.e	4	7 11 13 14 19 21 25 35 37 41 63	63	68, 72, …	16, 6, 0, 18, 0, 6	d, h
17-11.f	*	7 11 13 14 19 21 22 25 35 60 63	62	68, 88, …	4, 26, 0, 0, 12, 2, 0, 1	e, g, j
17-11.g	5	7 11 13 14 19 21 22 25 35 37 63	63	73, 67, …	19, 0, 12, 0, 12, 0, 3	h, i, j
17-11.h	7	7 11 13 14 19 21 22 35 37 38 57	60	76, 64, …	16, 0, 0, 24, 0, 0, 0, 3	i,
17-11.i	10	7 11 13 14 19 21 22 25 26 35 60	62	84, 56, …	16, 14, 0, 0, 0, 14, 0, 1	j, k
17-11.j	6	7 11 13 14 19 21 22 25 26 28 63	63	105, 35, …	31, 0, 0, 0, 0, 0, 15	k
16-10.a	1	7 11 13 19 21 35 37 57 58 60	59	43, 81, …	0, 18, 22, 0, 0, 3	a, b, d
16-10.b	2	7 11 19 29 37 41 47 49 55 59	61	45, 60, …	15, 0, 15, 15	c

Design	csw #	Generators	d.f.	$w_4, w_5, w_6, \ldots$	Alias Length Pattern	E/O Proj.
16-10.c	7	7 11 13 14 19 21 35 37 57 58	59	47, 72, …	4, 15, 17, 4, 0, 2, 1	d, h, j, l
16-10.d	3	7 11 13 19 21 25 35 37 41 63	61	49, 56, …	15, 6, 9, 9, 6	c, f, i
16-10.e	8	7 11 13 14 19 21 25 35 60 63	61	49, 68, …	8, 22, 0, 9, 5, 0, 1	e, g, j, m
16-10.f	9	7 11 13 14 19 21 22 35 57 60	59	51, 64, …	4, 24, 0, 12, 0, 1, 2	h, n
16-10.g	*	7 11 13 14 19 21 22 35 57 58	57	52, 64, …	0, 26, 0, 12, 0, 2, 0, 1	j, n
16-10.h	4	7 11 13 14 19 21 25 35 37 63	61	53, 52, …	18, 3, 9, 9, 3, 3	i, k, l, m
16-10.i	10	7 11 13 14 19 21 22 35 37 57	58	57, 48, …	15, 0, 12, 12, 0, 0, 3	l, n
16-10.j	5	7 11 13 14 19 21 22 25 35 60	60	61, 44, …	17, 12, 0, 0, 12, 2, 1	m, n, o
16-10.k	6	7 11 13 14 19 21 22 25 26 60	60	77, 28, …	29, 0, 0, 0, 0, 14, 1	o
15-9.a	1	7 11 19 30 37 41 49 60 63	58	30, 60, …	0, 30, 10, 0, 3	a
15-9.b	2	7 11 19 29 30 37 41 49 60	58	30, 61, …	0, 30, 10, 0, 3	a, c
15-9.c	3	7 11 19 29 37 41 47 49 55	59	33, 44, …	14, 6, 17, 7	d, g
15-9.d	6	7 11 13 19 21 35 37 57 58	58	33, 54, …	6, 19, 15, 0, 2, 1	a, c, h, j, n
15-9.e	7	7 11 13 19 21 25 35 60 63	60	34, 52, …	12, 18, 5, 9, 0, 1	b, e, f, j, o
15-9.f	8	7 11 13 19 21 35 41 49 63	59	35, 42, …	14, 11, 8, 10, 1	d, i, k
15-9.g	*	7 11 13 14 19 21 41 54 63	60	35, 50, …	12, 18, 8, 3, 3, 1	e, m, q
15-9.h	*	7 11 13 14 19 21 35 57 60	58	36, 48, …	8, 20, 8, 4, 1, 2	h, l, m, r
15-9.i	9	7 11 13 19 21 25 35 37 63	59	37, 40, …	17, 6, 11, 7, 3	g, i, k, n, o

Design	csw #	Generators	d.f.	$w_4, w_5, w_6, \ldots$	Alias Length Pattern	E/O Proj.
15-9.j	*	7 11 13 14 19 21 35 57 58	56	37, 48, …	4, 22, 8, 4, 2, 0, 1	j, m, p, r
15-9.k	4	7 11 13 14 19 21 35 41 63	59	39, 38, …	19, 2, 16, 2, 4, 1	k, q, r
15-9.l	*	7 11 13 14 19 21 35 37 57	56	41, 36, …	14, 3, 17, 4, 0, 3	n, r
15-9.m	10	7 11 13 14 19 21 25 35 60	58	43, 34, …	18, 10, 0, 9, 5, 1	o, q, r, s
15-9.n	*	7 11 13 14 19 21 22 35 57	56	45, 32, …	14, 12, 0, 12, 0, 2, 1	r, t
15-9.o	5	7 11 13 14 19 21 22 25 58	57	55, 22, …	27, 0, 0, 0, 12, 3	s, t
14-8.a	1	7 11 19 30 37 41 49 60	57	22, 40, 36, …	8, 26, 6, 2, 1	d, h, o
14-8.b	2	7 11 19 29 30 37 41 47	59	22, 40, 41, …	16, 14, 14, 0, 1	a, i, m
14-8.c	6	7 11 19 29 30 37 41 49	57	22, 41, …	8, 26, 6, 2, 1	d, i, l, o
14-8.d	7	7 11 19 30 37 41 52 56	57	23, 32, …	13, 15, 12, 3	c, f
14-8.e	8	7 11 13 19 21 41 54 63	59	23, 38, …	16, 17, 8, 3, 1	a, e, h, k, p
14-8.f	9	7 11 13 19 21 46 54 56	59	23, 40, …	16, 17, 8, 3, 1	e, i, q
14-8.g	10	7 11 19 29 37 41 47 49	57	24, 31, …	16, 9, 15, 3	f, m, o
14-8.h	*	7 11 13 19 21 35 57 60	57	24, 36, …	12, 19, 9, 1, 2	d, g, k, s
14-8.i	*	7 11 13 19 21 41 49 63	57	25, 30, …	16, 12, 9, 6	f, j, l, p, q
14-8.j	*	7 11 13 19 21 35 57 58	55	25, 36, …	8, 21, 9, 2, 0, 1	h, i, k, r, s
14-8.k	*	7 11 13 19 21 35 41 63	57	26, 29, …	18, 8, 12, 4, 1	f, j, p, s
14-8.l	*	7 11 13 14 19 37 57 63	57	26, 32, …	12, 24, 0, 4, 3	g, t

Design	CSW #	Generators	d.f.	$w_4, w_5, w_6, \ldots$	Alias Length Pattern	E/O Proj.
14-8.m	*	7 11 13 14 19 35 53 57	55	27, 32, …	8, 26, 0, 5, 1, 1	k, t, u
14-8.n	*	7 11 13 19 21 35 37 57	54	28, 27, …	13, 9, 15, 0, 3	l, s
14-8.o	3	7 11 13 19 21 25 35 60	56	29, 26, …	19, 8, 5, 9, 1	m, p, q, s, v
14-8.p	*	7 11 13 14 19 35 53 54	51	29, 32, …	0, 30, 0, 6, 0, 0, 1	r, u
14-8.q	*	7 11 13 14 19 21 41 54	56	30, 25, …	19, 8, 8, 3, 4	p, t, w, x
14-8.r	*	7 11 13 14 19 21 35 57	54	31, 24, …	15, 10, 8, 4, 2, 1	s, t, u, w
14-8.s	4	7 11 13 14 19 21 25 54	54	38, 17, …	25, 0, 0, 9, 6	v, w, x
14-8.t	5	7 11 13 14 19 21 22 57	54	39, 16, …	25, 0, 0, 12, 0, 3	w
13-7.a	1	7 11 21 25 38 58 60	58	14, 28, …	20, 18, 6, 1	b, e, g, i
13-7.b	2	7 11 13 30 46 49 63	63	14, 33, …	36, 0, 14	a, h
13-7.c	3	7 11 19 29 37 59 62	55	15, 24, …	12, 27, 0, 3	f
13-7.d	4	7 11 19 29 37 41 60	56	15, 27, …	16, 21, 4, 2	c, g, k, m
13-7.e	5	7 11 13 19 46 49 63	58	15, 28, …	22, 15, 6, 2	b, g, h, j, l
13-7.f	6	7 11 19 30 37 41 52	55	16, 22, …	17, 15, 9, 1	d, f, i, m
13-7.g	7	7 11 13 19 37 57 63	56	16, 24, …	18, 18, 4, 3	c, e, p
13-7.h	8	7 11 19 37 41 60 63	54	16, 26, …	12, 23, 5, 0, 1	g, k, n
13-7.i	*	7 11 19 29 30 37 41	54	16, 28, …	12, 23, 5, 0, 1	g, m, o
13-7.j	*	7 11 13 19 37 49 63	55	17, 21, …	19, 12, 9, 2	d, i, k, l, p

Design	csw #	Generators	d.f.	$w_4, w_5, w_6, \ldots$	Alias Length Pattern	E/O Proj.
13-7.k	*	7 11 13 19 35 53 57	54	17, 24, …	19, 12, 9, 2	e, g, j, n, p, q
13-7.l	*	7 11 19 30 37 41 49	52	18, 20, 24, …	12, 18, 6, 3	k, m
13-7.m	9	7 11 19 29 37 41 47	54	18, 20, 28, …	20, 6, 14, 1	i, m, r
13-7.n	10	7 11 13 19 35 49 63	55	18, 21, 24, …	21, 8, 12, 0, 1	f, l, q
13-7.o	*	7 11 19 29 37 41 49	52	18, 21, 24, …	12, 18, 6, 3	m
13-7.p	*	7 11 13 19 21 41 54	54	19, 19, …	20, 9, 8, 4	i, k, l, p, t, n
13-7.q	*	7 11 13 19 21 46 54	54	19, 20, …	20, 9, 8, 4	l, u
13-7.r	*	7 11 13 19 35 53 54	50	19, 24, …	6, 24, 6, 0, 0, 1	s, q, o, n
13-7.s	*	7 11 13 19 21 35 57	52	20, 18, …	16, 11, 9, 2, 1	k, m, p, q, t
13-7.t	*	7 11 13 14 19 37 57	52	22, 16, …	16, 16, 0, 5, 2	p, v
13-7.u	*	7 11 13 14 19 35 53	50	23, 16, …	12, 18, 0, 6, 0, 1	q, v
13-7.v	*	7 11 13 19 21 25 46	51	25, 13, …	23, 0, 5, 10	r, t, u
13-7.w	*	7 11 13 14 19 21 57	51	26, 12, …	23, 0, 8, 4, 3	t, v
13-7.x	*	7 11 13 14 19 21 54	51	26, 13, …	23, 0, 8, 4, 3	u, v
12-6.a	1	7 11 29 45 51 62	62	6, 24, …	36, 12, 2	a
12-6.b	2	7 11 21 46 54 56	57	8, 20, …	27, 15, 3	a, c, d, e
12-6.c	3	7 11 21 41 51 63	55	9, 18, …	24, 15, 4	c, h
12-6.d	4	7 11 21 41 54 56	53	10, 15, …	21, 15, 5	b, d, h

Design	CSW #	Generators	d.f.	$w_4, w_5, w_6, \ldots$	Alias Length Pattern	E/O Proj.
12-6.e	6	7 11 19 37 57 63	53	10, 16, 12, …	20, 18, 2, 1	c, g, j
12-6.f	7	7 11 19 29 37 59	53	10, 16, 16, …	20, 18, 2, 1	d, f, l
12-6.g	8	7 11 19 29 37 57	53	10, 18, …	20, 18, 2, 1	c, e, h, i, j, l
12-6.h	5	7 11 13 30 46 49	56	10, 20, …	30, 6, 8	a, e, k, m
12-6.i	9	7 11 21 25 38 58	52	11, 14, …	21, 12, 7	d, g, h, o
12-6.j	*	7 11 19 37 57 60	51	11, 16, …	16, 21, 0, 2	e, j
12-6.k	*	7 11 19 37 41 60	50	12, 13, …	17, 15, 5, 1	h, j, n, o
12-6.l	10	7 11 13 19 46 49	52	12, 14, 12, …	23, 9, 7, 1	d, h, j, k, p, r
12-6.m	*	7 11 19 29 37 41	50	12, 14, 12, …	17, 15, 5, 1	h, l, o
12-6.n	*	7 11 19 37 57 58	49	12, 16, …	12, 23, 1, 0, 1	i, j, r
12-6.o	*	7 11 19 29 30 37	49	12, 20, …	12, 23, 1, 0, 1	i, l, s
12-6.p	*	7 11 13 19 37 57	50	13, 12, …	19, 12, 5, 2	g, h, j, p
12-6.q	*	7 11 13 19 35 53	48	14, 12, …	15, 14, 6, 0, 1	j, l, p, q
12-6.r	*	7 11 21 25 31 45	48	15, 10, …	21, 0, 15	o
12-6.s	*	7 11 19 29 30 35	43	15, 16, …	0, 30, 0, 0, 0, 1	q, s
12-6.t	*	7 11 13 19 21 57	48	16, 9, …	21, 3, 9, 3	n, o, p
12-6.u	*	7 11 13 19 21 46	48	16, 10, …	21, 3, 9, 3	r, p, o
12-6.v	*	7 11 13 14 19 53	48	18, 8, …	21, 8, 0, 6, 1	p, t

Design	csw #	Generators	d.f.	$w_4, w_5, w_6, \ldots$	Alias Length Pattern	E/O Proj.
11-5.a	1	7 11 29 45 51	55	4, 14, …	34, 9, 1	a, c, f
11-5.b	2	7 25 42 52 63	51	5, 10, …	25, 15	b
11-5.c	3	7 11 29 46 49	52	5, 12, …	28, 12, 1	a, b, d, e
11-5.d	4	7 11 21 46 56	50	6, 10, …	25, 12, 2	b, c, e, h
11-5.e	5	7 11 29 45 49	50	6, 12, 4, …	25, 12, 2	a, e, f
11-5.f	6	7 11 19 29 62	51	6, 12, 8, …	27, 12, 0, 1	c, j
11-5.g	7	7 11 21 38 57	48	7, 8, …	22, 12, 3	b, g
11-5.h	8	7 11 21 41 51	48	7, 9, …	22, 12, 3	b, e, g, h
11-5.i	*	7 11 19 29 45	48	7, 12, …	21, 15, 0, 1	d, e, f, i, j
11-5.j	*	7 11 19 37 57	46	8, 8, …	18, 15, 1, 1	e, g, i
11-5.k	9	7 11 13 30 49	49	8, 10, 4, …	28, 3, 7	c, e, k, l
11-5.l	*	7 11 19 29 37	46	8, 10, 4, …	18, 15, 1, 1	e, h, j
11-5.m	10	7 11 13 30 46	49	8, 14, …	28, 3, 7	f, l
11-5.n	*	7 11 21 25 63	45	9, 6, …	19, 9, 6	g
11-5.o	*	7 11 21 25 45	45	9, 7, …	19, 9, 6	g, h
11-5.p	*	7 11 13 19 53	45	10, 6, …	21, 6, 6, 1	g, h, i, k
11-5.q	*	7 11 19 29 35	42	10, 8, 0, …	10, 20, 0, 0, 1	i, j
11-5.r	*	7 11 13 19 46	45	10, 8, 4, …	21, 6, 6, 1	j

Design	csw #	Generators	d.f.	$w_4, w_5, w_6, \ldots$	Alias Length Pattern	E/O Proj.
11-5.s	*	7 11 19 29 30	42	10, 16, …	10, 20, 0, 0, 1	k
11-5.t	*	7 11 13 14 51	45	14, 4, …	27, 0, 0, 7	h, i, l
10-4.a	1	7 27 43 53	49	2, 8, …	33, 6	a, c
10-4.b	2	7 25 42 53	46	3, 6, …	27, 9	a, b
10-4.c	3	7 11 29 51	47	3, 7, …	30, 6, 1	a, e, f
10-4.d	4	7 11 29 46	47	3, 8, …	30, 6, 1	a, f
10-4.e	5	7 11 29 49	44	4, 6, …	24, 9, 1	a, b, c, d, f
10-4.f	6	7 11 29 45	44	4, 8, …	24, 9, 1	c, f
10-4.g	8	7 11 21 57	42	5, 4, …	21, 9, 2	b, d
10-4.h	9	7 11 21 45	42	5, 5, …	21, 9, 2	b, d, e, f
10-4.i	*	7 11 19 45	40	6, 4, …	17, 12, 0, 1	d, f
10-4.j	*	7 11 19 29	40	6, 8, …	17, 12, 0, 1	f
10-4.k	*	7 11 13 51	41	7, 3, …	24, 0, 7	d, e
10-4.l	*	7 11 13 30	41	7, 7, …	24, 0, 7	f
9-3.a	1	7 27 45	42	1, 4, …	30, 3	a, c
9-3.b	2	7 25 43	39	2, 3, …	24, 6	a, b, c
9-3.c	3	7 27 43	39	2, 4, …	24, 6	c
9-3.d	6	7 11 53	37	3, 2, …	21, 6, 1	b, c

Design	csw #	Generators	d.f.	$w_4, w_5, w_6, \ldots$	Alias Length Pattern	E/O Proj.
9-3.e	7	7 11 51	37	3, 3, …	21, 6, 1	c
9-3.f	8	7 11 29	37	3, 4, …	21, 6, 1	c
8-2.a	1	15 51	36	0, 2, 1, …	28	-
8-2.b	*	7 57	33	1, 1, …	22, 3	-
8-2.c	*	7 27	33	1, 2, …	22, 3	-

Appendix C: Catalog of Designs, $n = 128$

k = 8, Designs sorted based on word length pattern

Design	wlp ($w_4, \ldots$)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
8-1.1	0 0 0 0 1	1	28 0 0 0	36	28	1	1	1	1	55.0998	1
8-1.2	0 0 0 1 0	2	28 0 0 0	36	28	1	2	2	2	55.0998	2
8-1.3	0 0 1 0 0	3	28 0 0 0	36	28	1	3	3	3	55.0999	3
8-1.4	0 1 0 0 0	4	28 0 0 0	36	28	1	4	4	4	55.1007	4
8-1.5	1 0 0 0 0	5	22 3 0 0	33	22	2	5	5	5	55.1082	5

k = 8, Design generators

Design	Design Generators
8-1.1	127
8-1.2	63
8-1.3	121
8-1.4	15
8-1.5	7

k = 9, Designs sorted based on word length pattern

Design	wlp (w_4,...)						wlp rank	alp				df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
9-2.1	0	0	3	0	0	0	1	36	0	0	0	45	36	1	1	1	1	49.5901	1
9-2.2	0	1	1	1	0	0	2	36	0	0	0	45	36	1	2	2	2	49.5908	2
9-2.3	0	2	0	0	1	0	3	36	0	0	0	45	36	1	3	3	3	49.5915	3
9-2.4	0	2	1	0	0	0	4	36	0	0	0	45	36	1	4	4	4	49.5916	4
9-2.5	1	0	0	2	0	0	5	30	3	0	0	42	30	2	5	5	5	49.5974	5
9-2.6	1	0	1	0	1	0	6	30	3	0	0	42	30	2	6	6	6	49.5975	6
9-2.7	1	0	2	0	0	0	7	30	3	0	0	42	30	2	7	7	7	49.5976	7
9-2.8	1	1	0	0	0	1	8	30	3	0	0	42	30	2	8	8	8	49.5982	8
9-2.9	1	1	0	1	0	0	9	30	3	0	0	42	30	2	9	9	9	49.5982	9
9-2.10	1	2	0	0	0	0	10	30	3	0	0	42	30	2	10	10	10	49.5991	10
9-2.11	2	0	0	0	1	0	11	24	6	0	0	39	24	2	11	11	11	49.6049	11
9-2.12	2	0	1	0	0	0	12	24	6	0	0	39	24	2	12	12	12	49.6050	12
9-2.13	3	0	0	0	0	0	13	21	6	1	0	37	21	3	13	13	13	49.6125	13

k = 9, Design generators

Design	Design Generators
9-2.1	31 121
9-2.2	15 121
9-2.3	15 120
9-2.4	15 51
9-2.5	7 123
9-2.6	7 121
9-2.7	7 59
9-2.8	7 120
9-2.9	7 57
9-2.10	7 27
9-2.11	7 112
9-2.12	7 25
9-2.13	7 11

k = 10, Designs sorted based on word length pattern

Design	wlp(w_4,…)			wlp rank	alp					df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
10-3.1	0	3	3	1	45	0	0	0	0	55	45	1	1	1	1	44.6334	1
10-3.2	0	4	2	2	45	0	0	0	0	55	45	1	2	2	2	44.6340	2
10-3.3	1	0	6	3	39	3	0	0	0	52	39	2	3	3	3	44.6381	3
10-3.4a	1	2	2	4	39	3	0	0	0	52	39	2	4	4	4	44.6393	4
10-3.4b	1	2	2	4	39	3	0	0	0	52	39	2	4	4	4	44.6393	4
10-3.6	1	3	1	6	39	3	0	0	0	52	39	2	6	6	6	44.6400	6
10-3.7	1	3	2	7	39	3	0	0	0	52	39	2	7	7	7	44.6401	7
10-3.8	1	4	0	8	39	3	0	0	0	52	39	2	8	8	8	44.6407	8
10-3.9	1	4	1	9	39	3	0	0	0	52	39	2	9	9	9	44.6408	9
10-3.10	1	4	2	10	39	3	0	0	0	52	39	2	10	10	10	44.6408	10
10-3.11a	2	0	4	11	33	6	0	0	0	49	33	2	11	11	11	44.6448	11
10-3.11b	2	0	4	11	33	6	0	0	0	49	33	2	11	11	11	44.6448	11
10-3.13	2	1	1	13	33	6	0	0	0	49	33	2	13	13	13	44.6453	13
10-3.14	2	2	0	14	33	6	0	0	0	49	33	2	14	14	14	44.6460	14
10-3.15	2	2	1	15	33	6	0	0	0	49	33	2	15	15	15	44.6461	15
10-3.16	2	3	1	16	33	6	0	0	0	49	33	2	16	16	16	44.6468	16
10-3.17	2	4	0	17	33	6	0	0	0	49	33	2	17	17	17	44.6475	17
10-3.18	3	0	0	18	30	6	1	0	0	47	30	3	18	18	21	44.6513	18
10-3.19	3	0	2	19	30	6	1	0	0	47	30	3	19	19	22	44.6514	19
10-3.20	3	0	2	19	27	9	0	0	0	46	27	2	26	26	18	44.6514	19

k = 10, Designs sorted based on degrees of freedom used

Design	wlp(w_4,…)			wlp rank	alp					df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
10-3.1	0	3	3	1	45	0	0	0	0	55	45	1	1	1	1	44.6334	1
10-3.2	0	4	2	2	45	0	0	0	0	55	45	1	2	2	2	44.6340	2
10-3.3	1	0	6	3	39	3	0	0	0	52	39	2	3	3	3	44.6381	3
10-3.4b	1	2	2	4	39	3	0	0	0	52	39	2	4	4	4	44.6393	4
10-3.4a	1	2	2	4	39	3	0	0	0	52	39	2	4	4	4	44.6393	4
10-3.6	1	3	1	6	39	3	0	0	0	52	39	2	6	6	6	44.6400	6
10-3.7	1	3	2	7	39	3	0	0	0	52	39	2	7	7	7	44.6401	7
10-3.8	1	4	0	8	39	3	0	0	0	52	39	2	8	8	8	44.6407	8
10-3.9	1	4	1	9	39	3	0	0	0	52	39	2	9	9	9	44.6408	9
10-3.10	1	4	2	10	39	3	0	0	0	52	39	2	10	10	10	44.6408	10
10-3.11b	2	0	4	11	33	6	0	0	0	49	33	2	11	11	11	44.6448	11
10-3.11a	2	0	4	11	33	6	0	0	0	49	33	2	11	11	11	44.6448	11
10-3.13	2	1	1	13	33	6	0	0	0	49	33	2	13	13	13	44.6453	13
10-3.14	2	2	0	14	33	6	0	0	0	49	33	2	14	14	14	44.6460	14
10-3.15	2	2	1	15	33	6	0	0	0	49	33	2	15	15	15	44.6461	15
10-3.16	2	3	1	16	33	6	0	0	0	49	33	2	16	16	16	44.6468	16
10-3.17	2	4	0	17	33	6	0	0	0	49	33	2	17	17	17	44.6475	17
10-3.18	3	0	0	18	30	6	1	0	0	47	30	3	18	18	21	44.6513	18
10-3.19	3	0	2	19	30	6	1	0	0	47	30	3	19	19	22	44.6514	19
10-3.21	3	0	3	21	30	6	1	0	0	47	30	3	20	20	23	44.6515	21

k = 10, Designs sorted based on the number of clear two-factor interactions

Design	wlp(w_4,…)			wlp rank	alp					df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
10-3.1	0	3	3	1	45	0	0	0	0	55	45	1	1	1	1	44.6334	1
10-3.2	0	4	2	2	45	0	0	0	0	55	45	1	2	2	2	44.6340	2
10-3.3	1	0	6	3	39	3	0	0	0	52	39	2	3	3	3	44.6381	3
10-3.4a	1	2	2	4	39	3	0	0	0	52	39	2	4	4	4	44.6393	4
10-3.4b	1	2	2	4	39	3	0	0	0	52	39	2	4	4	4	44.6393	4
10-3.6	1	3	1	6	39	3	0	0	0	52	39	2	6	6	6	44.6400	6
10-3.7	1	3	2	7	39	3	0	0	0	52	39	2	7	7	7	44.6401	7
10-3.8	1	4	0	8	39	3	0	0	0	52	39	2	8	8	8	44.6407	8
10-3.9	1	4	1	9	39	3	0	0	0	52	39	2	9	9	9	44.6408	9
10-3.10	1	4	2	10	39	3	0	0	0	52	39	2	10	10	10	44.6408	10
10-3.11a	2	0	4	11	33	6	0	0	0	49	33	2	11	11	11	44.6448	11
10-3.11b	2	0	4	11	33	6	0	0	0	49	33	2	11	11	11	44.6448	11
10-3.13	2	1	1	13	33	6	0	0	0	49	33	2	13	13	13	44.6453	13
10-3.14	2	2	0	14	33	6	0	0	0	49	33	2	14	14	14	44.6460	14
10-3.15	2	2	1	15	33	6	0	0	0	49	33	2	15	15	15	44.6461	15
10-3.16	2	3	1	16	33	6	0	0	0	49	33	2	16	16	16	44.6468	16
10-3.17	2	4	0	17	33	6	0	0	0	49	33	2	17	17	17	44.6475	17
10-3.18	3	0	0	18	30	6	1	0	0	47	30	3	18	18	21	44.6513	18
10-3.19	3	0	2	19	30	6	1	0	0	47	30	3	19	19	22	44.6514	19
10-3.21	3	0	3	21	30	6	1	0	0	47	30	3	20	20	23	44.6515	21

k = 10, Designs sorted based on minimizing Lmax

Design	wlp(w_4,…)			wlp rank	alp					df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
10-3.1	0	3	3	1	45	0	0	0	0	55	45	1	1	1	1	44.6334	1
10-3.2	0	4	2	2	45	0	0	0	0	55	45	1	2	2	2	44.6340	4
10-3.3	1	0	6	3	39	3	0	0	0	52	39	2	3	3	3	44.6381	3
10-3.4b	1	2	2	4	39	3	0	0	0	52	39	2	4	4	4	44.6393	5
10-3.4a	1	2	2	4	39	3	0	0	0	52	39	2	4	4	4	44.6393	4
10-3.6	1	3	1	6	39	3	0	0	0	52	39	2	6	6	6	44.6400	6
10-3.7	1	3	2	7	39	3	0	0	0	52	39	2	7	7	7	44.6401	7
10-3.8	1	4	0	8	39	3	0	0	0	52	39	2	8	8	8	44.6407	8
10-3.9	1	4	1	9	39	3	0	0	0	52	39	2	9	9	9	44.6408	9
10-3.10	1	4	2	10	39	3	0	0	0	52	39	2	10	10	10	44.6408	10
10-3.11b	2	0	4	11	33	6	0	0	0	49	33	2	11	11	11	44.6448	11
10-3.11a	2	0	4	11	33	6	0	0	0	49	33	2	11	11	11	44.6448	11
10-3.13	2	1	1	13	33	6	0	0	0	49	33	2	13	13	13	44.6453	13
10-3.14	2	2	0	14	33	6	0	0	0	49	33	2	14	14	14	44.6460	14
10-3.15	2	2	1	15	33	6	0	0	0	49	33	2	15	15	15	44.6461	15
10-3.16	2	3	1	16	33	6	0	0	0	49	33	2	16	16	16	44.6468	16
10-3.17	2	4	0	17	33	6	0	0	0	49	33	2	17	17	17	44.6475	17
10-3.20	3	0	2	19	27	9	0	0	0	46	27	2	26	26	18	44.6514	19
10-3.22	3	0	3	21	27	9	0	0	0	46	27	2	27	27	19	44.6515	21
10-3.24	3	0	4	23	27	9	0	0	0	46	27	2	28	28	20	44.6516	23

k = 10, Design generators

Design	Design Generators		
10-3.1	15	51	121
10-3.2	15	51	120
10-3.3	7	59	93
10-3.4a	7	27	109
10-3.4b	7	57	90
10-3.6	7	27	121
10-3.7	7	27	120
10-3.8	7	27	101
10-3.9	7	27	99
10-3.10	7	27	45
10-3.11a	7	26	121
10-3.11b	7	59	112
10-3.13	7	25	106
10-3.14	7	27	112
10-3.15	7	25	120
10-3.16	7	25	43
10-3.17	7	51	112
10-3.18	7	11	125
10-3.19	7	121	122
10-3.20	7	112	121
10-3.21	7	11	115
10-3.22	7	25	97
10-3.24	7	25	42

k = 11, Designs sorted based on word length pattern

Design	wlp(w_4,…)			wlp rank	alp					df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
11-4.1	0	6	6	1	55	0	0	0	0	66	55	1	1	1	1	40.1723	1
11-4.2	1	4	6	2	49	3	0	0	0	63	49	2	2	2	2	40.1771	2
11-4.3	1	5	6	3	49	3	0	0	0	63	49	2	3	3	3	40.1778	3
11-4.4	1	6	4	4	49	3	0	0	0	63	49	2	4	4	4	40.1783	4
11-4.5	1	6	5	5	49	3	0	0	0	63	49	2	5	5	5	40.1784	5
11-4.6	1	6	6	6	49	3	0	0	0	63	49	2	6	6	6	40.1784	6
11-4.7	1	7	4	7	49	3	0	0	0	63	49	2	7	7	7	40.1789	7
11-4.8	2	0	12	8	43	6	0	0	0	60	43	2	8	8	8	40.1809	8
11-4.9a	2	4	4	9	43	6	0	0	0	60	43	2	9	9	9	40.1831	9
11-4.9b	2	4	4	9	43	6	0	0	0	60	43	2	9	9	9	40.1831	9
11-4.9c	2	4	4	9	43	6	0	0	0	60	43	2	9	9	9	40.1831	9
11-4.12	2	5	4	12	43	6	0	0	0	60	43	2	12	12	12	40.1837	12
11-4.13a	2	6	2	13	43	6	0	0	0	60	43	2	13	13	13	40.1843	13
11-4.13b	2	6	2	13	43	6	0	0	0	60	43	2	13	13	13	40.1843	13
11-4.15	2	6	3	15	43	6	0	0	0	60	43	2	15	15	15	40.1843	15
11-4.16	2	6	4	16	43	6	0	0	0	60	43	2	16	16	16	40.1844	16
11-4.17	2	8	4	17	43	6	0	0	0	60	43	2	17	17	17	40.1857	17
11-4.18	3	0	10	18	37	9	0	0	0	57	37	2	32	32	18	40.1869	18
11-4.19	3	0	11	19	40	6	1	0	0	58	40	3	18	18	31	40.1870	19
11-4.20	3	2	4	20	37	9	0	0	0	57	37	2	33	33	19	40.1878	20

k = 11, Designs sorted based on degrees of freedom used

Design	wlp(w_4,...)			wlp rank	alp					df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
11-4.1	0	6	6	1	55	0	0	0	0	66	55	1	1	1	1	40.1723	1
11-4.2	1	4	6	2	49	3	0	0	0	63	49	2	2	2	2	40.1771	2
11-4.3	1	5	6	3	49	3	0	0	0	63	49	2	3	3	3	40.1778	3
11-4.4	1	6	4	4	49	3	0	0	0	63	49	2	4	4	4	40.1783	4
11-4.5	1	6	5	5	49	3	0	0	0	63	49	2	5	5	5	40.1784	5
11-4.6	1	6	6	6	49	3	0	0	0	63	49	2	6	6	6	40.1784	6
11-4.7	1	7	4	7	49	3	0	0	0	63	49	2	7	7	7	40.1789	7
11-4.8	2	0	12	8	43	6	0	0	0	60	43	2	8	8	8	40.1809	8

k = 11, Designs sorted based on the number of clear two-factor interactions

Design	wlp(w_4,...)			wlp rank	alp					df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
11-4.1	0	6	6	1	55	0	0	0	0	66	55	1	1	1	1	40.1723	1
11-4.2	1	4	6	2	49	3	0	0	0	63	49	2	2	2	2	40.1771	2
11-4.3	1	5	6	3	49	3	0	0	0	63	49	2	3	3	3	40.1778	3
11-4.4	1	6	4	4	49	3	0	0	0	63	49	2	4	4	4	40.1783	4
11-4.5	1	6	5	5	49	3	0	0	0	63	49	2	5	5	5	40.1784	5
11-4.6	1	6	6	6	49	3	0	0	0	63	49	2	6	6	6	40.1784	6
11-4.7	1	7	4	7	49	3	0	0	0	63	49	2	7	7	7	40.1789	7
11-4.8	2	0	12	8	43	6	0	0	0	60	43	2	8	8	8	40.1809	8

k = 11, Designs sorted based on minimizing Lmax

Design	wlp (w_4,…)			wlp rank	alp					df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
11-4.1	0	6	6	1	55	0	0	0	0	66	55	1	1	1	1	40.1723	1
11-4.2	1	4	6	2	49	3	0	0	0	63	49	2	2	2	2	40.1771	2
11-4.3	1	5	6	3	49	3	0	0	0	63	49	2	3	3	3	40.1778	3
11-4.4	1	6	4	4	49	3	0	0	0	63	49	2	4	4	4	40.1783	4
11-4.5	1	6	5	5	49	3	0	0	0	63	49	2	5	5	5	40.1784	5
11-4.6	1	6	6	6	49	3	0	0	0	63	49	2	6	6	6	40.1784	6
11-4.7	1	7	4	7	49	3	0	0	0	63	49	2	7	7	7	40.1789	7
11-4.8	2	0	12	8	43	6	0	0	0	60	43	2	8	8	8	40.1809	8

k = 11, Design generators

Design	Design Generators			
11-4.1	15	51	85	120
11-4.2	7	57	90	108
11-4.3	7	27	45	120
11-4.4	7	27	45	121
11-4.5	7	27	45	85
11-4.6	7	27	45	78
11-4.7	7	27	61	120
11-4.8	7	59	93	112
11-4.9a	7	26	45	121
11-4.9b	7	27	45	112
11-4.9c	7	51	93	112
11-4.12	7	25	43	120
11-4.13a	7	27	60	121
11-4.13b	7	27	43	121
11-4.15	7	27	58	121
11-4.16	7	27	43	120
11-4.17	7	51	85	112
11-4.18	7	26	44	121
11-4.19	7	11	61	94
11-4.20	7	25	42	116

k = 12, Designs sorted based on word length pattern

Design	wlp(w_4,…)			wlp rank	alp						df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
12-5.1	1	8	12	1	60	3	0	0	0	0	75	60	2	1	1	1	36.1623	1
12-5.2	1	10	10	2	60	3	0	0	0	0	75	60	2	2	2	2	36.1633	2
12-5.3	1	10	11	3	60	3	0	0	0	0	75	60	2	3	3	3	36.1634	3
12-5.4	2	7	12	4	54	6	0	0	0	0	72	54	2	4	4	4	36.1672	4
12-5.5	2	8	10	5	54	6	0	0	0	0	72	54	2	5	5	5	36.1676	5
12-5.6	2	8	12	6	54	6	0	0	0	0	72	54	2	6	6	6	36.1677	6
12-5.7	2	9	9	7	54	6	0	0	0	0	72	54	2	7	7	7	36.1682	7
12-5.8a	2	10	8	8	54	6	0	0	0	0	72	54	2	8	8	8	36.1687	8
12-5.8b	2	10	8	8	54	6	0	0	0	0	72	54	2	8	8	8	36.1687	8
12-5.10	2	10	10	10	54	6	0	0	0	0	72	54	2	10	10	10	36.1688	10
12-5.11	2	11	8	11	54	6	0	0	0	0	72	54	2	11	11	11	36.1693	12
12-5.12	2	12	8	12	54	6	0	0	0	0	72	54	2	12	12	12	36.1699	13
12-5.13	3	0	24	13	48	9	0	0	0	0	69	48	2	21	21	13	36.1691	11
12-5.14	3	6	10	14	48	9	0	0	0	0	69	48	2	22	22	14	36.1719	14
12-5.15	3	6	11	15	51	6	1	0	0	0	70	51	3	13	13	44	36.1720	15
12-5.16	3	7	10	16	48	9	0	0	0	0	69	48	2	23	23	15	36.1725	16
12-5.17	3	8	7	17	51	6	1	0	0	0	70	51	3	14	14	45	36.1729	17
12-5.18a	3	8	7	17	48	9	0	0	0	0	69	48	2	24	24	16	36.1729	17
12-5.18b	3	8	7	17	48	9	0	0	0	0	69	48	2	24	24	16	36.1729	17
12-5.18c	3	8	7	17	48	9	0	0	0	0	69	48	2	24	24	16	36.1729	17

k = 12, Designs sorted based on degrees of freedom used

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
12-5.1	1 8 12	1	60 3 0 0 0 0	75	60	2	1	1	1	36.1623	1
12-5.2	1 10 10	2	60 3 0 0 0 0	75	60	2	2	2	2	36.1633	2
12-5.3	1 10 11	3	60 3 0 0 0 0	75	60	2	3	3	3	36.1634	3
12-5.4	2 7 12	4	54 6 0 0 0 0	72	54	2	4	4	4	36.1672	4
12-5.5	2 8 10	5	54 6 0 0 0 0	72	54	2	5	5	5	36.1676	5
12-5.6	2 8 12	6	54 6 0 0 0 0	72	54	2	6	6	6	36.1677	6
12-5.7	2 9 9	7	54 6 0 0 0 0	72	54	2	7	7	7	36.1682	7

k = 12, Designs sorted based on the number of clear two-factor interactions

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
12-5.1	1 8 12	1	60 3 0 0 0 0	75	60	2	1	1	1	36.1623	1
12-5.2	1 10 10	2	60 3 0 0 0 0	75	60	2	2	2	2	36.1633	2
12-5.3	1 10 11	3	60 3 0 0 0 0	75	60	2	3	3	3	36.1634	3
12-5.4	2 7 12	4	54 6 0 0 0 0	72	54	2	4	4	4	36.1672	4
12-5.5	2 8 10	5	54 6 0 0 0 0	72	54	2	5	5	5	36.1676	5
12-5.6	2 8 12	6	54 6 0 0 0 0	72	54	2	6	6	6	36.1677	6
12-5.7	2 9 9	7	54 6 0 0 0 0	72	54	2	7	7	7	36.1682	7

k = 12, Designs sorted based on minimizing Lmax

Design	wlp(w_4,...)			wlp rank	alp						df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
12-5.1	1	8	12	1	60	3	0	0	0	0	75	60	2	1	1	1	36.1623	1
12-5.2	1	10	10	2	60	3	0	0	0	0	75	60	2	2	2	2	36.1633	2
12-5.3	1	10	11	3	60	3	0	0	0	0	75	60	2	3	3	3	36.1634	3
12-5.4	2	7	12	4	54	6	0	0	0	0	72	54	2	4	4	4	36.1672	4
12-5.5	2	8	10	5	54	6	0	0	0	0	72	54	2	5	5	5	36.1676	5
12-5.6	2	8	12	6	54	6	0	0	0	0	72	54	2	6	6	6	36.1677	6
12-5.7	2	9	9	7	54	6	0	0	0	0	72	54	2	7	7	7	36.1682	7

k = 12, Design generators

Design	Design Generators				
12-5.1	7	57	90	108	119
12-5.2	7	27	45	78	121
12-5.3	7	27	45	86	120
12-5.4	7	27	45	78	120
12-5.5	7	27	45	94	112
12-5.6	7	27	43	77	120
12-5.7	7	25	43	77	120
12-5.8a	7	25	43	85	120
12-5.8b	7	27	43	85	120
12-5.10	7	27	43	53	120
12-5.11	7	27	45	62	120
12-5.12	7	27	43	61	120
12-5.13	7	59	93	110	112
12-5.14	7	26	44	78	121
12-5.15	7	11	53	86	120
12-5.16	7	25	42	77	120
12-5.17	7	29	46	121	122
12-5.18a	7	27	45	112	121
12-5.18b	7	26	45	77	121
12-5.18c	7	26	45	86	121

k = 13, Designs sorted based on word length pattern

Design	wlp(w_4,…)	wlp rank	alp						df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
13-6.1	2 16 18	1	66	6	0	0	0	0	85	66	2	1	1	1	32.5558	1
13-6.2	2 16 20	2	66	6	0	0	0	0	85	66	2	2	2	2	32.5559	2
13-6.3	3 12 24	3	60	9	0	0	0	0	82	60	2	4	4	3	32.5589	3
13-6.4	3 14 17	4	60	9	0	0	0	0	82	60	2	5	5	4	32.5596	4
13-6.5	3 14 18	5	60	9	0	0	0	0	82	60	2	6	6	5	32.5597	5
13-6.6	3 15 15	6	63	6	1	0	0	0	83	63	3	3	3	45	32.5600	6
13-6.7a	3 15 17	7	60	9	0	0	0	0	82	60	2	7	7	6	32.5601	7
13-6.7b	3 15 17	7	60	9	0	0	0	0	82	60	2	7	7	6	32.5601	7
13-6.9	3 16 15	9	60	9	0	0	0	0	82	60	2	9	9	8	32.5606	9
13-6.10	3 16 16	10	60	9	0	0	0	0	82	60	2	10	10	9	32.5606	10
13-6.11	3 17 15	11	60	9	0	0	0	0	82	60	2	11	11	10	32.5611	11
13-6.12	4 10 22	12	57	9	1	0	0	0	80	57	3	12	12	46	32.5627	12
13-6.13	4 12 16	13	54	12	0	0	0	0	79	54	2	29	30	11	32.5634	13
13-6.14	4 12 17	14	57	9	1	0	0	0	80	57	3	13	13	47	32.5635	14
13-6.15	4 12 18	15	57	9	1	0	0	0	80	57	3	14	14	48	32.5635	15
13-6.16	4 12 22	16	57	9	1	0	0	0	80	57	3	15	15	49	32.5637	16
13-6.17	4 13 16	17	54	12	0	0	0	0	79	54	2	30	31	12	32.5640	17
13-6.18	4 14 14	18	57	9	1	0	0	0	80	57	3	16	16	50	32.5644	19
13-6.19	4 14 14	18	54	12	0	0	0	0	79	54	2	31	32	13	32.5644	18
13-6.20	4 14 15	20	54	12	0	0	0	0	79	54	2	32	33	14	32.5644	20

k = 13, Designs sorted based on degrees of freedom used

Design	wlp(w_4,...)	wlp rank	alp						df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
13-6.1	2 16 18	1	66	6	0	0	0	0	85	66	2	1	1	1	32.5558	1
13-6.2	2 16 20	2	66	6	0	0	0	0	85	66	2	2	2	2	32.5559	2
13-6.6	3 15 15	6	63	6	1	0	0	0	83	63	3	3	3	45	32.5600	6
13-6.3	3 12 24	3	60	9	0	0	0	0	82	60	2	4	4	3	32.5589	3
13-6.4	3 14 17	4	60	9	0	0	0	0	82	60	2	5	5	4	32.5596	4
13-6.5	3 14 18	5	60	9	0	0	0	0	82	60	2	6	6	5	32.5597	5
13-6.7b	3 15 17	7	60	9	0	0	0	0	82	60	2	7	7	6	32.5601	7
13-6.7a	3 15 17	7	60	9	0	0	0	0	82	60	2	7	7	6	32.5601	7
13-6.9	3 16 15	9	60	9	0	0	0	0	82	60	2	9	9	8	32.5606	9
13-6.10	3 16 16	10	60	9	0	0	0	0	82	60	2	10	10	9	32.5606	10

k = 13, Designs sorted based on the number of clear two-factor interactions

Design	wlp(w_4,...)	wlp rank	alp						df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
13-6.1	2 16 18	1	66	6	0	0	0	0	85	66	2	1	1	1	32.5558	1
13-6.2	2 16 20	2	66	6	0	0	0	0	85	66	2	2	2	2	32.5559	2
13-6.6	3 15 15	6	63	6	1	0	0	0	83	63	3	3	3	45	32.5600	6
13-6.3	3 12 24	3	60	9	0	0	0	0	82	60	2	4	4	3	32.5589	3
13-6.4	3 14 17	4	60	9	0	0	0	0	82	60	2	5	5	4	32.5596	4
13-6.5	3 14 18	5	60	9	0	0	0	0	82	60	2	6	6	5	32.5597	5
13-6.7a	3 15 17	7	60	9	0	0	0	0	82	60	2	7	7	6	32.5601	7
13-6.7b	3 15 17	7	60	9	0	0	0	0	82	60	2	7	7	6	32.5601	7
13-6.9	3 16 15	9	60	9	0	0	0	0	82	60	2	9	9	8	32.5606	9
13-6.10	3 16 16	10	60	9	0	0	0	0	82	60	2	10	10	9	32.5606	10

k = 13, Designs sorted based on minimizing Lmax

Design	wlp(w_4,…)	wlp rank	alp						df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
13-6.1	2 16 18	1	66	6	0	0	0	0	85	66	2	1	1	1	32.5558	1
13-6.2	2 16 20	2	66	6	0	0	0	0	85	66	2	2	2	2	32.5559	2
13-6.3	3 12 24	3	60	9	0	0	0	0	82	60	2	4	4	3	32.5589	3
13-6.4	3 14 17	4	60	9	0	0	0	0	82	60	2	5	5	4	32.5596	4
13-6.5	3 14 18	5	60	9	0	0	0	0	82	60	2	6	6	5	32.5597	5
13-6.7b	3 15 17	7	60	9	0	0	0	0	82	60	2	7	7	6	32.5601	7
13-6.7a	3 15 17	7	60	9	0	0	0	0	82	60	2	7	7	6	32.5601	7
13-6.9	3 16 15	9	60	9	0	0	0	0	82	60	2	9	9	8	32.5606	9
13-6.10	3 16 16	10	60	9	0	0	0	0	82	60	2	10	10	9	32.5606	10
13-6.11	3 17 15	11	60	9	0	0	0	0	82	60	2	11	11	10	32.5611	11

k = 13, Design generators

Design	Design Generators					
13-6.1	7	27	43	85	102	120
13-6.2	7	27	43	53	78	120
13-6.3	7	27	43	77	117	120
13-6.4	7	25	43	77	118	120
13-6.5	7	25	42	77	118	120
13-6.6	7	27	45	78	121	122
13-6.7a	7	25	42	53	78	120
13-6.7b	7	25	43	75	117	120
13-6.9	7	25	43	77	110	120
13-6.10	7	27	43	61	77	120
13-6.11	7	25	43	75	109	120
13-6.12	7	11	53	85	110	120
13-6.13	7	26	44	78	119	121
13-6.14	7	11	49	85	110	120
13-6.15	7	11	53	85	102	120
13-6.16	7	27	29	46	78	120
13-6.17	7	25	42	53	86	120
13-6.18	7	27	43	85	110	120
13-6.19	7	25	43	53	95	120
13-6.20	7	25	42	77	94	120

k = 14, Designs sorted based on word length pattern

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
14-7.1	3 24 36	1	73 9 0 0 0 0 0	96	73	2	1	1	1	29.3097	1
14-7.2	4 24 30	2	67 12 0 0 0 0 0	93	67	2	2	3	2	29.3138	2
14-7.3	5 22 30	3	64 12 1 0 0 0 0	91	64	3	3	4	33	29.3173	3
14-7.4	5 22 30	3	61 15 0 0 0 0 0	90	61	2	10	12	3	29.3173	3
14-7.5	5 23 27	5	64 12 1 0 0 0 0	91	64	3	4	5	34	29.3177	5
14-7.6a	5 23 27	5	61 15 0 0 0 0 0	90	61	2	11	13	4	29.3177	5
14-7.6b	5 23 27	5	61 15 0 0 0 0 0	90	61	2	11	13	4	29.3177	5
14-7.8a	5 24 26	8	64 12 1 0 0 0 0	91	64	3	5	6	35	29.3181	9
14-7.8b	5 24 26	8	64 12 1 0 0 0 0	91	64	3	5	6	35	29.3181	9
14-7.10a	5 24 26	8	61 15 0 0 0 0 0	90	61	2	13	15	6	29.3181	8
14-7.10b	5 24 26	8	61 15 0 0 0 0 0	90	61	2	13	15	6	29.3181	8
14-7.12	5 24 28	12	64 12 1 0 0 0 0	91	64	3	7	8	37	29.3182	12
14-7.13	5 26 26	13	64 12 1 0 0 0 0	91	64	3	8	9	38	29.3190	13
14-7.14	6 17 40	14	61 12 2 0 0 0 0	89	61	3	15	17	39	29.3198	14
14-7.15	6 20 28	15	61 12 2 0 0 0 0	89	61	3	16	18	40	29.3207	15
14-7.16	6 20 28	15	58 15 1 0 0 0 0	88	58	3	31	33	41	29.3207	15
14-7.17a	6 20 28	15	55 18 0 0 0 0 0	87	55	2	51	69	8	29.3207	15
14-7.17b	6 20 28	15	55 18 0 0 0 0 0	87	55	2	51	69	8	29.3207	15
14-7.19a	6 20 30	19	55 18 0 0 0 0 0	87	55	2	53	71	10	29.3208	19
14-7.19b	6 20 30	19	55 18 0 0 0 0 0	87	55	2	53	71	10	29.3208	19

k = 14, Designs sorted based on degrees of freedom used

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
14-7.1	3 24 36	1	73 9 0 0 0 0 0	96	73	2	1	1	1	29.3097	1
14-7.2	4 24 30	2	67 12 0 0 0 0 0	93	67	2	2	3	2	29.3138	2
14-7.3	5 22 30	3	64 12 1 0 0 0 0	91	64	3	3	4	33	29.3173	3
14-7.5	5 23 27	5	64 12 1 0 0 0 0	91	64	3	4	5	34	29.3177	5
14-7.8b	5 24 26	8	64 12 1 0 0 0 0	91	64	3	5	6	35	29.3181	9
14-7.8a	5 24 26	8	64 12 1 0 0 0 0	91	64	3	5	6	35	29.3181	9
14-7.12	5 24 28	12	64 12 1 0 0 0 0	91	64	3	7	8	37	29.3182	12
14-7.13	5 26 26	13	64 12 1 0 0 0 0	91	64	3	8	9	38	29.3190	13
14-7.94	7 21 21	94	70 0 7 0 0 0 0	91	70	3	9	2	98	29.3253	93
14-7.4	5 22 30	3	61 15 0 0 0 0 0	90	61	2	10	12	3	29.3173	3

k = 14, Designs sorted based on the number of clear two-factor interactions

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
14-7.1	3 24 36	1	73 9 0 0 0 0 0	96	73	2	1	1	1	29.3097	1
14-7.94	7 21 21	94	70 0 7 0 0 0 0	91	70	3	9	2	98	29.3253	93
14-7.2	4 24 30	2	67 12 0 0 0 0 0	93	67	2	2	3	2	29.3138	2
14-7.3	5 22 30	3	64 12 1 0 0 0 0	91	64	3	3	4	33	29.3173	3
14-7.5	5 23 27	5	64 12 1 0 0 0 0	91	64	3	4	5	34	29.3177	5
14-7.8a	5 24 26	8	64 12 1 0 0 0 0	91	64	3	5	6	35	29.3181	9
14-7.8b	5 24 26	8	64 12 1 0 0 0 0	91	64	3	5	6	35	29.3181	9
14-7.12	5 24 28	12	64 12 1 0 0 0 0	91	64	3	7	8	37	29.3182	12
14-7.13	5 26 26	13	64 12 1 0 0 0 0	91	64	3	8	9	38	29.3190	13
14-7.216	8 21 18	216	64 3 7 0 0 0 0	88	64	3	50	10	204	29.3296	216

k = 14, Designs sorted based on minimizing Lmax

Design	wlp(w_4,...)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
14-7.1	3 24 36	1	73 9 0 0 0 0 0	96	73	2	1	1	1	29.3097	1
14-7.2	4 24 30	2	67 12 0 0 0 0 0	93	67	2	2	3	2	29.3138	2
14-7.4	5 22 30	3	61 15 0 0 0 0 0	90	61	2	10	12	3	29.3173	3
14-7.6b	5 23 27	5	61 15 0 0 0 0 0	90	61	2	11	13	4	29.3177	5
14-7.6a	5 23 27	5	61 15 0 0 0 0 0	90	61	2	11	13	4	29.3177	5
14-7.10b	5 24 26	8	61 15 0 0 0 0 0	90	61	2	13	15	6	29.3181	8
14-7.10a	5 24 26	8	61 15 0 0 0 0 0	90	61	2	13	15	6	29.3181	8

k = 14, Design generators

Design	Design Generators						
14-7.1	7	27	43	53	78	118	120
14-7.2	7	25	42	53	78	118	120
14-7.3	7	11	29	53	94	102	120
14-7.4	7	25	42	53	78	83	120
14-7.5	7	11	29	49	82	102	120
14-7.6a	7	25	42	53	75	87	120
14-7.6b	7	25	42	53	75	118	120
14-7.8a	7	11	29	46	83	102	120
14-7.8b	7	11	29	49	94	102	120
14-7.10a	7	25	42	53	78	93	120
14-7.10b	7	25	42	60	77	118	120
14-7.12	7	11	29	45	78	118	120
14-7.13	7	11	29	45	51	78	120
14-7.14	7	27	29	46	78	118	120
14-7.15	7	11	25	53	85	110	120
14-7.16	7	11	29	53	86	102	120
14-7.17a	7	25	42	53	76	86	120
14-7.17b	7	25	42	53	86	102	120
14-7.19a	7	25	42	53	83	92	120
14-7.19b	7	25	42	61	78	118	120
14-7.94	7	27	45	78	121	122	124
14-7.216	7	27	43	85	94	101	120

k = 15, Designs sorted based on word length pattern

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
15-8.1	7 32 52	1	63 21 0 0 0 0 0	99	63	2	2	11	1	26.3993	1
15-8.2	7 34 46	2	63 21 0 0 0 0 0	99	63	2	3	12	2	26.3999	2
15-8.3	7 38 44	3	69 15 2 0 0 0 0	101	69	3	1	3	13	26.4015	3
15-8.4	8 31 50	4	57 24 0 0 0 0 0	96	57	2	28	73	3	26.4028	4
15-8.5	8 32 44	5	57 24 0 0 0 0 0	96	57	2	29	74	4	26.4030	5
15-8.6	8 32 49	6	63 18 2 0 0 0 0	98	63	3	8	13	14	26.4032	6
15-8.7	8 32 49	6	57 24 0 0 0 0 0	96	57	2	30	75	5	26.4032	7
15-8.8	8 33 44	8	60 21 1 0 0 0 0	97	60	3	13	28	15	26.4034	8
15-8.9	8 33 44	9	66 15 3 0 0 0 0	99	66	3	4	4	16	26.4034	8
15-8.10	8 33 44	9	60 21 1 0 0 0 0	97	60	3	14	29	17	26.4034	8
15-8.11	8 33 44	11	60 21 1 0 0 0 0	97	60	3	15	30	18	26.4034	8
15-8.12	8 33 44	11	57 24 0 0 0 0 0	96	57	2	31	76	6	26.4034	8
15-8.13	8 34 42	13	63 18 2 0 0 0 0	98	63	3	9	14	19	26.4037	13
15-8.14a	8 34 42	13	60 21 1 0 0 0 0	97	60	3	16	31	20	26.4037	13
15-8.14b	8 34 42	13	60 21 1 0 0 0 0	97	60	3	16	31	20	26.4037	13
15-8.14c	8 34 42	13	60 21 1 0 0 0 0	97	60	3	16	31	20	26.4037	13
15-8.17	8 34 43	17	60 21 1 0 0 0 0	97	60	3	19	34	23	26.4038	17
15-8.18	8 34 43	18	66 15 3 0 0 0 0	99	66	3	5	5	24	26.4038	17
15-8.19	8 34 46	19	60 21 1 0 0 0 0	97	60	3	20	34	25	26.4039	19
15-8.20	8 35 42	20	66 15 3 0 0 0 0	99	66	3	6	6	26	26.4041	20

k = 15, Designs sorted based on degrees of freedom used

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
15-8.3	7 38 44	3	69 15 2 0 0 0 0	101	69	3	1	3	13	26.4015	3
15-8.1	7 32 52	1	63 21 0 0 0 0 0	99	63	2	2	11	1	26.3993	1
15-8.2	7 34 46	2	63 21 0 0 0 0 0	99	63	2	3	12	2	26.3999	2
15-8.9	8 33 44	9	66 15 3 0 0 0 0	99	66	3	4	4	16	26.4034	8
15-8.18	8 34 43	18	66 15 3 0 0 0 0	99	66	3	5	5	24	26.4038	17
15-8.20	8 35 42	20	66 15 3 0 0 0 0	99	66	3	6	6	26	26.4041	20
15-8.1221	14 28 28	1221	77 0 0 7 0 0 0	99	77	4	7	1	1366	26.4245	1226
15-8.6	8 32 49	6	63 18 2 0 0 0 0	98	63	3	8	13	14	26.4032	6
15-8.13	8 34 42	13	63 18 2 0 0 0 0	98	63	3	9	14	19	26.4037	13
15-8.22b	8 36 41	22	63 18 2 0 0 0 0	98	63	3	10	16	28	26.4045	22

k = 15, Designs sorted based on the number of clear two-factor interactions

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
15-8.1221	14 28 28	1221	77 0 0 7 0 0 0	99	77	4	7	1	1366	26.4245	1226
15-8.1578	15 28 24	1578	71 3 0 7 0 0 0	96	71	4	57	2	1615	26.4284	1593
15-8.3	7 38 44	3	69 15 2 0 0 0 0	101	69	3	1	3	13	26.4015	3
15-8.9	8 33 44	9	66 15 3 0 0 0 0	99	66	3	4	4	16	26.4034	8
15-8.18	8 34 43	18	66 15 3 0 0 0 0	99	66	3	5	5	24	26.4038	17
15-8.20	8 35 42	20	66 15 3 0 0 0 0	99	66	3	6	6	26	26.4041	20
15-8.152	10 32 37	152	66 9 7 0 0 0 0	97	66	3	27	7	148	26.4106	153
15-8.303	11 30 36	303	65 9 6 1 0 0 0	96	65	4	53	8	933	26.4137	303
15-8.344	11 31 34	344	65 9 6 1 0 0 0	96	65	4	55	9	940	26.4141	352
15-8.358	11 32 34	358	65 9 6 1 0 0 0	96	65	4	56	10	944	26.4145	363

k = 15, Designs sorted based on minimizing Lmax

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
15-8.1	7 32 52	1	63 21 0 0 0 0 0	99	63	2	2	11	1	26.3993	1
15-8.2	7 34 46	2	63 21 0 0 0 0 0	99	63	2	3	12	2	26.3999	2
15-8.4	8 31 50	4	57 24 0 0 0 0 0	96	57	2	28	73	3	26.4028	4
15-8.5	8 32 44	5	57 24 0 0 0 0 0	96	57	2	29	74	4	26.4030	5
15-8.7	8 32 49	6	57 24 0 0 0 0 0	96	57	2	30	75	5	26.4032	7
15-8.12	8 33 44	11	57 24 0 0 0 0 0	96	57	2	31	76	6	26.4034	8
15-8.26	9 28 48	26	51 27 0 0 0 0 0	93	51	2	144	357	7	26.4054	25
15-8.31	9 30 46	27	51 27 0 0 0 0 0	93	51	2	145	358	8	26.4062	30
15-8.45	9 32 42	41	51 27 0 0 0 0 0	93	51	2	146	359	9	26.4069	41
15-8.214	11 20 60	214	39 33 0 0 0 0 0	87	39	2	831	1742	10	26.4104	149

k = 15, Design generators

Design	Design Generators							
15-8.1	7	25	42	53	78	83	111	120
15-8.2	7	25	42	53	75	87	116	120
15-8.3	7	11	29	45	51	78	118	120
15-8.4	7	25	42	53	62	78	83	120
15-8.5	7	25	42	53	75	87	108	120
15-8.6	7	11	29	46	53	83	107	120
15-8.7	7	25	42	53	62	78	92	120
15-8.8	7	11	29	45	62	81	98	120
15-8.9	7	11	25	45	50	86	110	120
15-8.10	7	11	29	46	49	82	102	120
15-8.11	7	11	29	46	49	82	109	120
15-8.12	7	25	42	52	63	77	91	120
15-8.13	7	11	25	45	55	86	100	120
15-8.14a	7	11	29	45	62	81	99	120
15-8.14b	7	11	29	46	49	83	102	120
15-8.14c	7	11	29	46	49	83	109	120
15-8.17	7	11	29	45	62	81	106	120
15-8.18	7	11	25	42	53	78	118	120
15-8.19	7	11	29	46	53	83	94	120
15-8.20	7	11	25	45	49	86	110	120
15-8.22b	7	11	29	45	51	78	86	120
15-8.26	7	25	42	52	77	86	107	120
15-8.31	7	25	42	52	63	77	86	120
15-8.45	7	25	42	52	63	77	107	120
15-8.152	7	11	13	30	49	82	101	120
15-8.214	7	25	42	52	77	86	119	120
15-8.303	7	11	19	25	45	77	118	120
15-8.344	7	11	19	25	45	86	100	120
15-8.358	7	11	19	25	45	77	110	120
15-8.1221	7	27	45	78	121	122	124	127
15-8.1578	7	27	43	85	94	101	110	120

k = 16, Designs sorted based on word length pattern

Design	wlp(w_4,...)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
16-9.1	10 48 72	1	60 30 0 0 0 0 0 0	106	60	2	2	24	1	23.7778	1
16-9.2	11 44 82	2	54 33 0 0 0 0 0 0	103	54	2	24	238	2	23.7802	2
16-9.3	11 47 72	3	57 30 1 0 0 0 0 0	104	57	3	12	102	6	23.7810	3
16-9.4	11 48 70	4	57 30 1 0 0 0 0 0	104	57	3	13	103	7	23.7813	4
16-9.5	11 50 66	5	60 27 2 0 0 0 0 0	105	60	3	3	25	8	23.7819	5
16-9.6	11 50 68	6	60 27 2 0 0 0 0 0	105	60	3	4	26	9	23.7819	6
16-9.7	11 52 66	7	60 27 2 0 0 0 0 0	105	60	3	5	27	10	23.7826	8
16-9.8	11 56 66	8	66 21 4 0 0 0 0 0	107	66	3	1	6	11	23.7842	16
16-9.9	12 40 80	9	48 36 0 0 0 0 0 0	100	48	2	168	968	3	23.7822	7
16-9.10	12 46 68	10	60 24 4 0 0 0 0 0	104	60	3	14	28	12	23.7840	9
16-9.11	12 46 68	10	57 27 3 0 0 0 0 0	103	57	3	25	104	13	23.7840	9
16-9.12a	12 46 68	10	54 30 2 0 0 0 0 0	102	54	3	50	239	14	23.7840	9
16-9.12b	12 46 68	10	54 30 2 0 0 0 0 0	102	54	3	50	239	14	23.7840	9
16-9.14a	12 46 69	14	54 30 2 0 0 0 0 0	102	54	3	52	241	16	23.7840	13
16-9.14b	12 46 69	14	54 30 2 0 0 0 0 0	102	54	3	52	241	16	23.7840	13
16-9.16	12 46 69	14	51 33 1 0 0 0 0 0	101	51	3	102	535	18	23.7840	13
16-9.17a	12 47 66	17	60 24 4 0 0 0 0 0	104	60	3	15	29	19	23.7843	17
16-9.17b	12 47 66	17	60 24 4 0 0 0 0 0	104	60	3	15	29	19	23.7843	17
16-9.19a	12 47 66	17	57 27 3 0 0 0 0 0	103	57	3	26	105	21	23.7843	17
16-9.19b	12 47 66	17	57 27 3 0 0 0 0 0	103	57	3	26	105	21	23.7843	17

k = 16, Designs sorted based on degrees of freedom used

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
16-9.8	11 56 66	8	66 21 4 0 0 0 0 0	107	66	3	1	6	11	23.7842	16
16-9.1	10 48 72	1	60 30 0 0 0 0 0 0	106	60	2	2	24	1	23.7778	1
16-9.5	11 50 66	5	60 27 2 0 0 0 0 0	105	60	3	3	25	8	23.7819	5
16-9.6	11 50 68	6	60 27 2 0 0 0 0 0	105	60	3	4	26	9	23.7819	6
16-9.7	11 52 66	7	60 27 2 0 0 0 0 0	105	60	3	5	27	10	23.7826	8
16-9.35	12 50 63	35	63 21 5 0 0 0 0 0	105	63	3	6	11	37	23.7854	37
16-9.39	12 52 63	39	63 21 5 0 0 0 0 0	105	63	3	7	12	41	23.7861	40
16-9.80	13 46 66	80	65 18 5 1 0 0 0 0	105	65	4	8	7	803	23.7875	80
16-9.90	13 47 64	90	65 18 5 1 0 0 0 0	105	65	4	9	8	806	23.7878	91

k = 16, Designs sorted based on the number of clear two-factor interactions

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
16-9.1413	17 43 56	1413	69 6 9 3 0 0 0 0	103	69	4	46	1	1551	23.8004	1446
16-9.2469	19 40 50	2469	69 11 0 6 1 0 0 0	103	69	5	47	2	4905	23.8062	2578
16-9.2499	19 41 48	2499	69 11 0 6 1 0 0 0	103	69	5	48	3	4911	23.8065	2647
16-9.2531	19 42 48	2531	69 11 0 6 1 0 0 0	103	69	5	49	4	4917	23.8069	2696
16-9.225	14 46 61	225	67 15 5 2 0 0 0 0	105	67	4	11	5	842	23.7909	232
16-9.8	11 56 66	8	66 21 4 0 0 0 0 0	107	66	3	1	6	11	23.7842	16
16-9.80	13 46 66	80	65 18 5 1 0 0 0 0	105	65	4	8	7	803	23.7875	80
16-9.90	13 47 64	90	65 18 5 1 0 0 0 0	105	65	4	9	8	806	23.7878	91

k = 16, Designs sorted based on minimizing Lmax

Design	wlp (w_4,...)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
16-9.1	10 48 72	1	60 30 0 0 0 0 0 0	106	60	2	2	24	1	23.7778	1
16-9.2	11 44 82	2	54 33 0 0 0 0 0 0	103	54	2	24	238	2	23.7802	2
16-9.9	12 40 80	9	48 36 0 0 0 0 0 0	100	48	2	168	968	3	23.7822	7
16-9.287	15 30 100	287	30 45 0 0 0 0 0 0	91	30	2	2383	5641	4	23.7897	142
16-9.2604	20 0 160	2604	0 60 0 0 0 0 0 0	76	0	2	6195	7485	5	23.7982	1042
16-9.3	11 47 72	3	57 30 1 0 0 0 0 0	104	57	3	12	102	6	23.7810	3
16-9.4	11 48 70	4	57 30 1 0 0 0 0 0	104	57	3	13	103	7	23.7813	4
16-9.5	11 50 66	5	60 27 2 0 0 0 0 0	105	60	3	3	25	8	23.7819	5
16-9.6	11 50 68	6	60 27 2 0 0 0 0 0	105	60	3	4	26	9	23.7819	6
16-9.7	11 52 66	7	60 27 2 0 0 0 0 0	105	60	3	5	27	10	23.7826	8

k = 16, Design generators

Design	Design Generators								
16-9.1	7	120	25	42	53	75	87	108	118
16-9.2	7	120	25	42	53	62	78	83	92
16-9.3	7	120	11	29	45	51	78	81	111
16-9.4	7	120	11	29	45	51	78	81	100
16-9.5	7	120	11	29	45	51	78	81	107
16-9.6	7	120	11	29	45	51	78	81	118
16-9.7	7	120	11	29	45	51	62	78	81
16-9.8	7	120	11	29	45	51	53	78	118
16-9.9	7	120	25	42	52	77	86	107	119
16-9.10	7	120	11	21	46	54	89	95	99
16-9.11	7	120	11	21	41	51	78	86	100
16-9.12a	7	120	11	29	45	49	78	86	106
16-9.12b	7	120	11	21	45	62	86	91	97
16-9.14a	7	120	11	29	45	53	78	81	98
16-9.14b	7	120	11	25	45	51	78	90	101
16-9.16	7	120	11	29	45	51	78	81	106
16-9.17a	7	120	11	21	45	86	91	97	103
16-9.17b	7	120	11	25	45	49	77	82	110
16-9.19a	7	120	11	21	41	51	78	93	100
16-9.19b	7	120	11	21	41	58	77	91	118
16-9.35	7	120	11	25	45	50	60	86	110
16-9.39	7	120	11	25	45	49	63	86	110
16-9.80	7	120	11	19	29	41	44	94	102
16-9.90	7	120	11	19	41	44	53	78	118
16-9.225	7	120	11	19	25	41	53	78	118
16-9.287	7	120	25	42	61	77	83	95	99
16-9.1413	7	120	11	19	25	28	45	77	110
16-9.2469	7	120	11	19	25	26	45	77	118
16-9.2499	7	120	11	19	25	26	45	86	100
16-9.2531	7	120	11	19	25	26	45	77	110
16-9.2604	7	121	112	26	44	59	79	94	109

k = 17, Designs sorted based on word length pattern

Design	wlp(w_4,...)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
17-10.1	15 60 130	1	46 45 0 0 0 0 0 0	108	46	2	53	1594	1	21.4231	1
17-10.2	15 66 110	2	52 39 2 0 0 0 0 0	110	52	3	6	390	3	21.4245	2
17-10.3	15 68 106	3	52 39 2 0 0 0 0 0	110	52	3	7	391	4	21.4251	3
17-10.4	15 72 102	4	58 33 4 0 0 0 0 0	112	58	3	1	62	5	21.4263	4
17-10.5	16 64 108	5	46 42 2 0 0 0 0 0	107	46	3	106	1594	6	21.4270	5
17-10.6	16 65 105	6	55 33 5 0 0 0 0 0	110	55	3	8	152	7	21.4273	6
17-10.7	16 65 105	6	52 36 4 0 0 0 0 0	109	52	3	22	392	8	21.4273	6
17-10.8	16 65 107	8	49 39 3 0 0 0 0 0	108	49	3	54	835	9	21.4273	8
17-10.9	16 66 102	9	55 33 5 0 0 0 0 0	110	55	3	9	153	10	21.4275	9
17-10.10	16 66 102	9	52 36 4 0 0 0 0 0	109	52	3	22	393	11	21.4275	9
17-10.11	16 67 101	11	55 33 5 0 0 0 0 0	110	55	3	10	154	12	21.4278	11
17-10.12	16 68 99	12	58 30 6 0 0 0 0 0	111	58	3	2	63	13	21.4281	12
17-10.13	16 68 100	13	55 33 5 0 0 0 0 0	110	55	3	11	155	14	21.4281	13
17-10.14	16 69 99	14	58 30 6 0 0 0 0 0	111	58	3	3	64	15	21.4284	14
17-10.15	16 69 99	14	55 33 5 0 0 0 0 0	110	55	3	12	156	16	21.4284	14
17-10.16	17 62 106	16	51 36 3 1 0 0 0 0	108	51	4	55	525	365	21.4295	16
17-10.17	17 62 108	17	49 36 5 0 0 0 0 0	107	49	3	107	836	17	21.4296	17
17-10.18	17 64 99	18	55 30 7 0 0 0 0 0	109	55	3	24	157	18	21.4300	18
17-10.19	17 64 100	19	51 36 3 1 0 0 0 0	108	51	4	56	526	366	21.4300	19
17-10.20	17 64 102	20	55 30 7 0 0 0 0 0	109	55	3	25	158	19	21.4301	20

k = 17, Designs sorted based on degrees of freedom used

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
17-10.4	15 72 102	4	58 33 4 0 0 0 0 0	112	58	3	1	62	5	21.4263	4
17-10.12	16 68 99	12	58 30 6 0 0 0 0 0	111	58	3	2	63	13	21.4281	12
17-10.14	16 69 99	14	58 30 6 0 0 0 0 0	111	58	3	3	64	15	21.4284	14
17-10.1042	21 62 92	1042	68 14 9 2 1 0 0 0	111	68	5	4	4	6454	21.4419	1091
17-10.2453	23 60 86	2453	68 19 0 5 2 0 0 0	111	68	5	5	5	6685	21.4475	2680
17-10.2	15 66 110	2	52 39 2 0 0 0 0 0	110	52	3	6	390	3	21.4245	2
17-10.3	15 68 106	3	52 39 2 0 0 0 0 0	110	52	3	7	391	4	21.4251	3
17-10.6	16 65 105	6	55 33 5 0 0 0 0 0	110	55	3	8	152	7	21.4273	6
17-10.9	16 66 102	9	55 33 5 0 0 0 0 0	110	55	3	9	153	10	21.4275	9
17-10.11	16 67 101	11	55 33 5 0 0 0 0 0	110	55	3	10	154	12	21.4278	11

k = 17, Designs sorted based on the number of clear two-factor interactions

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
17-10.5924	27 56 82	5924	75 3 8 4 3 0 0 0	110	75	5	21	1	7888	21.4589	6713
17-10.12633	39 44 86	12633	70 0 0 12 0 3 0 0	102	70	6	1412	2	13402	21.4938	13276
17-10.6792	28 55 77	6792	69 6 8 4 3 0 0 0	107	69	5	202	3	8264	21.4617	7580
17-10.1042	21 62 92	1042	68 14 9 2 1 0 0 0	111	68	5	4	4	6454	21.4419	1091
17-10.2453	23 60 86	2453	68 19 0 5 2 0 0 0	111	68	5	5	5	6685	21.4475	2680
17-10.6795a	28 55 79	6795	66 6 6 10 0 0 0 0	105	66	4	516	6	4750	21.4617	7626
17-10.6795b	28 55 79	6795	66 6 6 10 0 0 0 0	105	66	4	516	6	4750	21.4617	7626
17-10.7585a	29 52 76	7585	66 6 9 4 3 0 0 0	105	66	5	518	8	8654	21.4638	8165
17-10.7585b	29 52 76	7585	66 6 9 4 3 0 0 0	105	66	5	518	8	8653	21.4638	8165

k = 17, Designs sorted based on minimizing Lmax

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
17-10.1	15 60 130	1	46 45 0 0 0 0 0 0	108	46	2	53	1594	1	21.4231	1
17-10.315	20 40 160	315	16 60 0 0 0 0 0 0	93	16	2	6299	12479	2	21.4333	105
17-10.2	15 66 110	2	52 39 2 0 0 0 0 0	110	52	3	6	390	3	21.4245	2
17-10.3	15 68 106	3	52 39 2 0 0 0 0 0	110	52	3	7	391	4	21.4251	3
17-10.4	15 72 102	4	58 33 4 0 0 0 0 0	112	58	3	1	62	5	21.4263	4
17-10.5	16 64 108	5	46 42 2 0 0 0 0 0	107	46	3	106	1594	6	21.4270	5
17-10.6	16 65 105	6	55 33 5 0 0 0 0 0	110	55	3	8	152	7	21.4273	6
17-10.7	16 65 105	6	52 36 4 0 0 0 0 0	109	52	3	22	392	8	21.4273	6
17-10.8	16 65 107	8	49 39 3 0 0 0 0 0	108	49	3	54	835	9	21.4273	8
17-10.9	16 66 102	9	55 33 5 0 0 0 0 0	110	55	3	9	153	10	21.4275	9

k = 17, Design generators

Design	Design Generators									
17-10.1	7	25	42	53	62	78	83	92	99	120
17-10.2	7	11	29	45	51	78	81	100	118	120
17-10.3	7	11	29	45	51	62	78	81	100	120
17-10.4	7	11	25	45	51	62	78	84	90	120
17-10.5	7	11	29	45	51	78	81	106	118	120
17-10.6	7	11	21	45	62	86	91	97	103	120
17-10.7	7	11	21	41	58	77	91	110	118	120
17-10.8	7	11	25	45	51	62	78	84	101	120
17-10.9	7	11	21	38	57	76	83	111	118	120
17-10.10	7	11	25	45	51	77	87	98	118	120
17-10.11	7	11	21	41	51	63	78	93	100	120
17-10.12	7	11	21	45	59	78	86	97	103	120
17-10.13	7	11	21	38	57	77	83	110	118	120
17-10.14	7	11	21	45	54	83	93	97	103	120
17-10.15	7	11	21	45	51	62	78	86	97	120
17-10.16	7	11	19	41	53	74	85	110	118	120
17-10.17	7	11	21	41	54	58	79	86	101	120
17-10.18	7	11	21	38	57	73	83	108	118	120
17-10.19	7	11	19	41	53	78	82	109	118	120
17-10.20	7	11	21	41	50	63	78	84	101	120
17-10.315	7	25	42	61	77	83	95	99	108	120
17-10.1042	7	11	19	25	28	35	45	86	110	120
17-10.2453	7	11	19	25	26	41	53	78	118	120
17-10.5924	7	11	19	25	26	28	45	77	110	120
17-10.6792	7	11	13	19	25	26	46	85	100	120
17-10.6795a	7	11	13	19	21	25	46	78	98	120
17-10.6795b	7	11	13	19	21	25	46	78	118	120
17-10.7585a	7	11	13	19	25	26	53	85	110	120
17-10.7585b	7	11	13	19	25	26	54	86	110	120
17-10.7644a	7	11	13	19	25	26	46	78	118	120
17-10.12633	7	11	19	25	26	28	31	45	78	120

k = 18, Designs sorted based on word length pattern

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
18-11.1	20 80 200	1	33 60 0 0 0 0 0 0 0	111	33	2	209	10601	1	19.3048	1
18-11.2	20 92 160	2	45 48 4 0 0 0 0 0 0	115	45	3	7	1464	2	19.3074	2
18-11.3	21 95 148	3	54 36 9 0 0 0 0 0 0	117	54	3	1	124	3	19.3109	3
18-11.4	21 96 151	4	54 36 9 0 0 0 0 0 0	117	54	3	2	125	4	19.3112	4
18-11.5	22 86 162	5	42 45 7 0 0 0 0 0 0	112	42	3	91	2702	5	19.3114	5
18-11.6	22 90 150	6	51 36 10 0 0 0 0 0 0	115	51	3	8	260	6	19.3123	6
18-11.7	22 90 150	6	48 39 9 0 0 0 0 0 0	114	48	3	24	693	7	19.3123	6
18-11.8	22 92 146	8	51 36 10 0 0 0 0 0 0	115	51	3	9	261	8	19.3128	10
18-11.9	22 92 146	8	50 39 7 1 0 0 0 0 0	115	50	4	10	363	69	19.3128	10
18-11.10a	22 92 146	10	53 36 8 1 0 0 0 0 0	116	53	4	5	155	70	19.3128	8
18-11.10b	22 92 146	10	53 36 8 1 0 0 0 0 0	116	53	4	5	155	70	19.3128	8
18-11.12a	22 92 148	12	50 39 7 1 0 0 0 0 0	115	50	4	11	364	72	19.3128	12
18-11.12b	22 92 148	12	50 39 7 1 0 0 0 0 0	115	50	4	11	364	72	19.3128	12
18-11.14	23 86 154	14	48 36 11 0 0 0 0 0 0	113	48	3	51	694	9	19.3141	14
18-11.15	23 86 154	14	44 42 7 1 0 0 0 0 0	112	44	4	92	1836	74	19.3141	14
18-11.16	23 88 148	16	50 36 9 1 0 0 0 0 0	114	50	4	25	366	75	19.3145	16
18-11.17	23 88 148	16	48 36 11 0 0 0 0 0 0	113	48	3	53	695	10	19.3145	16
18-11.18	23 88 148	16	47 39 8 1 0 0 0 0 0	113	47	4	53	951	76	19.3145	16
18-11.19	23 88 148	16	43 45 4 2 0 0 0 0 0	112	43	4	93	2259	77	19.3145	19
18-11.20	23 88 150	20	51 33 12 0 0 0 0 0 0	114	51	3	26	262	11	19.3146	20

k = 18, Designs sorted based on degrees of freedom used

Design	wlp (w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
18-11.3	21 95 148	3	54 36 9 0 0 0 0 0 0	117	54	3	1	124	3	19.3109	3
18-11.4	21 96 151	4	54 36 9 0 0 0 0 0 0	117	54	3	2	125	4	19.3112	4
18-11.5146	32 80 132	5146	71 13 8 4 2 1 0 0 0	117	71	6	3	5	18580	19.3377	6205
18-11.14398	40 72 124	14398	81 3 0 12 0 3 0 0 0	117	81	6	4	1	20088	19.3583	16763
18-11.10b	22 92 146	10	53 36 8 1 0 0 0 0 0	116	53	4	5	155	70	19.3128	8
18-11.10a	22 92 146	10	53 36 8 1 0 0 0 0 0	116	53	4	5	155	70	19.3128	8
18-11.2	20 92 160	2	45 48 4 0 0 0 0 0 0	115	45	3	7	1464	2	19.3074	2
18-11.6	22 90 150	6	51 36 10 0 0 0 0 0 0	115	51	3	8	260	6	19.3123	6
18-11.8	22 92 146	8	51 36 10 0 0 0 0 0 0	115	51	3	9	261	8	19.3128	10
18-11.9	22 92 146	8	50 39 7 1 0 0 0 0 0	115	50	4	10	363	69	19.3128	10

k = 18, Designs sorted based on the number of clear two-factor interactions

Design	wlp (w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
18-11.14398	40 72 124	14398	81 3 0 12 0 3 0 0 0	117	81	6	4	1	20088	19.3583	16763
18-11.15397a	41 71 120	15397	72 6 1 9 6 0 0 0 0	112	72	5	206	2	13773	19.3608	17757
18-11.15397b	41 71 120	15397	72 6 1 9 6 0 0 0 0	112	72	5	206	2	13773	19.3608	17757
18-11.16125	42 72 112	16125	72 6 1 12 0 3 0 0 0	112	72	6	208	4	20598	19.3637	18906
18-11.5146	32 80 132	5146	71 13 8 4 2 1 0 0 0	117	71	6	3	5	18580	19.3377	6205
18-11.15386	41 70 120	15386	69 9 0 9 6 0 0 0 0	111	69	5	372	6	13769	19.3605	17304
18-11.23841a	56 56 140	23841	69 3 0 0 12 3 0 0 0	105	69	6	3057	7	23076	19.4004	24353
18-11.23841b	56 56 140	23841	69 3 0 0 12 3 0 0 0	105	69	6	3057	7	23076	19.4004	24352
18-11.5147	32 80 132	5146	66 14 6 9 1 0 0 0 0	114	66	5	48	9	7496	19.3377	6205
18-11.6397	33 79 128	6397	66 14 9 3 4 0 0 0 0	114	66	5	50	10	8258	19.3402	7583

k = 18, Designs sorted based on minimizing Lmax

Design	wlp(w_4,...)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
18-11.1	20 80 200	1	33 60 0 0 0 0 0 0 0	111	33	2	209	10601	1	19.3048	1
18-11.2	20 92 160	2	45 48 4 0 0 0 0 0 0	115	45	3	7	1464	2	19.3074	2
18-11.3	21 95 148	3	54 36 9 0 0 0 0 0 0	117	54	3	1	124	3	19.3109	3
18-11.4	21 96 151	4	54 36 9 0 0 0 0 0 0	117	54	3	2	125	4	19.3112	4
18-11.5	22 86 162	5	42 45 7 0 0 0 0 0 0	112	42	3	91	2702	5	19.3114	5
18-11.6	22 90 150	6	51 36 10 0 0 0 0 0 0	115	51	3	8	260	6	19.3123	6
18-11.7	22 90 150	6	48 39 9 0 0 0 0 0 0	114	48	3	24	693	7	19.3123	6
18-11.8	22 92 146	8	51 36 10 0 0 0 0 0 0	115	51	3	9	261	8	19.3128	10
18-11.14	23 86 154	14	48 36 11 0 0 0 0 0 0	113	48	3	51	694	9	19.3141	14
18-11.17	23 88 148	16	48 36 11 0 0 0 0 0 0	113	48	3	53	695	10	19.3145	16

k = 18, Design generators

Design	Design Generators									
18-11.1	7	25	42	53	62	78	83	92	99	111	120
18-11.2	7	11	25	45	51	62	78	84	90	101	120
18-11.3	7	11	21	45	51	62	78	86	97	103	120
18-11.4	7	11	25	42	77	81	95	99	110	118	120
18-11.5	7	11	21	41	54	58	79	86	92	99	120
18-11.6	7	11	21	38	57	76	83	90	111	118	120
18-11.7	7	11	21	38	57	76	83	90	101	118	120
18-11.8	7	11	21	41	51	63	77	84	110	118	120
18-11.9	7	11	19	41	53	63	78	82	99	118	120
18-11.10a	7	11	19	29	41	53	74	84	111	118	120
18-11.10b	7	11	19	38	57	60	77	85	91	101	120
18-11.12a	7	11	19	41	53	63	78	82	95	99	120
18-11.12b	7	11	19	41	53	63	78	82	95	100	120
18-11.14	7	11	21	38	59	73	83	95	106	118	120
18-11.15	7	11	19	29	41	53	74	85	110	118	120
18-11.16	7	11	19	29	38	41	69	91	106	116	120
18-11.17	7	11	21	25	38	58	78	84	101	107	120
18-11.18	7	11	19	38	57	60	73	85	106	118	120
18-11.19	7	11	19	29	41	53	73	86	102	106	120
18-11.20	7	11	21	25	38	58	77	83	101	118	120
18-11.5146	7	11	19	25	26	28	35	45	86	110	120
18-11.5147	7	11	13	19	21	25	41	63	78	118	120
18-11.6397	7	11	13	19	25	26	46	49	85	109	120
18-11.14398	7	11	19	25	26	28	31	45	77	110	120
18-11.15386	7	11	13	19	21	25	26	46	92	103	120
18-11.15397a	7	11	13	19	21	25	26	46	78	100	120
18-11.15397b	7	11	13	19	21	25	26	46	78	118	120
18-11.16125	7	11	19	25	26	28	31	45	77	117	120
18-11.23841a	7	11	13	19	21	25	26	28	46	78	120
18-11.23841b	7	11	13	19	21	25	26	28	46	95	120

k = 19, Designs sorted based on word length pattern

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
19-12.1	27 120 235	1	36 54 9 0 0 0 0 0 0	118	36	3	22	5807	1	17.4063	1
19-12.2	28 122 220	2	45 42 14 0 0 0 0 0 0	120	45	3	3	681	2	17.4091	2
19-12.3	30 110 240	3	32 51 11 1 0 0 0 0 0	114	32	4	387	11720	8	17.4115	3
19-12.4	30 114 228	4	42 39 17 0 0 0 0 0 0	117	42	3	52	1582	3	17.4123	5
19-12.5	30 116 220	5	40 45 11 2 0 0 0 0 0	117	40	4	53	2540	9	17.4127	6
19-12.6	30 118 214	6	45 36 18 0 0 0 0 0 0	118	45	3	23	682	4	17.4131	7
19-12.7	30 118 214	7	47 36 16 1 0 0 0 0 0	119	47	4	10	384	10	17.4131	7
19-12.8	30 118 214	7	44 39 15 1 0 0 0 0 0	118	44	4	24	937	11	17.4131	7
19-12.9	30 118 216	9	44 39 15 1 0 0 0 0 0	118	44	4	25	938	12	17.4131	10
19-12.10	30 120 212	10	42 51 1 6 0 0 0 0 0	119	42	4	11	1583	13	17.4135	11
19-12.11	30 121 208	11	47 36 16 1 0 0 0 0 0	119	47	4	12	385	14	17.4137	12
19-12.12	30 122 208	12	50 33 17 1 0 0 0 0 0	120	50	4	5	170	16	17.4140	13
19-12.13	30 122 208	12	46 45 5 5 0 0 0 0 0	120	46	4	4	517	15	17.4140	13
19-12.14	31 100 271	14	30 48 15 0 0 0 0 0 0	112	30	3	970	15112	5	17.4121	4
19-12.15	31 116 210	15	43 39 14 2 0 0 0 0 0	117	43	4	54	1286	17	17.4150	15
19-12.16	31 116 215	16	46 36 15 2 0 0 0 0 0	118	46	4	26	518	18	17.4151	16
19-12.17a	31 116 215	16	40 42 13 2 0 0 0 0 0	116	40	4	107	2541	19	17.4151	16
19-12.17b	31 116 215	16	40 42 13 2 0 0 0 0 0	116	40	4	107	2541	19	17.4151	16
19-12.19	31 116 219	19	50 30 19 1 0 0 0 0 0	119	50	4	13	171	21	17.4152	19
19-12.20a	31 117 210	20	46 36 15 2 0 0 0 0 0	118	46	4	27	519	22	17.4153	20
19-12.20b	31 117 210	20	46 36 15 2 0 0 0 0 0	118	46	4	27	519	22	17.4153	20

k = 19, Designs sorted based on degrees of freedom used

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
19-12.12482	46 102 192	12482	74 15 0 12 0 2 1 0 0	123	74	7	1	3	35208	17.4498	16695
19-12.6923	42 106 200	6923	70 8 17 2 4 1 0 0 0	121	70	6	2	7	22319	17.4407	9180
19-12.2	28 122 220	2	45 42 14 0 0 0 0 0 0	120	45	3	3	681	2	17.4091	2
19-12.13	30 122 208	12	46 45 5 5 0 0 0 0 0	120	46	4	4	517	15	17.4140	13
19-12.12	30 122 208	12	50 33 17 1 0 0 0 0 0	120	50	4	5	170	16	17.4140	13
19-12.161	33 117 198	161	53 32 11 4 1 0 0 0 0	120	53	5	6	91	2587	17.4202	164
19-12.3218	39 116 187	3218	59 26 9 4 1 2 0 0 0	120	59	6	7	39	21728	17.4353	5406
19-12.12483	46 102 192	12482	69 16 1 9 5 1 0 0 0	120	69	6	8	8	24025	17.4498	16695
19-12.14059	47 100 187	14059	68 18 0 12 0 2 1 0 0	120	68	7	9	11	35317	17.4518	18094
19-12.7	30 118 214	7	47 36 16 1 0 0 0 0 0	119	47	4	10	384	10	17.4131	7

k = 19, Designs sorted based on the number of clear two-factor interactions

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
19-12.26380a	58 90 184	26380	78 6 1 0 12 3 0 0 0	119	78	6	20	1	29308	17.4777	33773
19-12.26380b	58 90 184	26380	78 6 1 0 12 3 0 0 0	119	78	6	20	1	29308	17.4777	33773
19-12.12482	46 102 192	12482	74 15 0 12 0 2 1 0 0	123	74	7	1	3	35208	17.4498	16695
19-12.38700	78 70 224	38700	74 3 0 0 0 14 1 0 0	111	74	7	1911	4	38310	17.5257	38922
19-12.31264	62 86 164	31264	72 0 7 0 12 3 0 0 0	113	72	6	968	5	30857	17.4865	36481
19-12.31266	62 90 160	31266	72 0 7 0 12 3 0 0 0	113	72	6	969	6	30858	17.4875	36579
19-12.6923	42 106 200	6923	70 8 17 2 4 1 0 0 0	121	70	6	2	7	22319	17.4407	9180
19-12.12483	46 102 192	12482	69 16 1 9 5 1 0 0 0	120	69	6	8	8	24025	17.4498	16695
19-12.27425	59 86 182	27425	69 12 0 0 12 3 0 0 0	115	69	6	386	9	29630	17.4792	34647

k = 19, Designs sorted based on minimizing Lmax

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
19-12.1	27 120 235	1	36 54 9 0 0 0 0 0 0	118	36	3	22	5807	1	17.4063	1
19-12.2	28 122 220	2	45 42 14 0 0 0 0 0 0	120	45	3	3	681	2	17.4091	2
19-12.4	30 114 228	4	42 39 17 0 0 0 0 0 0	117	42	3	52	1582	3	17.4123	5
19-12.6	30 118 214	6	45 36 18 0 0 0 0 0 0	118	45	3	23	682	4	17.4131	7
19-12.14	31 100 271	14	30 48 15 0 0 0 0 0 0	112	30	3	970	15112	5	17.4121	4
19-12.640	36 90 252	640	45 18 30 0 0 0 0 0 0	112	45	3	1053	722	6	17.4219	299
19-12.18529	51 0 483	18529	0 18 45 0 0 0 0 0 0	82	0	3	27971	39241	7	17.4415	9659
19-12.3	30 110 240	3	32 51 11 1 0 0 0 0 0	114	32	4	387	11720	8	17.4115	3
19-12.5	30 116 220	5	40 45 11 2 0 0 0 0 0	117	40	4	53	2540	9	17.4127	6
19-12.7	30 118 214	7	47 36 16 1 0 0 0 0 0	119	47	4	10	384	10	17.4131	7

k = 19, Design generators

Design	Design Generators											
19-12.1	7	11	21	41	54	58	79	86	92	99	101	120
19-12.2	7	11	21	38	57	76	83	90	101	111	118	120
19-12.3	7	11	19	38	59	62	73	87	93	101	106	120
19-12.4	7	11	21	38	59	73	83	95	101	106	118	120
19-12.5	7	11	19	38	57	60	73	85	95	101	106	120
19-12.6	7	11	21	38	57	73	83	95	101	107	118	120
19-12.7	7	11	19	38	57	60	73	84	99	110	118	120
19-12.8	7	11	19	38	57	60	73	85	99	110	118	120
19-12.9	7	11	21	25	38	55	58	78	84	101	107	120
19-12.10	7	11	19	30	41	52	61	74	87	101	111	120
19-12.11	7	11	19	29	41	53	63	78	82	99	118	120
19-12.12	7	11	19	29	41	53	63	78	82	95	99	120
19-12.13	7	11	19	25	41	53	63	78	82	95	100	120
19-12.14	7	11	21	41	55	58	78	86	92	99	101	120
19-12.15	7	11	19	38	57	60	73	85	92	99	118	120
19-12.16	7	11	21	38	57	76	83	90	111	118	120	123
19-12.17a	7	11	21	25	38	41	58	78	84	101	107	120
19-12.17b	7	11	19	29	38	57	60	73	85	106	118	120
19-12.19	7	11	21	25	38	44	58	77	83	101	118	120
19-12.20a	7	11	19	29	38	41	60	69	91	106	116	120
19-12.20b	7	11	19	29	38	41	55	73	85	108	118	120
19-12.161	7	11	19	29	35	41	55	73	87	102	108	120
19-12.640	7	11	21	38	57	76	87	93	98	107	118	120
19-12.3218	7	11	19	25	26	28	35	45	53	78	118	120
19-12.6923	7	11	19	25	26	28	35	45	50	86	110	120
19-12.12482	7	11	19	25	26	28	31	35	45	86	110	120
19-12.12483	7	11	19	21	25	26	28	35	45	86	110	120
19-12.14059	7	11	19	25	26	28	31	35	45	77	118	120
19-12.18529	7	21	28	38	44	59	79	81	98	112	121	122
19-12.26380a	7	11	14	19	25	26	28	31	45	77	110	120
19-12.26380b	7	11	14	19	25	26	28	31	45	77	117	120
19-12.27425	7	11	13	19	21	22	25	26	46	92	103	120
19-12.31264	7	11	13	19	21	22	25	26	46	78	118	120
19-12.31266	7	11	19	21	25	26	28	31	45	77	117	120
19-12.38700	7	27	43	51	56	75	83	88	99	104	112	125

k = 20, Designs sorted based on word length pattern

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
20-13.1	36 152 340	1	24 60 14 1 0 0 0 0 0 0	119	24	4	111	28084	1	15.6994	1
20-13.2	38 156 310	2	41 39 21 2 0 0 0 0 0 0	123	41	4	6	715	2	15.7043	2
20-13.3	39 152 308	3	40 39 20 3 0 0 0 0 0 0	122	40	4	11	1032	3	15.7056	3
20-13.4	39 152 308	3	38 39 22 2 0 0 0 0 0 0	121	38	4	26	1929	4	15.7056	3
20-13.5	40 148 316	5	34 42 20 3 0 0 0 0 0 0	119	34	4	111	5165	6	15.7072	5
20-13.6	40 148 316	5	30 54 8 7 0 0 0 0 0 0	119	30	4	111	11873	5	15.7072	5
20-13.7	40 152 308	7	36 42 18 4 0 0 0 0 0 0	120	36	4	54	3164	7	15.7080	7
20-13.8	40 153 300	8	39 39 19 4 0 0 0 0 0 0	121	39	4	27	1501	8	15.7080	8
20-13.9	40 154 298	9	40 42 14 6 0 0 0 0 0 0	122	40	4	12	1033	9	15.7082	9
20-13.10	40 154 298	9	39 39 19 4 0 0 0 0 0 0	121	39	4	28	1502	10	15.7082	10
20-13.11	40 156 296	11	31 60 4 3 3 0 0 0 0 0	121	31	5	29	9924	485	15.7087	12
20-13.12	40 156 300	12	40 42 14 6 0 0 0 0 0 0	122	40	4	13	1034	11	15.7088	13
20-13.13	41 144 312	13	32 45 16 5 0 0 0 0 0 0	118	32	4	230	7874	12	15.7085	11
20-13.14	41 150 301	14	41 36 19 5 0 0 0 0 0 0	121	41	4	30	716	13	15.7097	16
20-13.15	41 150 301	15	36 39 20 4 0 0 0 0 0 0	119	36	4	115	3165	15	15.7097	14
20-13.16	41 150 301	15	35 42 17 5 0 0 0 0 0 0	119	35	4	114	4168	14	15.7097	14
20-13.17	41 152 294	17	43 35 20 3 1 0 0 0 0 0	122	43	5	14	415	486	15.7100	17
20-13.18	41 152 294	17	39 36 21 4 0 0 0 0 0 0	120	39	4	55	1503	16	15.7100	17
20-13.19	41 152 295	19	39 36 21 4 0 0 0 0 0 0	120	39	4	55	1504	17	15.7100	19
20-13.20	41 152 296	20	46 27 26 3 0 0 0 0 0 0	122	46	4	15	190	18	15.7100	20
20-13.21	41 152 296	20	36 45 12 7 0 0 0 0 0 0	120	36	4	57	3166	19	15.7100	20

k = 20, Designs sorted based on degrees of freedom used

Design	wlp(w_4,...)			wlp rank	alp										df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
20-13.23128	64	128	280	23128	72	18	1	0	12	2	1	0	0	0	126	72	7	1	4	47887	15.7578	30523
20-13.47458	80	112	280	47458	84	6	1	0	0	14	1	0	0	0	126	84	7	2	1	51633	15.7915	55382
20-13.7545	54	148	266	7545	59	30	1	12	0	1	2	0	0	0	125	59	7	3	13	45588	15.7390	12963
20-13.58	42	154	284	58	46	39	13	3	3	0	0	0	0	0	124	46	5	4	191	497	15.7126	61
20-13.16206	60	132	272	16206	70	6	13	12	0	0	3	0	0	0	124	70	7	5	5	46802	15.7491	23100
20-13.2	38	156	310	2	41	39	21	2	0	0	0	0	0	0	123	41	4	6	715	2	15.7043	2
20-13.62	42	156	286	62	50	23	27	2	1	0	0	0	0	0	123	50	5	7	64	501	15.7131	74
20-13.63	42	156	286	62	38	55	3	2	5	0	0	0	0	0	123	38	5	8	1933	502	15.7131	73

k = 20, Designs sorted based on the number of clear two-factor interactions

Design	wlp(w_4,...)			wlp rank	alp										df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
20-13.47458	80	112	280	47458	84	6	1	0	0	14	1	0	0	0	126	84	7	2	1	51633	15.7915	55382
20-13.52497	84	108	256	52497	78	0	7	0	0	14	1	0	0	0	120	78	7	110	2	52866	15.7993	56241
20-13.50328	82	108	270	50328	75	9	2	0	0	14	1	0	0	0	121	75	7	53	3	52274	15.7950	55770
20-13.23128	64	128	280	23128	72	18	1	0	12	2	1	0	0	0	126	72	7	1	4	47887	15.7578	30523
20-13.16206	60	132	272	16206	70	6	13	12	0	0	3	0	0	0	124	70	7	5	5	46802	15.7491	23100
20-13.57639	108	84	336	57639	70	6	1	0	0	0	15	0	0	0	112	70	7	3369	6	55270	15.8520	57809

k = 20, Designs sorted based on minimizing Lmax

Design	wlp(w_4,…)			wlp rank	alp										df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
20-13.1	36	152	340	1	24	60	14	1	0	0	0	0	0	0	119	24	4	111	28084	1	15.6994	1
20-13.2	38	156	310	2	41	39	21	2	0	0	0	0	0	0	123	41	4	6	715	2	15.7043	2
20-13.3	39	152	308	3	40	39	20	3	0	0	0	0	0	0	122	40	4	11	1032	3	15.7056	3
20-13.4	39	152	308	3	38	39	22	2	0	0	0	0	0	0	121	38	4	26	1929	4	15.7056	3
20-13.6	40	148	316	5	30	54	8	7	0	0	0	0	0	0	119	30	4	111	11873	5	15.7072	5
20-13.5	40	148	316	5	34	42	20	3	0	0	0	0	0	0	119	34	4	111	5165	6	15.7072	5
20-13.7	40	152	308	7	36	42	18	4	0	0	0	0	0	0	120	36	4	54	3164	7	15.7080	7
20-13.8	40	153	300	8	39	39	19	4	0	0	0	0	0	0	121	39	4	27	1501	8	15.7080	8
20-13.9	40	154	298	9	40	42	14	6	0	0	0	0	0	0	122	40	4	12	1033	9	15.7082	9
20-13.10	40	154	298	9	39	39	19	4	0	0	0	0	0	0	121	39	4	28	1502	10	15.7082	10

k = 20, Design generators

Design	Design Generators												
20-13.1	7	11	21	41	54	58	79	86	92	99	101	120	123
20-13.2	7	11	21	38	60	70	73	82	95	101	107	118	120
20-13.3	7	11	19	38	57	60	73	84	93	99	110	118	120
20-13.4	7	11	19	38	57	60	73	85	92	99	110	118	120
20-13.5	7	11	19	29	38	57	60	73	85	95	106	118	120
20-13.6	7	11	14	19	38	57	60	73	85	95	101	106	120
20-13.7	7	11	21	25	38	41	55	58	78	84	101	107	120
20-13.8	7	11	21	25	38	55	58	78	84	93	101	107	120
20-13.9	7	11	13	21	38	57	76	83	90	101	111	118	120
20-13.10	7	11	19	29	38	57	60	73	85	91	106	118	120
20-13.11	7	11	19	30	35	41	73	84	93	101	111	114	120
20-13.12	7	11	19	29	41	47	49	55	91	94	99	102	120
20-13.13	7	11	19	38	57	60	73	85	95	101	106	119	120
20-13.14	7	11	21	38	57	63	76	83	90	111	118	120	123
20-13.15	7	11	19	29	38	57	60	73	85	99	110	118	120
20-13.16	7	11	21	25	38	41	58	78	82	84	101	107	120
20-13.17	7	11	13	19	38	57	60	73	85	92	99	118	120
20-13.18	7	11	21	38	59	73	81	82	95	99	108	117	120
20-13.19	7	11	19	29	38	57	60	70	73	99	110	118	120
20-13.20	7	11	19	30	38	41	52	59	74	85	111	118	120
20-13.21	7	11	19	30	41	49	52	61	74	87	101	111	120
20-13.58	7	11	19	29	41	55	62	74	84	102	108	111	120
20-13.62	7	11	19	29	30	41	53	63	78	82	95	99	120
20-13.63	7	11	19	25	26	41	53	63	78	82	95	100	120
20-13.7545	7	11	19	25	26	28	31	35	45	53	86	110	120
20-13.16206	7	11	19	25	26	28	31	35	45	59	86	110	120
20-13.23128	7	11	19	21	25	26	28	31	35	45	86	110	120
20-13.47458	7	11	14	19	22	25	26	28	31	45	77	117	120
20-13.50328	7	11	13	19	21	22	25	26	31	46	78	100	120
20-13.52497	7	11	14	19	21	25	26	28	31	45	77	117	120
20-13.57639	7	27	43	51	56	75	83	88	99	104	112	123	125

k = 21, Designs sorted based on word length pattern

Design	wlp(w_4,…)			wlp rank	alp										df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
21-14.1	51	200	414	1	26	54	15	4	3	0	0	0	0	0	123	26	5	23	17819	45	14.1759	2
21-14.2	51	202	400	2	28	51	12	11	0	0	0	0	0	0	123	28	4	24	10484	1	14.1761	3
21-14.3	52	184	452	3	24	48	18	9	0	0	0	0	0	0	120	24	4	244	25188	2	14.1753	1
21-14.4	52	194	420	4	31	38	26	5	1	0	0	0	0	0	122	31	5	57	5419	46	14.1768	4
21-14.5	52	196	412	5	33	38	24	6	1	0	0	0	0	0	123	33	5	25	3019	47	14.1771	5
21-14.6	52	196	416	6	36	36	22	9	0	0	0	0	0	0	124	36	4	9	1156	3	14.1772	7
21-14.7	52	198	402	7	35	39	19	10	0	0	0	0	0	0	124	35	4	10	1882	4	14.1774	8
21-14.8	52	201	400	8	36	48	16	0	6	0	0	0	0	0	127	36	5	1	1157	48	14.1780	9
21-14.9	53	184	440	9	8	66	12	7	0	1	0	0	0	0	115	8	6	1698	40852	8560	14.1772	6
21-14.10	53	190	422	10	34	39	18	11	0	0	0	0	0	0	123	34	4	26	2365	5	14.1781	10
21-14.11	53	190	422	10	32	39	20	10	0	0	0	0	0	0	122	32	4	58	3933	6	14.1781	10
21-14.12	53	192	412	12	32	45	12	13	0	0	0	0	0	0	123	32	4	27	3934	7	14.1783	12
21-14.13	53	193	413	13	34	37	24	5	2	0	0	0	0	0	123	34	5	28	2366	49	14.1786	13
21-14.14	53	193	413	13	29	41	22	7	1	0	0	0	0	0	121	29	5	120	8257	50	14.1786	13
21-14.15	53	194	405	15	36	36	24	6	0	1	0	0	0	0	124	36	6	11	1158	8561	14.1787	15
21-14.16	53	195	401	16	37	35	22	8	1	0	0	0	0	0	124	37	5	12	914	51	14.1788	16
21-14.17	53	196	404	17	41	33	24	4	3	0	0	0	0	0	126	41	5	6	240	52	14.1791	18
21-14.18	53	196	404	17	34	39	18	11	0	0	0	0	0	0	123	34	4	29	2367	8	14.1791	17
21-14.19	53	199	395	19	29	47	14	10	1	0	0	0	0	0	122	29	5	59	8258	53	14.1795	19
21-14.20	53	200	400	20	20	72	0	7	0	3	0	0	0	0	123	20	6	30	34343	8562	14.1799	22
21-14.21	54	186	438	21	32	35	25	7	1	0	0	0	0	0	121	32	5	121	3935	54	14.1796	20

k = 21, Designs sorted based on degrees of freedom used

Design	wlp(w_4,…)			wlp rank	alp										df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
21-14.8	52	201	400	8	36	48	16	0	6	0	0	0	0	0	127	36	5	1	1157	48	14.1780	9
21-14.110	56	189	392	110	56	0	49	0	0	0	1	0	0	0	127	56	7	2	8	51208	14.1836	113
21-14.2560	64	181	392	2560	62	0	37	0	6	0	1	0	0	0	127	62	7	3	3	51401	14.1986	4100
21-14.23744	80	165	392	23744	72	0	19	0	12	0	3	0	0	0	127	72	7	4	2	56822	14.2290	7684
21-14.80683	112	133	392	80683	84	0	7	0	0	0	15	0	0	0	127	84	7	5	1	74585	14.2896	82077
21-14.17	53	196	404	17	41	33	24	4	3	0	0	0	0	0	126	41	5	6	240	52	14.1791	18
21-14.225	57	196	376	225	44	30	24	4	0	3	0	0	0	0	126	44	6	7	79	8605	14.1869	331
21-14.7379	69	196	364	7379	54	23	12	13	0	0	2	1	0	0	126	54	8	8	10	75434	14.2121	16832
21-14.6	52	196	416	6	36	36	22	9	0	0	0	0	0	0	124	36	4	9	1156	3	14.1772	7
21-14.7	52	198	402	7	35	39	19	10	0	0	0	0	0	0	124	35	4	10	1882	4	14.1774	8

k = 21, Designs sorted based on the number of clear two-factor interactions

Design	wlp(w_4,…)			wlp rank	alp										df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
21-14.80683	112	133	392	80683	84	0	7	0	0	0	15	0	0	0	127	84	7	5	1	74585	14.2896	82077
21-14.23744	80	165	392	23744	72	0	19	0	12	0	3	0	0	0	127	72	7	4	2	56822	14.2290	37684
21-14.2560	64	181	392	2560	62	0	37	0	6	0	1	0	0	0	127	62	7	3	3	51401	14.1986	4100
21-14.18122	77	164	404	18122	62	9	6	19	0	6	0	0	0	0	123	62	6	56	4	17698	14.2227	28548
21-14.41505	93	148	372	41505	62	17	6	1	0	14	0	1	0	0	122	62	8	119	5	77854	14.2523	74961
21-14.38737	92	148	380	38737	60	20	6	0	0	14	0	1	0	0	122	60	8	118	6	77767	14.2503	73985
21-14.29904	84	153	384	29904	57	8	17	0	13	0	3	0	0	0	119	57	7	617	7	58605	14.2346	51023
21-14.110	56	189	392	110	56	0	49	0	0	0	1	0	0	0	127	56	7	2	8	51208	14.1836	113
21-14.28450	83	153	391	28450	55	12	14	2	12	0	3	0	0	0	119	55	7	616	9	58086	14.2326	46493
21-14.7379	69	196	364	7379	54	23	12	13	0	0	2	1	0	0	126	54	8	8	10	75434	14.2121	16832

k = 21, Designs sorted based on minimizing Lmax

Design	wlp(w_4,...)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
21-14.2	51 202 400	2	28 51 12 11 0 0 0 0 0 0	123	28	4	24	10484	1	14.1761	3
21-14.3	52 184 452	3	24 48 18 9 0 0 0 0 0 0	120	24	4	244	25188	2	14.1753	1
21-14.6	52 196 416	6	36 36 22 9 0 0 0 0 0 0	124	36	4	9	1156	3	14.1772	7
21-14.7	52 198 402	7	35 39 19 10 0 0 0 0 0 0	124	35	4	10	1882	4	14.1774	8
21-14.10	53 190 422	10	34 39 18 11 0 0 0 0 0 0	123	34	4	26	2365	5	14.1781	10
21-14.11	53 190 422	10	32 39 20 10 0 0 0 0 0 0	122	32	4	58	3933	6	14.1781	10
21-14.12	53 192 412	12	32 45 12 13 0 0 0 0 0 0	123	32	4	27	3934	7	14.1783	12
21-14.18	53 196 404	17	34 39 18 11 0 0 0 0 0 0	123	34	4	29	2367	8	14.1791	17

k = 21, Design generators

Design	Design Generators													
21-14.1	7	14	25	42	54	61	69	88	104	112	121	122	124	127
21-14.2	7	30	35	38	41	52	81	82	104	112	121	122	124	127
21-14.3	7	29	30	35	37	41	44	70	73	104	112	121	122	124
21-14.4	7	11	19	29	35	42	69	73	81	92	108	119	120	126
21-14.5	7	11	19	29	35	38	52	73	101	104	112	121	122	124
21-14.6	7	11	30	35	49	76	84	88	104	107	112	121	122	124
21-14.7	7	11	13	19	21	22	25	35	61	62	78	84	111	120
21-14.8	7	11	13	19	35	69	70	81	82	87	98	108	118	120
21-14.9	7	11	19	25	26	59	95	97	98	104	112	121	122	124
21-14.10	7	11	21	35	46	52	61	79	81	104	112	121	122	124
21-14.11	7	11	19	29	35	45	53	57	70	73	74	94	108	120
21-14.12	7	19	25	28	31	38	55	62	84	97	112	121	122	124
21-14.13	7	11	19	29	38	41	49	55	69	74	76	111	120	126
21-14.14	7	11	19	29	35	45	53	57	63	73	74	81	119	120
21-14.15	7	11	21	26	50	56	59	61	95	104	112	121	122	124
21-14.16	7	11	19	25	38	41	52	62	67	73	82	92	109	120
21-14.17	7	11	19	35	38	41	42	55	59	73	74	93	101	120
21-14.18	7	22	35	38	41	50	55	56	101	104	112	121	122	124
21-14.19	7	35	41	42	52	67	87	102	104	112	121	122	124	127
21-14.20	7	11	19	28	31	35	49	76	85	104	112	121	122	124
21-14.21	7	11	35	38	42	49	50	76	101	104	112	121	122	124
21-14.110	7	11	21	35	46	52	69	73	76	104	112	121	122	124
21-14.225	7	19	25	28	31	38	44	50	55	81	112	121	122	124
21-14.2560	7	11	19	29	38	41	55	67	74	76	84	109	118	120
21-14.7379	7	11	19	21	28	31	38	41	52	104	112	121	122	124
21-14.18122	7	11	19	29	38	41	60	69	90	95	111	119	120	123
21-14.23744	7	35	38	41	42	49	52	63	82	104	112	121	122	124
21-14.28450	7	19	25	26	28	38	52	79	81	109	112	121	122	124
21-14.29904	7	11	21	31	38	77	94	103	104	112	121	122	124	127
21-14.38737	7	11	25	26	31	41	53	91	104	112	115	121	122	124
21-14.41505	7	11	13	19	21	31	47	50	76	100	112	121	122	124
21-14.80683	7	19	25	28	41	50	63	73	82	93	112	121	122	124

k = 22, Designs sorted based on word length pattern

Design	wlp(W_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
22-15.1	65 248 572	1	25 36 32 8 0 1 0 0 0 0 0	124	25	6	20	14585	942	12.8007	1
22-15.2	65 256 552	2	12 68 12 6 1 3 0 0 0 0 0	124	12	6	21	37076	943	12.8019	2
22-15.3	66 254 544	3	21 52 12 15 2 0 0 0 0 0 0	124	21	5	22	29981	1	12.8032	3
22-15.4	67 248 564	4	24 43 23 9 2 1 0 0 0 0 0	124	24	6	23	18713	944	12.8043	4
22-15.5	68 240 568	5	8 58 18 7 5 0 0 0 0 0 0	118	8	5	732	38218	2	12.8047	5
22-15.6	68 240 570	6	24 36 27 12 0 1 0 0 0 0 0	122	24	6	135	18714	945	12.8047	6
22-15.7	68 241 568	7	28 34 30 5 5 0 0 0 0 0 0	124	28	5	24	5514	3	12.8049	7
22-15.8	68 248 542	8	29 38 22 10 4 0 0 0 0 0 0	125	29	5	3	3996	4	12.8058	8
22-15.9	68 248 553	9	32 30 28 10 3 0 0 0 0 0 0	125	32	5	4	1549	5	12.8060	10
22-15.10	68 248 553	9	20 46 22 7 5 0 0 0 0 0 0	122	20	5	136	31744	6	12.8060	10
22-15.11	68 249 544	11	4 70 6 11 5 0 0 0 0 0 0	118	4	5	733	38644	7	12.8060	12
22-15.12	68 249 548	12	29 32 30 7 4 0 0 0 0 0 0	124	29	5	25	3997	8	12.8061	13
22-15.13	68 253 536	13	21 50 14 12 4 0 0 0 0 0 0	123	21	5	67	29982	9	12.8067	18
22-15.14	68 256 521	14	9 80 0 6 6 0 0 1 0 0 0	124	9	8	26	38114	30009	12.8070	21
22-15.15	68 256 530	15	17 54 16 7 6 0 0 0 0 0 0	122	17	5	137	34659	10	12.8072	26
22-15.16	69 236 578	16	28 40 15 17 2 0 0 0 0 0 0	124	28	5	27	5515	11	12.8060	9
22-15.17	69 240 552	17	17 45 24 10 0 2 0 0 0 0 0	120	17	6	389	34660	946	12.8063	14
22-15.18	69 240 562	18	25 36 25 11 3 0 0 0 0 0 0	122	25	5	138	14586	12	12.8065	16
22-15.19	69 240 562	19	30 32 26 12 1 1 0 0 0 0 0	124	30	6	28	3051	947	12.8065	15
22-15.20	69 242 548	20	17 46 22 10 2 1 0 0 0 0 0	120	17	6	390	34661	948	12.8066	17
22-15.21	69 242 558	21	32 33 22 13 3 0 0 0 0 0 0	125	32	5	5	1550	13	12.8068	19

k = 22, Designs sorted based on degrees of freedom used

Design	wlp(w_4,...)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
22-15.26	69 248 532	26	36 26 36 3 1 3 0 0 0 0 0	127	36	6	1	454	950	12.8075	30
22-15.4645	85 264 492	4645	48 17 24 12 1 0 0 3 0 0 0	127	48	8	2	1	30303	12.8406	17429
22-15.8	68 248 542	8	29 38 22 10 4 0 0 0 0 0 0	125	29	5	3	3996	4	12.8058	8
22-15.9	68 248 553	9	32 30 28 10 3 0 0 0 0 0 0	125	32	5	4	1549	5	12.8060	10
22-15.21	69 242 558	21	32 33 22 13 3 0 0 0 0 0 0	125	32	5	5	1550	13	12.8068	19
22-15.22	69 244 544	22	30 35 27 6 4 1 0 0 0 0 0	125	30	6	6	3052	949	12.8070	20
22-15.23	69 244 548	23	32 33 22 13 3 0 0 0 0 0 0	125	32	5	7	1551	14	12.8070	22
22-15.39	70 240 544	39	31 37 19 11 5 0 0 0 0 0 0	125	31	5	8	2409	24	12.8081	41
22-15.43	70 240 556	43	33 31 25 9 5 0 0 0 0 0 0	125	33	5	9	1134	27	12.8083	44
22-15.46	70 243 538	46	31 36 21 11 3 1 0 0 0 0 0	125	31	6	10	2411	958	12.8085	49

k = 22, Designs sorted based on the number of clear two-factor interactions

Design	wlp(w_4,...)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
22-15.4645	85 264 492	4645	48 17 24 12 1 0 0 3 0	127	48	8	2	1	30303	12.8406	17429
22-15.8501	89 210 546	8501	48 20 7 20 1 5 1 0 0	124	48	7	66	2	17314	12.8381	14609
22-15.29288	104 216 501	29288	48 24 14 0 0 14 0 0 1	123	48	9	132	3	37674	12.8672	35585
22-15.30203	105 194 514	30203	48 27 8 3 0 14 0 0 1	123	48	9	133	4	37728	12.8648	35134
22-15.30206	105 216 492	30206	48 27 8 3 0 14 0 0 1	123	48	9	134	5	37729	12.8690	35809

k = 22, Designs sorted based on minimizing Lmax

Design	wlp(w_4,...)			wlp rank	alp											df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
22-15.3	66	254	544	3	21	52	12	15	2	0	0	0	0	0	0	124	21	5	22	29981	1	12.8032	3
22-15.5	68	240	568	5	8	58	18	7	5	0	0	0	0	0	0	118	8	5	732	38218	2	12.8047	5
22-15.7	68	241	568	7	28	34	30	5	5	0	0	0	0	0	0	124	28	5	24	5514	3	12.8049	7
22-15.8	68	248	542	8	29	38	22	10	4	0	0	0	0	0	0	125	29	5	3	3996	4	12.8058	8
22-15.9	68	248	553	9	32	30	28	10	3	0	0	0	0	0	0	125	32	5	4	1549	5	12.8060	10
22-15.10	68	248	553	9	20	46	22	7	5	0	0	0	0	0	0	122	20	5	136	31744	6	12.8060	10
22-15.11	68	249	544	11	4	70	6	11	5	0	0	0	0	0	0	118	4	5	733	38644	7	12.8060	12
22-15.12	68	249	548	12	29	32	30	7	4	0	0	0	0	0	0	124	29	5	25	3997	8	12.8061	13
22-15.13	68	253	536	13	21	50	14	12	4	0	0	0	0	0	0	123	21	5	67	29982	9	12.8067	18
22-15.15	68	256	530	15	17	54	16	7	6	0	0	0	0	0	0	122	17	5	137	34659	10	12.8072	26

k = 22, Design generators

Design	Design Generators														
22-15.1	7	11	19	29	37	41	55	59	74	82	84	102	108	120	126
22-15.2	7	11	19	30	38	41	52	61	74	87	93	101	111	114	120
22-15.3	7	11	19	30	38	41	59	61	74	85	92	98	111	118	120
22-15.4	7	11	19	29	37	41	47	49	55	69	91	94	99	120	125
22-15.5	7	11	19	41	52	62	73	82	84	94	99	101	111	113	120
22-15.6	7	11	19	38	41	50	60	63	69	91	93	106	117	118	120
22-15.7	7	11	19	29	38	41	60	70	76	82	99	109	117	118	120
22-15.8	7	11	19	22	38	41	60	67	78	82	95	109	113	119	120
22-15.9	7	11	21	28	38	57	76	83	90	95	101	111	118	120	123
22-15.10	7	11	19	29	37	41	47	59	77	78	84	91	102	119	120
22-15.11	7	11	19	29	37	41	50	60	63	69	73	82	99	102	120
22-15.12	7	11	19	29	30	38	41	49	60	78	82	95	109	119	120
22-15.13	7	11	21	28	38	57	63	76	83	90	95	111	118	120	123
22-15.14	7	11	19	29	35	45	52	55	67	73	74	86	108	114	120
22-15.15	7	11	21	28	38	57	63	69	76	83	90	95	111	118	120
22-15.16	7	11	19	38	57	60	70	73	76	84	93	99	110	118	120
22-15.17	7	11	19	29	37	41	50	60	69	73	82	95	102	120	126
22-15.18	7	11	19	38	41	55	59	73	76	85	86	91	103	113	120
22-15.19	7	11	19	29	37	41	49	59	77	78	84	87	99	106	120
22-15.20	7	11	19	29	35	45	53	73	79	81	87	103	118	120	123
22-15.21	7	11	19	29	38	41	50	55	73	85	92	106	108	118	120
22-15.22	7	11	13	19	22	38	57	60	73	85	92	99	106	118	120
22-15.23	7	11	19	29	38	41	50	55	73	85	92	99	108	118	120
22-15.26	7	11	19	29	38	41	55	62	67	73	87	108	114	120	123
22-15.39	7	11	19	29	35	45	53	59	70	73	81	87	103	120	126
22-15.43	7	11	19	29	37	41	49	55	59	70	87	89	90	116	120
22-15.46	7	11	13	21	28	38	42	57	76	83	90	97	111	118	120
22-15.4645	7	11	19	29	30	35	41	42	44	47	53	59	78	118	120
22-15.8501	7	11	19	29	38	41	47	70	73	79	99	109	110	117	120
22-15.29288	7	11	19	21	22	25	26	28	31	35	45	46	77	118	120
22-15.30203	7	11	19	21	22	25	26	28	31	35	45	67	77	118	120
22-15.30206	7	11	19	21	22	25	26	28	31	35	45	46	77	117	120

k = 23, Designs sorted based on word length pattern

Design	wlp(w_4,...)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
23-16.1	83 316 744	1	12 52 24 9 2 2 1 0 0 0 0	125	12	7	10	32307	5495	11.5703	1
23-16.2	83 318 734	2	14 54 11 17 6 0 0 0 0 0 0	125	14	5	11	31330	1	11.5704	2
23-16.3	84 312 744	3	0 58 26 1 11 0 0 0 0 0 0	119	0	5	472	34743	2	11.5713	3
23-16.4	84 319 726	4	12 54 16 10 9 0 0 0 0 0 0	124	12	5	51	32308	3	11.5722	6
23-16.5	85 304 744	5	9 49 20 16 2 2 0 0 0 0 0	121	9	6	249	33463	61	11.5716	4
23-16.6	85 306 756	6	25 26 34 12 4 1 0 0 0 0 0	125	25	6	12	9682	62	11.5721	5
23-16.7	85 312 730	7	22 38 26 9 7 1 0 0 0 0 0	126	22	6	1	22091	63	11.5727	8
23-16.8	85 318 718	8	17 44 26 8 4 3 0 0 0 0 0	125	17	6	13	29653	64	11.5736	15
23-16.9	86 299 766	9	20 32 29 14 4 1 0 0 0 0 0	123	20	6	95	26421	65	11.5727	7
23-16.10	86 304 753	10	18 37 27 10 8 0 0 0 0 0 0	123	18	5	96	28456	4	11.5734	13
23-16.11	86 305 740	11	4 53 23 6 10 0 0 0 0 0 0	119	4	5	473	34497	5	11.5734	10
23-16.12	86 305 740	12	6 46 31 4 8 1 0 0 0 0 0	119	6	6	474	34227	66	11.5734	10
23-16.13	86 305 740	13	0 64 13 10 8 1 0 0 0 0 0	119	0	6	475	34744	67	11.5734	10
23-16.14	86 306 735	14	10 48 21 12 6 1 0 0 0 0 0	121	10	6	250	32981	68	11.5735	14
23-16.15	86 308 728	15	23 35 30 8 4 3 0 0 0 0 0	126	23	6	2	18285	69	11.5737	16
23-16.16	86 320 697	16	7 66 16 6 2 4 0 1 0 0 0	125	7	8	14	34110	20195	11.5753	26
23-16.17	86 324 696	17	13 45 36 0 0 7 0 0 0 0 0	124	13	6	52	32028	70	11.5760	31
23-16.18	87 290 790	18	22 42 11 21 6 0 0 0 0 0 0	125	22	5	15	22092	6	11.5732	9

k = 23, Designs sorted based on degrees of freedom used

Design	wlp(w_4,…)			wlp rank	alp											df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
23-16.7	85	312	730	7	22	38	26	9	7	1	0	0	0	0	0	126	22	6	1	22091	63	11.5727	8
23-16.15	86	308	728	15	23	35	30	8	4	3	0	0	0	0	0	126	23	6	2	18285	69	11.5737	16
23-16.21	87	300	754	21	26	31	29	8	8	1	0	0	0	0	0	126	26	6	3	6412	73	11.5744	21
23-16.29	88	300	745	29	28	30	21	21	0	3	0	0	0	0	0	126	28	6	4	2668	76	11.5759	30
23-16.31	88	305	724	31	24	38	21	12	7	0	1	0	0	0	0	126	24	7	5	13130	5497	11.5765	39
23-16.47	89	298	728	47	26	35	22	11	7	2	0	0	0	0	0	126	26	6	6	6415	91	11.5770	49
23-16.123	92	292	725	123	30	33	11	25	0	4	0	0	0	0	0	126	30	6	7	1289	145	11.5810	155
23-16.124	92	300	717	124	27	31	29	10	1	4	0	1	0	0	0	126	27	8	8	4520	20200	11.5823	231
23-16.537	97	270	776	537	36	27	8	25	3	4	0	0	0	0	0	126	36	6	9	208	338	11.5863	646
23-16.1	83	316	744	1	12	52	24	9	2	2	1	0	0	0	0	125	12	7	10	32307	5495	11.5703	1

k = 23, Designs sorted based on the number of clear two-factor interactions

Design	wlp(w_4,…)			wlp rank	alp											df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
23-16.9896	115	244	740	9896	45	6	27	4	15	0	0	3	0	0	123	45	8	189	1	23298	11.6118	18586
23-16.32406	140	140	1109	32406	44	18	0	1	12	17	1	0	0	0	116	44	7	3056	2	19930	11.6418	32819
23-16.32595	141	138	1102	32595	44	18	0	2	12	14	3	0	0	0	116	44	7	3057	3	19948	11.6430	32929
23-16.32597	141	138	1104	32597	44	18	0	0	17	11	2	1	0	0	116	44	8	3058	4	29387	11.6431	32933
23-16.32747	142	138	1095	32747	44	18	0	5	6	17	3	0	0	0	116	44	7	3059	5	19968	11.6446	33033
23-16.32751	142	138	1095	32751	44	18	0	3	12	11	5	0	0	0	116	44	7	3060	6	19972	11.6446	33036

k = 23, Designs sorted based on minimizing Lmax

Design	wlp(w_4,…)			wlp rank	alp												df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
23-16.2	83	318	734	2	14	54	11	17	6	0	0	0	0	0	0	125	14	5	11	31330	1	11.5704	2
23-16.3	84	312	744	3	0	58	26	1	11	0	0	0	0	0	0	119	0	5	472	34743	2	11.5713	3
23-16.4	84	319	726	4	12	54	16	10	9	0	0	0	0	0	0	124	12	5	51	32308	3	11.5722	6
23-16.10	86	304	753	10	18	37	27	10	8	0	0	0	0	0	0	123	18	5	96	28456	4	11.5734	13
23-16.11	86	305	740	11	4	53	23	6	10	0	0	0	0	0	0	119	4	5	473	34497	5	11.5734	10
23-16.18	87	290	790	18	22	42	11	21	6	0	0	0	0	0	0	125	22	5	15	22092	6	11.5732	9
23-16.22	87	304	750	22	22	42	11	21	6	0	0	0	0	0	0	125	22	5	17	22093	7	11.5750	24
23-16.24	88	284	820	24	24	28	24	19	5	0	0	0	0	0	0	123	24	5	97	13127	8	11.5742	18

k = 23, Design generators

Design	Design Generators															
23-16.1	7	11	19	25	26	31	35	45	46	77	81	92	100	106	118	120
23-16.2	7	11	19	30	38	57	60	70	73	76	84	93	99	110	118	120
23-16.3	7	11	19	29	37	59	62	73	87	94	99	106	111	117	118	120
23-16.4	7	11	19	29	41	47	49	59	62	77	82	92	97	110	116	120
23-16.5	7	11	19	29	35	46	53	57	73	76	82	100	109	118	120	123
23-16.6	7	11	19	29	37	41	47	55	59	74	82	84	102	108	120	126
23-16.7	7	11	19	29	37	41	49	55	59	70	76	87	89	90	116	120
23-16.8	7	11	19	29	37	38	41	50	60	63	69	73	91	106	113	120
23-16.9	7	11	21	26	28	38	57	63	73	82	95	99	110	119	120	125
23-16.10	7	11	19	29	37	41	47	59	77	78	84	91	99	102	119	120
23-16.11	7	11	19	29	37	41	50	60	63	69	73	82	99	102	106	120
23-16.12	7	11	19	29	37	41	55	59	77	78	82	87	91	99	116	120
23-16.13	7	11	19	22	35	38	57	60	63	73	87	93	103	109	114	120
23-16.14	7	11	19	29	37	41	47	55	59	82	99	109	110	113	116	120
23-16.15	7	11	19	29	30	38	41	47	70	84	89	90	99	106	108	120
23-16.16	7	11	19	25	26	35	45	53	67	78	86	92	100	103	106	120
23-16.17	7	11	19	29	35	37	41	50	60	63	73	87	94	102	111	120
23-16.18	7	11	19	38	57	60	70	73	76	81	84	93	99	110	118	120
23-16.21	7	11	19	29	37	41	49	55	59	70	87	89	90	106	116	120
23-16.22	7	11	19	29	37	41	47	49	55	62	77	82	92	97	116	120
23-16.24	7	11	19	30	38	41	44	49	59	69	76	93	97	111	117	120
23-16.29	7	11	21	28	38	42	57	76	83	90	95	101	111	118	120	123
23-16.31	7	11	19	29	37	41	59	73	76	79	85	91	99	109	113	120
23-16.47	7	11	19	29	37	41	50	59	73	76	79	85	99	109	113	120
23-16.123	7	11	19	29	35	37	41	55	73	74	76	82	94	102	116	120
23-16.124	7	11	19	25	26	28	35	45	53	54	67	73	86	103	114	120
23-16.537	7	11	19	29	35	37	41	55	59	73	74	76	82	94	102	120
23-16.9896	7	11	13	14	19	25	26	31	35	41	53	67	73	85	100	120
23-16.32406	7	11	13	14	19	21	38	41	44	50	55	61	62	93	101	120
23-16.32595	7	11	13	19	21	25	26	35	38	41	44	50	55	93	101	120
23-16.32597	7	11	13	19	25	26	28	35	41	44	47	61	62	78	118	120
23-16.32747	7	11	13	14	19	25	28	54	86	104	110	117	121	122	124	127
23-16.32751	7	11	13	19	21	25	35	38	41	44	47	50	55	93	101	120

k = 24, Designs sorted based on word length pattern

Design	$wlp(w_4, \ldots)$			wlp rank	alp										df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
24-17.1	102	384	992	1	0	54	16	24	0	4	0	0	0	0	122	0	6	120	27865	4	10.4617	1
24-17.2	102	394	985	2	7	57	9	17	12	0	0	0	0	0	126	7	5	7	26967	1	10.4631	2
24-17.3	103	393	972	3	14	39	31	7	9	3	0	0	0	0	127	14	6	1	24313	5	10.4643	3
24-17.4	104	392	960	4	15	36	33	12	0	7	0	0	0	0	127	15	6	2	24068	6	10.4655	7
24-17.5	105	372	1026	5	15	29	32	15	7	2	0	0	0	0	124	15	6	54	24069	7	10.4648	4
24-17.6	105	374	1008	6	3	37	40	3	11	2	0	0	0	0	120	3	6	248	27675	8	10.4649	5
24-17.7	105	378	988	7	5	45	24	13	9	2	0	0	0	0	122	5	6	121	27306	9	10.4653	6
24-17.8	105	400	930	8	4	53	32	6	0	4	2	1	0	0	126	4	8	8	27392	10050	10.4679	11
24-17.9	105	405	928	9	8	42	42	3	0	3	4	0	0	0	126	8	7	9	26390	1118	10.4687	15
24-17.10	106	374	1000	10	0	47	29	9	7	4	0	0	0	0	120	0	6	249	27866	10	10.4663	8
24-17.11	107	370	994	11	9	38	27	12	10	2	0	0	0	0	122	9	6	122	26199	11	10.4671	10
24-17.12	107	380	988	12	12	48	12	24	3	0	3	0	0	0	126	12	7	10	25053	1119	10.4686	14
24-17.13	108	352	1072	13	16	48	0	26	12	0	0	0	0	0	126	16	5	11	22970	2	10.4668	9
24-17.14	108	367	996	14	0	53	18	12	10	3	0	0	0	0	120	0	6	250	27867	12	10.4682	12
24-17.15	108	370	987	15	10	37	28	8	14	1	0	0	0	0	122	10	6	123	25868	13	10.4686	13
24-17.16	108	373	1012	16	16	48	0	26	12	0	0	0	0	0	126	16	5	12	22971	3	10.4693	18
24-17.17	109	363	1000	17	13	31	29	14	8	3	0	0	0	0	122	13	6	124	24822	14	10.4692	16
24-17.18	109	366	1006	18	17	30	28	13	9	3	0	0	0	0	124	17	6	55	22403	15	10.4697	22
24-17.19	109	367	988	19	4	43	26	11	8	4	0	0	0	0	120	4	6	253	27393	16	10.4696	19
24-17.20	109	367	988	19	3	44	27	11	7	3	1	0	0	0	120	3	7	251	27676	1120	10.4696	19

k = 24, Designs sorted based on degrees of freedom used

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
24-17.3	103 393 972	3	14 39 31 7 9 3 0 0 0 0 0 0	127	14	6	1	24313	5	10.4643	3
24-17.4	104 392 960	4	15 36 33 12 0 7 0 0 0 0 0 0	127	15	6	2	24068	6	10.4655	7
24-17.22	109 373 968	22	20 34 25 12 8 3 1 0 0 0 0 0	127	20	7	3	19896	1122	10.4703	25
24-17.35	111 364 996	35	24 30 16 27 3 0 3 0 0 0 0 0	127	24	7	4	9940	1126	10.4723	45
24-17.91	115 356 972	91	24 39 0 33 3 1 3 0 0 0 0 0	127	24	7	5	9941	1157	10.4768	133
24-17.94	115 364 964	94	24 26 32 11 4 4 1 0 1 0 0 0	127	24	9	6	9943	20625	10.4779	178
24-17.2	102 394 985	2	7 57 9 17 12 0 0 0 0 0 0 0	126	7	5	7	26967	1	10.4631	2
24-17.8	105 400 930	8	4 53 32 6 0 4 2 1 0 0 0 0	126	4	8	8	27392	10050	10.4679	11
24-17.9	105 405 928	9	8 42 42 3 0 3 4 0 0 0 0 0	126	8	7	9	26390	1118	10.4687	15
24-17.12	107 380 988	12	12 48 12 24 3 0 3 0 0 0 0 0	126	12	7	10	25053	1119	10.4686	14

k = 24, Designs sorted based on the number of clear two-factor interactions

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
24-17.28100	250 54 2304	28100	45 0 0 0 0 1 15 15 0 0	100	45	8	28068	1	20624	10.6570	28100
24-17.28101a	251 53 2296	28101	45 0 0 0 0 1 17 12 0 1	100	45	10	28069	2	27802	10.6583	28101
24-17.28101b	251 53 2296	28101	45 0 0 0 0 2 15 12 2 0	100	45	9	28069	2	26133	10.6583	28101
24-17.28101c	251 53 2296	28101	45 0 0 0 0 2 15 12 2 0	100	45	9	28069	2	26133	10.6583	28101
24-17.28104	251 54 2296	28104	45 0 0 0 0 2 15 12 2 0	100	45	9	28072	5	26135	10.6584	28104
24-17.28105	251 55 2296	28105	45 0 0 0 0 2 15 12 2 0	100	45	9	28073	6	26136	10.6586	28105
24-17.28106	251 56 2296	28106	45 0 0 0 0 1 17 12 0 1	100	45	10	28074	7	27803	10.6588	28106
24-17.28107	252 52 2288	28107	45 0 0 0 0 4 12 12 3 0	100	45	9	28075	8	26137	10.6595	28107

k = 24, Designs sorted based on minimizing Lmax

Design	wlp(w_4,…)			wlp rank	alp									df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
24-17.2	102	394	985	2	7	57	9	17	12	0	0	0	0	126	7	5	7	26967	1	10.4631	2
24-17.13	108	352	1072	13	16	48	0	26	12	0	0	0	0	126	16	5	11	22970	2	10.4668	9
24-17.16	108	373	1012	16	16	48	0	26	12	0	0	0	0	126	16	5	12	22971	3	10.4693	18
24-17.1	102	384	992	1	0	54	16	24	0	4	0	0	0	122	0	6	120	27865	4	10.4617	1
24-17.3	103	393	972	3	14	39	31	7	9	3	0	0	0	127	14	6	1	24313	5	10.4643	3
24-17.4	104	392	960	4	15	36	33	12	0	7	0	0	0	127	15	6	2	24068	6	10.4655	7
24-17.5	105	372	1026	5	15	29	32	15	7	2	0	0	0	124	15	6	54	24069	7	10.4648	4
24-17.6	105	374	1008	6	3	37	40	3	11	2	0	0	0	120	3	6	248	27675	8	10.4649	5
24-17.7	105	378	988	7	5	45	24	13	9	2	0	0	0	122	5	6	121	27306	9	10.4653	6
24-17.10	106	374	1000	10	0	47	29	9	7	4	0	0	0	120	0	6	249	27866	10	10.4663	8

k = 24, Design generators

Design	Design Generators																
24-17.1	7	11	19	29	35	46	53	57	73	76	82	87	100	109	118	120	123
24-17.2	7	11	19	30	38	57	60	70	73	76	81	84	93	99	110	118	120
24-17.3	7	11	19	29	41	47	49	59	62	77	82	92	97	110	116	119	120
24-17.4	7	11	19	29	37	38	41	50	60	63	69	73	82	91	106	113	120
24-17.5	7	11	21	26	28	38	57	63	73	76	82	95	99	110	119	120	125
24-17.6	7	11	19	29	35	53	57	73	76	82	94	98	100	109	118	120	123
24-17.7	7	11	19	29	35	46	53	57	73	76	82	94	100	109	118	120	123
24-17.8	7	11	19	25	26	35	45	53	63	67	78	86	92	100	103	106	120
24-17.9	7	11	19	29	35	37	41	50	60	63	73	87	94	102	111	113	120
24-17.10	7	11	19	29	37	41	59	62	73	82	87	99	106	111	117	118	120
24-17.11	7	11	19	29	38	41	44	55	62	69	76	89	90	98	111	120	125
24-17.12	7	11	19	30	38	41	44	49	52	61	74	87	93	101	111	114	120
24-17.13	7	11	19	38	57	60	70	73	76	81	84	91	93	99	110	118	120
24-17.14	7	11	19	21	38	41	52	62	69	79	87	89	100	106	114	120	125
24-17.15	7	11	19	29	37	41	47	55	59	62	82	99	109	110	113	116	120
24-17.16	7	11	19	29	37	41	47	49	55	59	62	77	78	82	84	91	120
24-17.17	7	11	19	29	37	41	49	55	59	62	77	78	91	97	98	111	120
24-17.18	7	11	19	29	37	41	47	49	59	62	69	84	89	90	99	102	120
24-17.19	7	11	19	29	37	41	44	62	73	76	87	99	106	111	117	118	120
24-17.20	7	11	19	29	35	44	53	57	73	76	82	94	100	109	118	120	123
24-17.22	7	11	19	29	37	38	41	50	60	63	69	73	76	82	91	113	120
24-17.35	7	11	21	28	38	42	57	76	83	90	95	101	105	111	118	120	123
24-17.91	7	11	19	29	35	37	41	55	59	73	74	76	82	94	102	116	120
24-17.94	7	11	19	25	26	35	41	53	54	59	69	70	82	106	116	119	120
24-17.28100	7	19	21	22	35	37	38	49	67	69	81	87	92	100	103	112	117
24-17.28101a	7	19	21	22	35	37	38	49	55	67	81	84	95	100	103	112	117
24-17.28101b	7	19	21	22	35	37	38	49	50	67	70	81	84	95	97	100	112
24-17.28101c	7	19	21	22	35	37	38	49	67	69	81	82	87	97	111	112	118
24-17.28104	7	19	21	22	35	37	38	49	55	67	69	81	84	95	100	103	112
24-17.28105	7	19	21	22	35	37	38	49	67	81	87	92	100	103	112	115	117
24-17.28106	7	19	21	22	35	37	38	49	67	81	82	87	92	100	103	112	115
24-17.28107	7	19	21	22	35	37	38	49	63	67	81	82	84	87	97	112	117

k = 25, Designs sorted based on word length pattern

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
25-18.1	124 482 1312	1	0 64 0 18 20 0 0 0 0	127	0	5	1	20240	1	9.4697	1
25-18.2	125 504 1222	2	0 41 48 6 0 0 6 1 0	127	0	8	2	20241	3424	9.4730	3
25-18.3	126 468 1304	3	0 42 28 12 12 4 0 0 0	123	0	6	45	20242	2	9.4704	2
25-18.4	129 458 1310	4	5 33 34 7 15 4 0 0 0	123	5	6	46	19619	3	9.4732	4
25-18.5	130 449 1341	5	0 36 33 14 6 6 1 0 0	121	0	7	111	20243	98	9.4736	5
25-18.6	131 448 1324	6	9 26 35 12 10 6 0 0 0	123	9	6	47	18698	4	9.4747	6
25-18.7	132 449 1325	7	0 38 30 14 10 0 4 0 0	121	0	7	112	20244	99	9.4761	7
25-18.8	133 440 1350	8	15 24 29 17 9 5 1 0 0	125	15	7	19	16697	100	9.4765	8
25-18.9	133 442 1326	9	0 43 20 20 5 7 1 0 0	121	0	7	113	20245	101	9.4765	10
25-18.10	133 442 1326	10	3 34 29 17 5 7 1 0 0	121	3	7	115	19942	103	9.4765	9
25-18.11	133 442 1326	10	0 39 31 10 9 5 2 0 0	121	0	7	114	20246	102	9.4765	10
25-18.12	134 444 1280	12	0 54 16 0 24 4 0 0 0	123	0	6	48	20247	5	9.4777	12
25-18.13	135 432 1348	13	12 18 43 3 15 6 0 0 0	122	12	6	95	17805	6	9.4781	13
25-18.14	135 435 1320	14	3 36 29 12 6 10 0 0 0	121	3	6	117	19943	8	9.4782	14
25-18.15a	135 435 1320	14	0 30 35 15 3 10 0 0 0	118	0	6	706	20248	9	9.4782	14
25-18.15b	135 435 1320	14	0 45 20 15 6 10 0 0 0	121	0	6	116	20248	7	9.4782	14
25-18.17	135 442 1310	17	0 44 18 21 9 0 3 1 0	121	0	8	118	20250	3425	9.4791	17
25-18.18	135 442 1310	18	0 38 36 3 15 0 3 1 0	121	0	8	119	20251	3426	9.4791	18
25-18.19	136 432 1338	19	15 24 37 3 12 9 0 0 0	125	15	6	20	16698	10	9.4794	20
25-18.20	136 435 1317	20	3 39 20 21 6 4 3 0 0	121	3	7	120	19944	104	9.4796	21

k = 25, Designs sorted based on degrees of freedom used

Design	wlp(w_4,…)			wlp rank	alp												df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
25-18.1	124	482	1312	1	0	64	0	18	20	0	0	0	0	0			127	0	5	1	20240	1	9.4697	1
25-18.2	125	504	1222	2	0	41	48	6	0	0	6	1	0	0			127	0	8	2	20241	3424	9.4730	3
25-18.27	138	448	1296	27	12	48	0	27	12	0	0	3	0	0			127	12	8	3	17806	3427	9.4839	44
25-18.51	142	416	1344	51	20	30	20	10	16	4	0	2	0	0			127	20	8	4	14176	3437	9.4854	66
25-18.63	143	419	1312	63	25	16	36	0	20	0	5	0	0	0			127	25	7	5	4870	130	9.4868	104
25-18.134	146	408	1336	134	25	22	22	14	9	8	0	2	0	0			127	25	8	6	4871	3481	9.4896	239
25-18.136	146	440	1232	136	12	53	0	17	12	6	0	1	0	1			127	12	10	7	17814	17107	9.4929	570
25-18.193	147	423	1280	193	20	32	22	0	25	0	1	0	2	0			127	20	9	8	14184	11141	9.4925	521
25-18.874	154	400	1296	874	28	22	16	16	12	5	0	2	0	1			127	28	10	9	988	17188	9.4990	1767
25-18.988	155	367	1440	988	36	0	42	0	15	0	9	0	0	0			127	36	7	10	44	176	9.4973	1366
25-18.1021	155	399	1280	1021	36	0	39	0	24	0	0	0	3	0			127	36	9	11	45	11472	9.5000	2053
25-18.1022	155	415	1232	1022	23	32	18	0	24	0	4	0	0	0	1		127	23	11	12	13544	19796	9.5017	2559
25-18.2757	163	359	1392	2757	39	0	36	0	21	0	3	0	3	0	0		127	39	9	13	43	12242	9.5066	4973
25-18.59	143	404	1386	59	20	31	10	25	4	10	0	1	0	0	0		126	20	8	14	14178	3440	9.4855	71
25-18.137	146	456	1184	137	0	72	0	0	24	4	0	0	0	0	0	1	126	0	12	15	20267	20477	9.4946	796

k = 25, Designs sorted based on the number of clear two-factor interactions

Design	wlp(w_4,…)			wlp rank	alp										df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
25-18.20549a	304	61	3105	20549	47	0	0	0	0	0	3	21	6	1	103	47	10	20527	1	19773	9.6836	20549
25-18.20549b	304	61	3105	20549	47	0	0	0	0	0	4	18	9	0	103	47	9	20527	1	17104	9.6836	20549
25-18.20551	304	62	3105	20551	47	0	0	0	0	0	4	18	9	0	103	47	9	20529	3	17105	9.6837	20551
25-18.20552	304	63	3105	20552	47	0	0	0	0	0	3	21	6	1	103	47	10	20530	4	19774	9.6839	20552
25-18.20553	305	60	3096	20553	47	0	0	0	0	0	6	15	9	1	103	47	10	20531	5	19775	9.6847	20553
25-18.20554	305	61	3096	20554	47	0	0	0	0	0	6	15	9	1	103	47	10	20532	6	19776	9.6848	20554
25-18.20555	305	61	3096	20555	47	0	0	0	0	0	6	15	9	1	103	47	10	20533	7	19777	9.6848	20555
25-18.20556	305	62	3096	20556	47	0	0	0	0	0	6	15	9	1	103	47	10	20534	8	19778	9.6850	20556
25-18.20557	306	60	3089	20557	47	0	0	0	0	0	8	12	9	2	103	47	10	20535	9	19779	9.6860	20557

k = 25, Designs sorted based on minimizing Lmax

Design	wlp(w_4,…)			wlp rank	alp												df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
25-18.1	124	482	1312	1	0	64	0	18	20	0	0	0	0	0	0	0	127	0	5	1	20240	1	9.4697	1
25-18.3	126	468	1304	3	0	42	28	12	12	4	0	0	0	0	0	0	123	0	6	45	20242	2	9.4704	2
25-18.4	129	458	1310	4	5	33	34	7	15	4	0	0	0	0	0	0	123	5	6	46	19619	3	9.4732	4
25-18.6	131	448	1324	6	9	26	35	12	10	6	0	0	0	0	0	0	123	9	6	47	18698	4	9.4747	6
25-18.12	134	444	1280	12	0	54	16	0	24	4	0	0	0	0	0	0	123	0	6	48	20247	5	9.4777	12
25-18.13	135	432	1348	13	12	18	43	3	15	6	0	0	0	0	0	0	122	12	6	95	17805	6	9.4781	13
25-18.15b	135	435	1320	14	0	45	20	15	6	10	0	0	0	0	0	0	121	0	6	116	20248	7	9.4782	14
25-18.14	135	435	1320	14	3	36	29	12	6	10	0	0	0	0	0	0	121	3	6	117	19943	7	9.4782	14
25-18.15a	135	435	1320	14	0	30	35	15	3	10	0	0	0	0	0	0	118	0	6	706	20248	7	9.4782	14
25-18.19	136	432	1338	19	15	24	37	3	12	9	0	0	0	0	0	0	125	15	6	20	16698	10	9.4794	20

k = 25, Design generators

Design	Design Generators
25-18.1	7 11 19 29 37 41 47 49 55 59 62 77 78 82 84 91 102 120
25-18.2	7 11 19 25 26 35 45 53 63 67 78 86 92 100 103 106 114 120
25-18.3	7 11 19 29 35 46 53 57 60 73 76 82 87 100 109 118 120 123
25-18.4	7 11 19 30 38 47 57 69 73 79 82 84 93 97 98 108 119 120
25-18.5	7 11 13 19 21 38 41 55 59 70 73 87 91 99 101 106 116 120
25-18.6	7 11 19 29 37 41 49 55 59 77 78 91 97 98 111 116 120 125
25-18.7	7 11 19 29 37 41 55 59 77 78 82 87 91 99 102 106 116 120
25-18.8	7 11 19 29 37 44 50 52 59 62 73 82 87 106 111 117 118 120
25-18.9	7 11 19 29 37 41 59 73 76 82 87 94 99 106 111 117 118 120
25-18.10	7 11 19 29 37 44 50 59 62 73 82 87 99 106 111 117 118 120
25-18.11	7 11 13 19 31 38 41 55 59 70 73 87 91 99 101 106 116 120
25-18.12	7 11 19 29 35 46 53 57 69 73 76 82 87 100 109 118 120 123
25-18.13	7 11 19 30 38 47 52 57 69 73 79 82 84 93 97 98 119 120
25-18.14	7 11 19 29 35 53 57 69 73 76 82 94 98 100 109 118 120 123
25-18.15a	7 11 19 29 35 53 57 70 73 76 82 94 97 100 109 118 120 123
25-18.15b	7 11 13 19 21 38 41 52 62 69 79 87 89 100 106 114 120 125
25-18.17	7 11 19 29 37 50 59 62 73 76 82 87 99 106 111 117 118 120
25-18.18	7 11 19 29 37 59 62 73 76 82 87 91 99 106 111 117 118 120
25-18.19	7 11 19 29 30 38 41 50 60 78 82 87 91 100 106 117 118 120
25-18.20	7 11 19 29 35 38 41 44 50 55 69 73 82 92 95 100 120 125
25-18.27	7 11 19 29 30 38 57 60 70 89 92 99 109 110 117 118 120 123
25-18.51	7 11 13 14 19 22 26 41 53 60 73 74 76 85 97 103 120 126
25-18.59	7 11 21 26 28 42 44 51 77 78 95 104 107 112 118 121 122 124
25-18.63	7 11 19 29 35 46 53 69 70 73 79 81 87 94 109 118 120 123
25-18.134	7 11 13 14 19 35 38 44 57 58 69 81 82 87 93 106 111 120
25-18.136	7 11 13 30 35 53 54 67 85 86 102 104 112 115 121 122 124 127
25-18.137	7 11 19 22 25 26 28 31 35 45 46 67 77 78 117 118 120 123
25-18.193	7 11 13 30 35 53 54 78 85 86 102 104 112 115 121 122 124 127
25-18.874	7 11 19 29 35 45 52 58 67 69 70 73 74 79 81 97 118 120
25-18.988	7 27 30 35 41 42 44 67 74 82 87 101 104 112 121 122 124 127
25-18.1021	7 11 19 29 35 45 58 67 69 70 73 74 79 81 97 118 120 123
25-18.1022	7 11 13 14 19 22 26 31 41 53 60 73 85 92 97 100 109 120
25-18.2757	7 11 13 14 19 22 25 26 35 41 60 85 92 95 103 114 120 123
25-18.20549a	7 19 21 22 35 37 38 49 55 67 69 81 84 95 100 103 112 117
25-18.20549b	7 19 21 22 35 37 38 49 52 67 69 70 81 87 97 111 112 115
25-18.20551	7 19 21 22 35 37 38 49 67 69 70 81 87 97 100 111 112 115
25-18.20552	7 19 21 22 35 37 38 49 52 67 81 82 87 92 100 103 112 115
25-18.20553	7 19 21 22 35 37 38 49 67 69 81 82 87 97 111 112 115 118
25-18.20554	7 19 21 22 35 37 38 49 50 67 69 70 81 87 97 111 112 115
25-18.20555	7 19 21 22 35 37 38 49 67 69 70 81 87 97 98 111 112 115
25-18.20556	7 19 21 22 35 37 38 67 69 81 82 87 92 100 103 112 117 118
25-18.20557	7 19 21 22 35 37 38 49 67 69 70 81 82 87 97 111 112 115

k = 26, Designs sorted based on word length pattern

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
26-19.1	152 568 1704	1	0 29 41 4 16 8 0 0 0 0 0 0 0	124	0	6	13	13068	1	8.5797	1
26-19.2	155 555 1720	2	5 20 45 5 13 10 0 0 0 0 0 0 0	124	5	6	14	12525	2	8.5819	2
26-19.3	160 530 1767	3	0 30 30 20 6 5 5 0 0 0 0 0 0	122	0	7	43	13069	8	8.5854	3
26-19.4	161 530 1758	4	0 33 23 25 5 6 3 1 0 0 0 0 0	122	0	8	44	13070	708	8.5865	4
26-19.5	163 520 1783	5	15 18 27 19 15 0 6 0 0 0 0 0 0	126	15	7	3	10630	9	8.5879	5
26-19.6	163 523 1752	6	0 36 19 25 6 4 6 0 0 0 0 0 0	122	0	7	45	13071	10	8.5880	6
26-19.7	163 523 1752	7	3 30 19 31 3 4 6 0 0 0 0 0 0	122	3	7	46	12806	11	8.5880	6
26-19.8	164 523 1743	8	0 33 29 14 10 6 2 2 0 0 0 0 0	122	0	8	47	13072	709	8.5892	8
26-19.9	164 536 1664	9	0 42 28 0 12 15 1 0 0 0 0 0 0	124	0	7	15	13073	12	8.5900	9
26-19.10	166 516 1737	10	0 39 17 21 9 3 7 0 0 0 0 0 0	122	0	7	48	13074	13	8.5907	10
26-19.11	167 516 1728	11	0 42 8 30 6 6 1 3 0 0 0 0 0	122	0	8	49	13075	710	8.5918	12
26-19.12	168 492 1912	12	24 3 27 31 6 6 0 3 0 0 0 0 0	126	24	8	4	8959	711	8.5918	11
26-19.13	168 524 1672	13	5 33 32 2 9 14 3 0 0 0 0 0 0	124	5	7	16	12526	14	8.5935	15
26-19.14	169 490 1830	14	8 22 24 29 1 5 6 1 0 0 0 0 0	122	8	8	50	11866	712	8.5920	13
26-19.15	169 509 1722	15	3 33 24 14 12 2 8 0 0 0 0 0 0	122	3	7	51	12807	15	8.5933	14
26-19.16	170 506 1746	16	15 21 30 13 6 9 6 0 0 0 0 0 0	126	15	7	5	10631	16	8.5944	19
26-19.17	170 509 1725	17	0 42 16 15 13 4 4 2 0 0 0 0 0	122	0	8	52	13076	713	8.5946	21

k = 26, Designs sorted based on degrees of freedom used

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
26-19.224	181 468 1808	224	20 31 0 31 8 0 10 0 1 0 0 0 0	127	20	9	1	9213	4570	8.6037	370
26-19.997	190 528 1520	997	0 72 0 0 0 28 0 0 0 0 0 0 1	127	0	13	2	13371	13476	8.6194	4435
26-19.5	163 520 1783	5	15 18 27 19 15 0 6 0 0 0 0 0 0	126	15	7	3	10630	9	8.5879	5
26-19.12	168 492 1912	12	24 3 27 31 6 6 0 3 0 0 0 0 0	126	24	8	4	8959	711	8.5918	11
26-19.16	170 506 1746	16	15 21 30 13 6 9 6 0 0 0 0 0 0	126	15	7	5	10631	16	8.5944	19
26-19.48	176 484 1848	48	24 3 30 34 0 0 3 6 0 0 0 0 0	126	24	8	6	8960	732	8.5999	113
26-19.49	176 486 1758	49	18 22 20 19 8 7 3 3 0 0 0 0 0	126	18	8	7	9448	733	8.5994	87
26-19.935	190 418 1978	935	24 21 18 10 9 9 6 3 0 0 0 0 0	126	24	8	8	8961	786	8.6102	1197
26-19.1462	194 414 1950	1462	27 18 15 13 12 6 3 6 0 0 0 0 0	126	27	8	9	1151	791	8.6143	2180
26-19.1063	191 416 1939	1063	24 12 24 24 0 0 13 0 2 0 0 0 0	125	24	9	10	8962	4949	8.6109	1312
26-19.1187	192 412 1932	1187	24 14 20 26 0 1 11 1 2 0 0 0 0	125	24	9	11	8963	5004	8.6115	1449
26-19.1460	194 412 1912	1460	24 18 12 30 0 1 12 0 1 1 0 0 0	125	24	10	12	8964	9542	8.6137	2037
26-19.1	152 568 1704	1	0 29 41 4 16 8 0 0 0 0 0 0 0	124	0	6	13	13068	1	8.5797	1
26-19.2	155 555 1720	2	5 20 45 5 13 10 0 0 0 0 0 0 0	124	5	6	14	12525	2	8.5819	2
26-19.9	164 536 1664	9	0 42 28 0 12 15 1 0 0 0 0 0 0	124	0	7	15	13073	12	8.5900	9

k = 26, Designs sorted based on the number of clear two-factor interactions

Design	wlp(w_4,...)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
26-19.13485	365 70 4138	13485	49 0 0 0 0 0 0 6 22 3 0 0 0	106	49	10	13472	1	12014	8.8115	13485
26-19.13486	365 71 4138	13486	49 0 0 0 0 0 0 6 22 3 0 0 0	106	49	10	13473	2	12015	8.8117	13486
26-19.13487	366 69 4129	13487	49 0 0 0 0 0 0 9 16 6 0 0 0	106	49	10	13474	3	12016	8.8125	13487
26-19.13488	366 70 4128	13488	49 0 0 0 0 0 0 9 16 6 0 0 0	106	49	10	13475	4	12017	8.8127	13488
26-19.13489	366 70 4129	13489	49 0 0 0 0 0 0 9 16 6 0 0 0	106	49	10	13476	5	12018	8.8127	13489
26-19.13490	366 71 4129	13490	49 0 0 0 0 0 0 9 16 6 0 0 0	106	49	10	13477	6	12019	8.8128	13490
26-19.13491	367 69 4120	13491	49 0 0 0 0 0 0 11 13 6 1 0 0	106	49	11	13478	7	13214	8.8137	13491
26-19.13492	367 71 4120	13492	49 0 0 0 0 0 0 11 13 6 1 0 0	106	49	11	13479	8	13215	8.8139	13492
26-19.13493	369 68 4106	13493	49 0 0 0 0 0 0 16 4 9 2 0 0	106	49	11	13480	9	13216	8.8158	13493
26-19.13494	369 69 4106	13494	49 0 0 0 0 0 0 16 4 9 2 0 0	106	49	11	13481	10	13217	8.8160	13494

k = 26, Designs sorted based on minimizing Lmax

Design	wlp(w_4,...)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
26-19.1	152 568 1704	1	0 29 41 4 16 8 0 0 0 0 0 0 0	124	0	6	13	13068	1	8.5797	1
26-19.2	155 555 1720	2	5 20 45 5 13 10 0 0 0 0 0 0 0	124	5	6	14	12525	2	8.5819	2
26-19.1862	198 237 2813	1862	25 0 2 18 30 12 0 0 0 0 0 0 0	113	25	6	3692	4678	3	8.6050	503
26-19.2093	200 235 2795	2093	25 0 10 0 42 10 0 0 0 0 0 0 0	113	25	6	3733	4680	4	8.6070	742
26-19.2095a	200 236 2795	2095	25 0 1 27 15 19 0 0 0 0 0 0 0	113	25	6	3736	4682	5	8.6071	765
26-19.2098	200 237 2795	2098	25 0 4 18 24 16 0 0 0 0 0 0 0	113	25	6	3738	4685	6	8.6073	784
26-19.2612b	204 231 2779	2612	25 0 10 12 18 22 0 0 0 0 0 0 0	113	25	6	3883	4751	7	8.6113	1387
26-19.3	160 530 1767	3	0 30 30 20 6 5 5 0 0 0 0 0 0	122	0	7	43	13069	8	8.5854	3
26-19.5	163 520 1783	5	15 18 27 19 15 0 6 0 0 0 0 0 0	126	15	7	3	10630	9	8.5879	5
26-19.6	163 523 1752	6	0 36 19 25 6 4 6 0 0 0 0 0 0	122	0	7	45	13071	10	8.5880	6

k = 26, Design generators

Design	Design Generators
26-19.1	7 11 19 29 37 41 49 55 59 77 78 87 91 97 98 111 116 120 125
26-19.2	7 11 19 30 38 47 52 57 58 69 73 79 82 84 93 97 98 119 120
26-19.3	7 11 13 19 21 31 38 41 55 59 70 73 87 91 99 101 106 116 120
26-19.4	7 11 19 29 37 41 50 55 59 77 78 82 87 91 99 102 106 116 120
26-19.5	7 11 19 29 35 38 41 44 50 55 69 73 92 95 100 103 113 120 125
26-19.6	7 11 19 29 37 41 44 59 73 76 82 87 94 99 106 111 117 118 120
26-19.7	7 11 19 29 35 38 41 44 50 55 69 73 82 92 95 100 103 120 125
26-19.8	7 11 19 29 37 41 44 55 59 77 78 82 87 91 99 102 106 116 120
26-19.9	7 11 19 29 35 46 53 57 60 69 73 76 82 87 100 109 118 120 123
26-19.10	7 11 19 29 37 41 44 55 59 73 76 82 87 100 103 106 113 120 125
26-19.11	7 11 19 29 35 38 41 44 50 55 69 73 82 92 95 97 100 120 125
26-19.12	7 27 29 30 35 37 38 41 49 67 69 76 84 104 112 121 122 124 127
26-19.13	7 11 19 30 38 41 49 50 52 77 78 82 84 91 97 108 119 120 126
26-19.14	7 11 19 29 30 38 41 49 60 78 82 87 91 97 98 100 117 118 120
26-19.15	7 11 19 29 37 41 44 50 55 59 73 76 87 100 103 106 113 120 125
26-19.16	7 11 19 29 38 41 47 49 70 79 89 90 99 106 108 114 116 120 123
26-19.17	7 11 14 19 35 37 38 41 52 59 69 70 89 90 95 103 106 117 120
26-19.48	7 11 19 29 30 35 37 38 41 42 50 60 69 73 76 113 116 120 125
26-19.49	7 11 19 29 35 37 38 41 44 50 55 69 73 92 95 100 113 120 125
26-19.224	7 11 19 22 28 38 52 57 69 70 73 79 82 84 93 98 108 119 120
26-19.935	7 11 13 21 26 47 51 54 78 81 100 104 107 109 112 121 122 124 127
26-19.997	7 11 19 21 22 25 26 28 31 35 45 46 67 77 78 117 118 120 123
26-19.1063	7 11 13 14 19 38 57 60 73 85 95 101 106 113 114 116 120 125 126
26-19.1187	7 11 13 19 25 26 41 53 59 78 86 95 97 98 104 112 121 122 124
26-19.1460	7 11 19 29 30 38 41 47 70 81 82 84 87 99 101 121 122 124 127
26-19.1462	7 11 19 29 37 38 41 42 44 50 62 77 78 85 89 99 111 118 120
26-19.1862	7 11 21 26 35 37 41 52 59 74 79 86 100 103 104 112 121 122 124
26-19.2093	7 11 21 26 35 37 41 52 59 61 74 79 86 100 104 112 121 122 124
26-19.2095a	7 11 21 26 35 37 41 52 56 74 79 86 100 103 104 112 121 122 124
26-19.2098	7 11 21 26 35 37 41 52 59 61 79 86 100 103 104 112 121 122 124
26-19.2612b	7 11 22 25 31 35 46 50 52 69 93 98 103 104 109 112 121 122 124
26-19.13485	7 19 21 22 35 37 38 49 52 67 69 70 81 87 97 98 111 112 115
26-19.13486	7 19 21 22 35 37 38 49 50 67 69 70 81 87 97 100 111 112 115
26-19.13487	7 19 21 22 35 37 38 49 52 67 69 70 81 82 87 97 111 112 115
26-19.13488	7 19 21 22 35 37 38 67 69 81 82 87 92 98 100 103 112 117 118
26-19.13489	7 19 21 22 35 37 38 49 50 52 67 69 70 81 87 97 111 112 115
26-19.13490	7 19 21 22 35 37 38 49 50 67 69 70 81 84 98 112 117 118 123
26-19.13491	7 19 21 22 35 37 38 49 50 67 69 70 81 82 87 97 111 112 115
26-19.13492	7 19 21 22 35 37 38 49 50 52 67 81 82 87 92 100 103 112 115
26-19.13493	7 19 21 22 35 37 38 49 50 67 69 70 81 82 84 87 97 111 112
26-19.13494	7 19 21 22 35 37 38 49 67 69 70 81 82 84 87 97 111 112 118

k = 27, Designs sorted based on word length pattern

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
27-20.1	180 690 2200	1	0 15 55 0 12 16 0 0 0 0 0 0 0	125	0	6	6	7696	1	7.7798	1
27-20.2	195 624 2304	2	0 30 12 39 3 2 9 0 1 0 0 0 0	123	0	9	19	7697	1326	7.7898	2
27-20.3	196 646 2152	3	0 29 41 0 4 18 6 0 0 0 0 0 0	125	0	7	7	7698	3	7.7920	5
27-20.4a	197 617 2296	4	0 33 9 35 9 0 7 3 0 0 0 0 0	123	0	8	20	7699	71	7.7912	3
27-20.4b	197 617 2296	4	0 30 18 26 12 0 7 3 0 0 0 0 0	123	0	8	20	7699	71	7.7912	3
27-20.6	200 610 2278	6	0 33 15 24 14 0 6 4 0 0 0 0 0	123	0	8	22	7701	73	7.7935	6
27-20.7	200 630 2172	7	5 20 45 0 7 11 10 0 0 0 0 0 0	125	5	7	8	7316	4	7.7948	8
27-20.8	201 610 2274	8	0 30 24 16 15 1 8 0 2 0 0 0 0	123	0	9	23	7702	1327	7.7946	7
27-20.9	202 588 2488	9	24 0 16 45 0 12 0 0 3 0 0 0 0	127	24	9	1	5505	1328	7.7950	9
27-20.10	203 603 2266	10	0 36 12 22 16 0 5 5 0 0 0 0 0	123	0	8	24	7703	74	7.7959	10
27-20.11	206 596 2248	11	3 30 18 17 18 0 4 6 0 0 0 0 0	123	3	8	25	7499	75	7.7983	13
27-20.12	207 592 2279	12	15 18 22 24 0 15 0 6 0 0 0 0 0	127	15	8	2	5934	76	7.7992	17
27-20.13	207 596 2244	13	0 42 0 29 15 0 7 0 3 0 0 0 0	123	0	9	26	7704	1329	7.7993	20
27-20.14	208 566 2488	14	20 2 33 6 28 6 0 0 2 1 0 0 0	125	20	10	9	5541	3728	7.7992	16
27-20.15	209 565 2384	15	8 22 16 28 10 2 3 7 0 0 0 0 0	123	8	8	27	6937	77	7.7993	18
27-20.16	210 546 2512	16	18 9 28 9 18 13 0 0 3 0 0 0 0	125	18	9	10	5651	1330	7.7993	19
27-20.17	210 548 2472	17	8 6 48 1 18 6 0 6 1 0 0 0 0	121	8	9	83	6938	1331	7.7994	21
27-20.18a	210 562 2314	18	0 3 29 42 6 0 0 3 4 0 0 0 0	114	0	9	6488	7705	1332	7.7995	24
27-20.18b	210 562 2314	18	0 3 27 48 0 2 0 3 4 0 0 0 0	114	0	9	6488	7705	1332	7.7995	24
27-20.20	210 563 2314	20	0 3 29 42 6 0 0 3 4 0 0 0 0	114	0	9	6490	7707	1334	7.7997	27

k = 27, Designs sorted based on degrees of freedom used

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
27-20.9	202 588 2488	9	24 0 16 45 0 12 0 0 3 0 0 0 0	127	24	9	1	5505	1328	7.7950	9
27-20.12	207 592 2279	12	15 18 22 24 0 15 0 6 0 0 0 0 0	127	15	8	2	5934	76	7.7992	17
27-20.23	210 580 2416	23	24 0 16 51 0 0 0 6 3 0 0 0 0	127	24	9	3	5506	1337	7.8022	67
27-20.1023	234 484 2576	1023	24 18 16 15 0 18 0 6 3 0 0 0 0	127	24	9	4	5507	1425	7.8195	2110
27-20.1221	237 472 2543	1221	24 12 12 36 0 0 1 12 0 2 0 0 0	126	24	10	5	5508	4315	7.8212	2635
27-20.1	180 690 2200	1	0 15 55 0 12 16 0 0 0 0 0 0 0	125	0	6	6	7696	1	7.7798	1
27-20.3	196 646 2152	3	0 29 41 0 4 18 6 0 0 0 0 0 0	125	0	7	7	7698	3	7.7920	5
27-20.7	200 630 2172	7	5 20 45 0 7 11 10 0 0 0 0 0 0	125	5	7	8	7316	4	7.7948	8
27-20.14	208 566 2488	14	20 2 33 6 28 6 0 0 2 1 0 0 0	125	20	10	9	5541	3728	7.7992	16
27-20.16	210 546 2512	16	18 9 28 9 18 13 0 0 3 0 0 0 0	125	18	9	10	5651	1330	7.7993	19

k = 27, Designs sorted based on the number of clear two-factor interactions

Design	wlp(W_4,…)			wlp rank	alp													df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
27-20.8067	435	80	5440	8067	51	0	0	0	0	0	0	0	10	21	0	0	0	109	51	10	8029	1	6112	8.0318	8067
27-20.8068	435	80	5440	8068	51	0	0	0	0	0	0	0	10	21	0	0	0	109	51	10	8030	2	6113	8.0319	8068
27-20.8069	436	79	5430	8069	51	0	0	0	0	0	0	0	13	15	3	0	0	109	51	11	8031	3	7511	8.0327	8069
27-20.8070	436	80	5430	8070	51	0	0	0	0	0	0	0	13	15	3	0	0	109	51	11	8032	4	7512	8.0329	8070
27-20.8071	437	78	5422	8071	51	0	0	0	0	0	0	0	16	9	6	0	0	109	51	11	8033	5	7513	8.0337	8071
27-20.8072	437	79	5422	8072	51	0	0	0	0	0	0	0	16	9	6	0	0	109	51	11	8034	6	7514	8.0338	8072
27-20.8073	438	78	5412	8073	51	0	0	0	0	0	0	0	18	6	6	1	0	109	51	12	8035	7	7994	8.0347	8073
27-20.8074	438	80	5412	8074	51	0	0	0	0	0	0	0	18	6	6	1	0	109	51	12	8036	8	7995	8.0349	8074
27-20.8075	442	76	5376	8075	51	0	0	0	0	0	0	0	24	0	0	7	0	109	51	12	8037	9	7996	8.0385	8075
27-20.8042	374	141	4468	8042	38	18	0	0	0	0	0	6	21	4	0	0	0	114	38	10	7690	10	6106	7.9572	8042

k = 27, Designs sorted based on minimizing Lmax

Design	wlp(W_4,…)			wlp rank	alp													df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
27-20.1	180	690	2200	1	0	15	55	0	12	16	0	0	0	0	0	0	0	125	0	6	6	7696	1	7.7798	1
27-20.1043	235	280	3647	1043	26	0	0	10	27	25	0	0	0	0	0	0	0	115	26	6	1650	2152	2	7.8063	252
27-20.3	196	646	2152	3	0	29	41	0	4	18	6	0	0	0	0	0	0	125	0	7	7	7698	3	7.7920	5
27-20.7	200	630	2172	7	5	20	45	0	7	11	10	0	0	0	0	0	0	125	5	7	8	7316	4	7.7948	8
27-20.1192	237	278	3632	1192	26	0	0	13	24	22	3	0	0	0	0	0	0	115	26	7	1651	2153	5	7.8082	378
27-20.1235	238	277	3624	1235	26	0	1	10	30	15	6	0	0	0	0	0	0	115	26	7	1652	2154	6	7.8091	437
27-20.1298b	239	276	3616	1298	26	0	0	16	21	19	6	0	0	0	0	0	0	115	26	7	1655	2157	7	7.8100	490
27-20.1298a	239	276	3616	1298	26	0	2	11	24	20	5	0	0	0	0	0	0	115	26	7	1655	2157	7	7.8100	490
27-20.1300	239	276	3619	1300	26	0	0	16	21	19	6	0	0	0	0	0	0	115	26	7	1657	2159	9	7.8100	497
27-20.1301	239	277	3614	1301	26	0	1	14	21	21	5	0	0	0	0	0	0	115	26	7	1658	2160	10	7.8101	499

k = 27, Design generators

Design	Design Generators
27-20.1	7 11 19 30 38 47 52 57 58 69 73 79 82 84 93 97 98 108 119 120
27-20.2	7 11 19 29 30 38 41 49 60 78 82 87 91 97 98 100 109 117 118 120
27-20.3	7 11 19 29 37 41 49 50 55 59 77 78 87 91 97 98 111 116 120 125
27-20.4a	7 11 19 29 30 38 41 49 60 78 82 84 87 91 97 98 100 109 118 120
27-20.4b	7 11 19 29 30 37 38 41 49 60 78 82 87 91 97 98 100 109 118 120
27-20.6	7 11 19 29 37 41 44 59 69 73 76 82 87 94 99 106 111 117 118 120
27-20.7	7 11 19 30 38 47 52 57 58 69 70 73 79 82 84 93 97 98 119 120
27-20.8	7 11 19 29 37 41 44 50 55 59 62 73 76 85 86 91 99 102 120 125
27-20.9	7 11 13 14 19 38 47 57 58 69 82 84 91 93 105 108 113 119 120 126
27-20.10	7 11 19 29 37 41 44 59 73 76 82 87 91 94 99 106 111 117 118 120
27-20.11	7 11 19 29 35 37 38 41 44 50 55 69 73 82 92 95 100 103 120 125
27-20.12	7 11 19 30 38 47 52 57 69 70 73 79 82 84 93 97 98 110 119 120
27-20.13	7 11 13 14 19 21 22 35 38 47 62 73 76 79 81 101 116 120 123 125
27-20.14	7 11 19 29 30 41 50 63 77 86 88 101 102 104 107 112 115 121 122 124
27-20.15	7 11 19 29 37 38 41 44 50 55 67 69 70 89 97 103 109 118 120 123
27-20.16	7 27 29 30 35 37 38 41 49 67 69 74 76 79 104 112 121 122 124 127
27-20.17	7 11 13 14 19 21 22 41 50 61 73 84 91 99 101 111 113 119 120 126
27-20.18a	7 11 19 29 30 37 38 44 55 57 70 73 74 92 97 98 103 117 118 120
27-20.18b	7 11 19 29 30 35 45 53 54 57 60 67 69 73 82 92 98 111 119 120
27-20.20	7 11 19 29 30 37 38 44 52 57 70 73 74 92 97 98 103 117 118 120
27-20.23	7 11 19 29 30 35 37 38 41 42 50 60 63 69 73 76 113 116 120 125
27-20.1023	7 11 13 21 26 47 51 54 78 81 100 104 107 109 112 117 121 122 124 127
27-20.1043	7 11 21 26 35 37 41 52 59 61 74 79 86 100 103 104 112 121 122 124
27-20.1192	7 11 21 26 35 37 41 52 56 59 74 79 86 100 103 104 112 121 122 124
27-20.1221	7 11 13 14 19 38 57 60 73 85 95 101 106 113 114 116 119 120 125 126
27-20.1235	7 11 19 21 26 35 37 41 52 59 74 79 86 100 103 104 112 121 122 124
27-20.1298a	7 11 21 26 35 37 41 52 59 74 79 86 88 100 103 104 112 121 122 124
27-20.1298b	7 11 21 26 31 35 45 62 70 73 74 82 94 97 104 112 117 121 122 124
27-20.1300	7 19 25 28 38 47 49 61 67 69 78 81 91 100 103 107 112 121 122 124
27-20.1301	7 14 19 25 28 31 37 38 42 47 52 70 75 81 93 104 112 121 122 124
27-20.8042	7 19 21 30 35 37 38 49 50 55 67 69 70 76 81 87 98 112 117 118
27-20.8067	7 19 21 22 35 37 38 49 52 67 69 70 81 87 97 98 111 112 115 117
27-20.8068	7 19 21 22 35 37 38 49 52 67 69 70 81 87 97 98 100 111 112 115
27-20.8069	7 19 21 22 35 37 38 49 50 52 67 69 70 81 87 97 98 111 112 115
27-20.8070	7 19 21 22 35 37 38 49 50 67 69 70 81 82 87 97 100 111 112 115
27-20.8071	7 19 21 22 35 37 38 49 50 67 69 70 81 82 84 87 97 111 112 117
27-20.8072	7 19 21 22 35 37 38 49 50 67 69 70 81 82 84 87 97 100 111 112
27-20.8073	7 19 21 22 35 37 38 49 50 52 67 69 70 81 82 84 87 97 111 112
27-20.8074	7 19 21 22 35 37 38 49 55 67 69 70 81 82 84 87 112 117 118 123
27-20.8075	7 19 21 22 35 37 38 49 50 52 55 67 69 84 87 100 103 105 112 115

k = 28, Designs sorted based on word length pattern

Design	wlp(w_4,...)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
28-21.1	210 840 2800	1	0 0 70 0 0 28 0 0 0 0 0 0 0 0	126	0	6	2	3930	1	7.0617	1
28-21.2	230 780 2752	2	0 15 55 0 0 13 15 0 0 0 0 0 0 0	126	0	7	3	3931	2	7.0751	2
28-21.3	238 717 2976	3	0 30 6 33 15 2 0 9 1 0 0 0 0 0	124	0	9	9	3932	194	7.0784	3
28-21.4	241 710 2958	4	0 30 12 21 22 1 0 8 2 0 0 0 0 0	124	0	9	10	3933	195	7.0806	4
28-21.5	244 703 2940	5	0 33 9 18 26 0 0 7 3 0 0 0 0 0	124	0	9	11	3934	196	7.0827	5
28-21.6	248 674 2960	6	0 1 17 52 8 2 0 0 5 2 0 0 0 0	115	0	10	3649	3935	1200	7.0840	9
28-21.7	248 675 2959	7	0 1 19 46 14 0 0 0 5 2 0 0 0 0	115	0	10	3650	3936	1201	7.0840	10
28-21.8	248 676 2960	8	0 1 17 52 8 2 0 0 5 2 0 0 0 0	115	0	10	3651	3937	1202	7.0842	11
28-21.9a	249 674 2949	9	0 1 21 42 16 0 0 0 6 0 1 0 0 0	115	0	11	3652	3938	2300	7.0848	18
28-21.9b	249 674 2949	9	0 1 21 42 16 0 0 1 3 3 0 0 0 0	115	0	10	3652	3938	1203	7.0848	16
28-21.9c	249 674 2949	9	0 1 19 48 10 2 0 1 3 3 0 0 0 0	115	0	10	3652	3938	1203	7.0848	16
28-21.12	249 675 2948	12	0 1 21 42 16 0 0 1 3 3 0 0 0 0	115	0	10	3655	3941	1205	7.0849	20
28-21.13	249 675 2948	13	0 4 12 51 13 0 0 1 3 3 0 0 0 0	115	0	10	3656	3942	1206	7.0849	21
28-21.14	249 675 2950	14	0 1 21 42 16 0 0 1 3 3 0 0 0 0	115	0	10	3657	3943	1207	7.0850	22
28-21.15a	249 676 2949	15	0 1 21 42 16 0 0 0 6 0 1 0 0 0	115	0	11	3658	3944	2301	7.0850	24
28-21.15b	249 676 2949	15	0 1 21 42 16 0 0 1 3 3 0 0 0 0	115	0	10	3658	3944	1208	7.0850	24
28-21.15c	249 676 2949	15	0 1 19 48 10 2 0 1 3 3 0 0 0 0	115	0	10	3658	3944	1208	7.0850	24
28-21.18	250 648 3232	18	18 3 34 0 18 22 0 0 0 3 0 0 0 0	126	18	10	4	2855	1210	7.0852	27
28-21.19	250 672 2940	19	0 1 17 56 0 6 0 1 4 1 1 0 0 0	115	0	11	3661	3947	2302	7.0856	28

k = 28, Designs sorted based on degrees of freedom used

Design	wlp(w_4,...)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
28-21.1157	290 536 3320	1157	24 12 0 48 0 0 0 1 12 0 2 0 0 0	127	24	11	1	2830	2771	7.1145	2583
28-21.1	210 840 2800	1	0 0 70 0 0 28 0 0 0 0 0 0 0 0	126	0	6	2	3930	1	7.0617	1
28-21.2	230 780 2752	2	0 15 55 0 0 13 15 0 0 0 0 0 0 0	126	0	7	3	3931	2	7.0751	2
28-21.18	250 648 3232	18	18 3 34 0 18 22 0 0 0 3 0 0 0 0	126	18	10	4	2855	1210	7.0852	27
28-21.58	254 644 3192	58	18 3 34 6 12 16 6 0 0 3 0 0 0 0	126	18	10	5	2856	1217	7.0885	73
28-21.172	260 618 3208	172	18 6 31 9 9 10 12 0 0 3 0 0 0 0	126	18	10	6	2857	1235	7.0919	175
28-21.2961	308 474 3656	2961	27 6 34 0 0 7 9 9 0 6 0 0 0 0	126	27	10	7	2398	1872	7.1290	3555
28-21.3388	314 456 3680	3388	27 6 34 0 0 16 0 0 9 6 0 0 0 0	126	27	10	8	2602	2050	7.1334	3705
28-21.3	238 717 2976	3	0 30 6 33 15 2 0 9 1 0 0 0 0 0	124	0	9	9	3932	194	7.0784	3
28-21.4	241 710 2958	4	0 30 12 21 22 1 0 8 2 0 0 0 0 0	124	0	9	10	3933	195	7.0806	4

k = 28, Designs sorted based on the number of clear two-factor interactions

Design	wlp(w_4,...)			wlp rank	alp														df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
28-21.4280	515	90	7062	4280	53	0	0	0	0	0	0	0	0	16	15	0	0	0	112	53	11	4231	1	3461	7.3351	4280
28-21.4281	515	90	7063	4281	53	0	0	0	0	0	0	0	0	16	15	0	0	0	112	53	11	4232	2	3462	7.3351	4281
28-21.4282	516	89	7052	4282	53	0	0	0	0	0	0	0	0	19	9	3	0	0	112	53	12	4233	3	4084	7.3359	4282
28-21.4283	516	90	7052	4283	53	0	0	0	0	0	0	0	0	19	9	3	0	0	112	53	12	4234	4	4085	7.3360	4283
28-21.4284	518	88	7032	4284	53	0	0	0	0	0	0	0	0	24	0	6	1	0	112	53	13	4235	5	4264	7.3376	4284
28-21.4268	445	160	5830	4268	37	20	0	0	0	0	0	0	10	20	1	0	0	0	116	37	11	3643	6	3456	7.2563	4268
28-21.4269	445	160	5831	4269	37	20	0	0	0	0	0	0	10	20	1	0	0	0	116	37	11	3644	7	3457	7.2564	4269
28-21.4270	446	159	5821	4270	37	20	0	0	0	0	0	0	13	14	4	0	0	0	116	37	11	3645	8	3458	7.2572	4270
28-21.4271	446	160	5820	4271	37	20	0	0	0	0	0	0	13	14	4	0	0	0	116	37	11	3646	9	3459	7.2572	4271

k = 28, Designs sorted based on minimizing Lmax

Design	wlp(w_4,...)			wlp rank	alp														df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
28-21.1	210	840	2800	1	0	0	70	0	0	28	0	0	0	0	0	0	0	0	126	0	6	2	3930	1	7.0617	1
28-21.2	230	780	2752	2	0	15	55	0	0	13	15	0	0	0	0	0	0	0	126	0	7	3	3931	2	7.0751	2
28-21.681	280	325	4653	681	27	0	0	5	21	26	10	0	0	0	0	0	0	0	117	27	7	787	876	3	7.0927	213
28-21.732	282	323	4637	732	27	0	0	7	21	20	14	0	0	0	0	0	0	0	117	27	7	789	877	4	7.0944	275
28-21.795	284	321	4621	795	27	0	0	11	15	20	16	0	0	0	0	0	0	0	117	27	7	797	883	5	7.0960	343
28-21.733	282	323	4640	733	27	0	0	6	21	26	6	3	0	0	0	0	0	0	117	27	8	790	878	6	7.0944	276
28-21.772	283	322	4630	772	27	0	1	4	24	22	8	3	0	0	0	0	0	0	117	27	8	794	880	7	7.0952	307
28-21.773	283	322	4631	773	27	0	0	7	21	23	8	3	0	0	0	0	0	0	117	27	8	795	881	8	7.0952	308
28-21.794	284	321	4621	794	27	0	1	6	22	19	12	2	0	0	0	0	0	0	117	27	8	796	882	9	7.0960	343
28-21.796	284	321	4621	796	27	0	2	4	21	24	8	3	0	0	0	0	0	0	117	27	8	798	884	10	7.0960	343

k = 28, Design generators

Design	Design Generators
28-21.1	7 11 19 30 38 47 52 57 58 69 73 79 82 84 93 97 98 108 119 120 126
28-21.2	7 11 19 30 38 47 52 57 58 69 70 73 79 82 84 93 97 98 108 119 120
28-21.3	7 11 19 29 37 38 41 44 50 55 67 69 70 89 92 97 103 109 118 120 123
28-21.4	7 11 19 29 37 41 44 50 55 59 62 73 76 85 86 91 99 102 106 120 125
28-21.5	7 11 13 14 19 21 22 25 35 38 47 62 73 76 79 81 101 116 120 123 125
28-21.6	7 11 13 14 19 21 22 38 41 50 52 59 73 79 84 93 99 101 108 119 120
28-21.7	7 11 19 29 30 35 44 52 57 67 69 73 74 81 95 97 100 103 118 120 123
28-21.8	7 11 13 14 19 21 22 38 41 50 52 59 70 73 84 93 99 101 108 119 120
28-21.9a	7 11 13 19 22 26 28 38 41 47 50 73 79 82 84 93 99 106 108 120 126
28-21.9b	7 11 19 29 30 35 38 41 50 60 77 78 86 89 90 95 97 116 119 120 126
28-21.9c	7 11 19 29 30 38 41 42 49 50 60 67 69 70 76 90 97 103 117 118 120
28-21.12	7 11 19 29 30 35 45 53 57 58 63 73 74 92 97 108 111 116 120 123 125
28-21.13	7 11 19 29 35 45 46 53 54 57 60 67 69 70 76 84 89 90 100 120 126
28-21.14	7 11 19 29 38 41 42 49 60 67 77 78 85 86 89 90 95 97 98 120 125
28-21.15a	7 11 13 19 22 26 28 38 41 47 50 73 79 82 84 93 106 108 113 120 126
28-21.15b	7 11 19 29 30 35 38 41 49 60 77 78 86 89 90 95 97 116 119 120 126
28-21.15c	7 11 19 29 30 38 41 42 49 50 60 67 69 70 90 97 103 109 117 118 120
28-21.18	7 11 19 29 30 38 41 44 70 74 81 82 101 104 107 112 115 121 122 124 127
28-21.19	7 11 13 14 19 21 22 38 41 50 61 73 79 82 91 99 101 113 119 120 126
28-21.58	7 11 19 25 26 28 31 35 45 46 53 54 59 69 73 76 79 84 113 120 125
28-21.172	7 11 19 29 30 37 41 44 47 67 69 70 73 82 92 95 109 110 113 116 120
28-21.681	7 11 21 26 35 37 41 52 59 61 74 79 86 88 100 103 104 112 121 122 124
28-21.732	7 11 13 21 26 35 37 41 52 59 74 79 86 88 100 103 104 112 121 122 124
28-21.733	7 11 19 21 26 35 37 41 52 56 59 74 79 86 100 103 104 112 121 122 124
28-21.772	7 11 19 21 26 28 35 41 52 59 62 73 79 86 91 97 100 112 121 122 124
28-21.773	7 11 21 22 26 31 35 45 52 67 70 73 79 88 94 97 104 112 121 122 124
28-21.794	7 11 21 26 31 41 44 47 50 62 67 77 84 91 104 107 112 117 121 122 124
28-21.795	7 11 19 21 26 28 41 44 47 50 62 67 77 84 91 104 112 117 121 122 124
28-21.796	7 11 19 21 26 28 35 37 41 52 59 73 79 86 91 97 100 112 121 122 124
28-21.1157	7 11 13 14 19 38 57 60 73 85 95 101 106 113 114 116 119 120 123 125 126
28-21.2961	7 11 13 14 19 22 31 35 37 38 41 42 44 49 59 62 69 89 109 119 120
28-21.3388	7 11 13 19 21 25 26 46 54 63 91 97 98 103 104 107 112 115 121 122 124
28-21.4268	7 19 21 30 35 37 38 49 50 55 67 69 70 76 81 87 98 103 112 117 118
28-21.4269	7 19 21 22 35 37 38 49 50 56 67 69 70 81 84 98 100 111 112 115 118
28-21.4270	7 19 21 22 35 37 38 49 50 52 56 67 69 70 81 84 98 111 112 115 118
28-21.4271	7 19 21 22 35 37 38 41 49 52 67 69 70 81 84 87 97 112 117 118 123
28-21.4280	7 19 21 22 35 37 38 49 50 52 67 69 70 81 87 97 98 100 111 112 115
28-21.4281	7 19 21 22 35 37 38 49 50 67 69 70 81 82 84 87 97 100 111 112 118
28-21.4282	7 19 21 22 35 37 38 49 50 52 67 69 70 81 82 84 87 97 98 111 112
28-21.4283	7 19 21 22 35 37 38 49 50 52 67 69 70 81 82 84 87 97 111 112 118
28-21.4284	7 19 21 22 35 37 38 49 50 52 55 67 69 70 81 82 84 87 97 111 112

k = 29, Designs sorted based on word length pattern

Design	wlp(w_4,...)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
29-22.1	266 945 3472	1	0 0 70 0 0 0 28 0 0 0 0 0 0 0	127	0	7	1	1914	1	6.4312	1
29-22.2	287 823 3819	2	0 30 0 30 21 4 1 0 10 0 0 0 0 0	125	0	9	4	1915	20	6.4414	2
29-22.3	289 810 3744	3	0 0 8 48 24 0 0 0 0 7 0 0 0 0	116	0	10	1792	1916	261	6.4415	3
29-22.4	290 810 3733	4	0 0 10 44 26 0 0 0 1 5 1 0 0 0	116	0	11	1793	1917	791	6.4423	5
29-22.5	290 810 3734	5	0 0 8 50 20 2 0 0 1 5 1 0 0 0	116	0	11	1794	1918	792	6.4423	6
29-22.6	290 816 3798	6	0 30 6 18 27 5 0 0 9 1 0 0 0 0	125	0	10	5	1919	262	6.4432	14
29-22.7a	291 808 3724	7	0 0 10 46 22 2 0 0 2 3 2 0 0 0	116	0	11	1795	1920	793	6.4430	9
29-22.7b	291 808 3724	7	0 0 8 52 16 4 0 0 2 3 2 0 0 0	116	0	11	1795	1920	793	6.4430	9
29-22.9a	291 810 3722	9	0 0 10 46 22 2 0 0 2 3 2 0 0 0	116	0	11	1797	1922	795	6.4431	11
29-22.9b	291 810 3722	9	0 0 12 40 28 0 0 0 2 3 2 0 0 0	116	0	11	1797	1922	795	6.4431	11
29-22.11	291 810 3723	11	0 0 12 40 28 0 0 0 2 3 2 0 0 0	116	0	11	1799	1924	797	6.4431	13
29-22.12a	291 812 3724	12	0 0 10 46 22 2 0 0 2 3 2 0 0 0	116	0	11	1800	1925	798	6.4433	15
29-22.12b	291 812 3724	12	0 0 8 52 16 4 0 0 2 3 2 0 0 0	116	0	11	1800	1925	798	6.4433	15
29-22.14a	292 808 3714	14	0 0 8 54 12 6 0 0 2 4 0 1 0 0	116	0	12	1803	1927	1266	6.4438	19
29-22.14b	292 808 3714	14	0 0 12 42 24 2 0 0 2 4 0 1 0 0	116	0	12	1802	1928	1265	6.4438	18
29-22.16a	292 810 3712	16	0 0 12 42 24 2 0 0 2 4 0 1 0 0	116	0	12	1804	1929	1267	6.4439	20
29-22.16b	292 810 3712	16	0 0 12 42 24 2 0 0 3 1 3 0 0 0	116	0	11	1804	1929	800	6.4439	20
29-22.18	292 810 3715	18	0 0 14 36 30 0 0 0 3 1 3 0 0 0	116	0	11	1806	1931	801	6.4440	22
29-22.19	292 812 3714	19	0 0 8 54 12 6 0 0 2 4 0 1 0 0	116	0	12	1807	1932	1268	6.4441	23

k = 29, Designs sorted based on degrees of freedom used

Design	wlp(w_4,...)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
29-22.1	266 945 3472	1	0 0 70 0 0 0 28 0 0 0 0 0 0 0	127	0	7	1	1914	1	6.4312	1
29-22.114	306 729 4096	114	18 0 37 0 18 0 22 0 0 0 3 0 0 0	127	18	11	2	1407	834	6.4515	121
29-22.1725	370 537 4736	1725	27 0 40 0 0 0 16 0 9 0 6 0 0 0	127	27	11	3	1400	1146	6.4964	1878
29-22.2	287 823 3819	2	0 30 0 30 21 4 1 0 10 0 0 0 0 0	125	0	9	4	1915	20	6.4414	2
29-22.6	290 816 3798	6	0 30 6 18 27 5 0 0 9 1 0 0 0 0	125	0	10	5	1919	262	6.4432	14
29-22.147	309 740 3963	147	8 22 4 24 23 0 5 0 4 6 0 0 0 0	125	8	10	6	1661	265	6.4544	180
29-22.152	310 712 4156	152	12 15 18 3 24 11 1 9 0 0 3 0 0 0	125	12	11	7	1473	843	6.4540	163
29-22.181	312 704 4148	181	12 15 18 7 16 16 0 8 1 0 3 0 0 0	125	12	11	8	1474	850	6.4550	191
29-22.182	312 710 4134	182	12 15 18 7 16 16 0 8 1 0 3 0 0 0	125	12	11	9	1475	851	6.4554	205
29-22.224	315 700 4132	224	14 11 20 11 8 20 0 9 0 0 2 1 0 0	125	14	12	10	1444	1369	6.4572	267

k = 29, Designs sorted based on the number of clear two-factor interactions

Design	wlp(w_4,...)			wlp rank	alp														df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
29-22.2147	605	101	9075	2147	55	0	0	0	0	0	0	0	0	0	21	10	0	0	115	55	12	2112	1	1839	6.7120	2147
29-22.2148	606	100	9064	2148	55	0	0	0	0	0	0	0	0	0	24	4	3	0	115	55	13	2113	2	2093	6.7127	2148
29-22.2149	606	101	9064	2149	55	0	0	0	0	0	0	0	0	0	24	4	3	0	115	55	13	2114	3	2094	6.7128	2149
29-22.2140	526	180	7522	2140	36	22	0	0	0	0	0	0	0	16	14	1	0	0	118	36	12	1782	4	1835	6.6300	2140
29-22.2141	526	180	7524	2141	36	22	0	0	0	0	0	0	0	16	14	1	0	0	118	36	12	1783	5	1836	6.6301	2141
29-22.2142	527	179	7513	2142	36	22	0	0	0	0	0	0	0	19	8	4	0	0	118	36	12	1784	6	1837	6.6308	2142
29-22.2143	527	180	7512	2143	36	22	0	0	0	0	0	0	0	19	8	4	0	0	118	36	12	1785	7	1838	6.6309	2143
29-22.1912	384	322	5626	1912	35	0	0	0	6	31	11	0	0	0	6	1	0	0	119	35	12	1525	8	1739	6.4940	1853
29-22.1917	385	321	5615	1917	35	0	0	0	8	28	11	1	0	0	6	1	0	0	119	35	12	1526	9	1740	6.4947	1860
29-22.1936	389	317	5619	1936	35	0	0	0	16	12	20	0	0	0	5	2	0	0	119	35	12	1538	10	1745	6.4980	1899

k = 29, Designs sorted based on minimizing Lmax

Design	wlp(w_4,...)			wlp rank	alp														df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
29-22.1	266	945	3472	1	0	0	70	0	0	0	28	0	0	0	0	0	0	0	127	0	7	1	1914	1	6.4312	1
29-22.379	330	376	5894	379	28	0	0	3	10	32	12	5	0	0	0	0	0	0	119	28	8	373	333	2	6.4526	136
29-22.390	331	375	5885	390	28	0	0	2	18	17	22	3	0	0	0	0	0	0	119	28	8	374	334	3	6.4533	144
29-22.405	332	374	5876	405	28	0	0	4	13	23	17	5	0	0	0	0	0	0	119	28	8	376	336	4	6.4540	164
29-22.424	333	373	5871	424	28	0	0	3	17	20	15	7	0	0	0	0	0	0	119	28	8	378	338	5	6.4548	184
29-22.432b	334	372	5856	432	28	0	0	5	12	26	10	9	0	0	0	0	0	0	119	28	8	379	340	6	6.4555	206
29-22.434b	334	372	5862	434	28	0	0	5	14	20	16	7	0	0	0	0	0	0	119	28	8	381	342	7	6.4555	208

k = 29, Design generators

Design	Design Generators
29-22.1	7 11 19 30 38 47 52 57 58 69 70 73 79 82 84 93 97 98 108 119 120 126
29-22.2	7 11 19 29 35 37 38 57 63 69 70 73 79 81 87 97 98 103 109 117 120 123
29-22.3	7 11 19 29 30 35 44 52 57 67 69 73 74 81 95 97 100 103 109 118 120 123
29-22.4	7 11 19 29 38 41 42 49 60 67 77 78 85 86 89 90 95 97 98 108 120 125
29-22.5	7 11 19 29 30 35 45 49 52 56 73 79 85 86 102 104 112 115 121 122 124 127
29-22.6	7 11 19 29 37 41 44 50 55 59 62 73 76 85 86 91 99 102 106 111 120 125
29-22.7a	7 11 19 29 30 35 41 44 47 54 56 67 77 78 81 84 88 104 112 121 122 124
29-22.7b	7 11 13 14 19 28 35 44 53 57 58 67 76 85 89 90 102 105 120 123 125 126
29-22.9a	7 11 19 29 30 35 45 46 49 52 56 73 79 85 102 104 112 115 121 122 124 127
29-22.9b	7 11 19 29 30 35 44 52 55 57 67 69 73 74 95 97 100 103 109 118 120 123
29-22.11	7 11 19 21 22 25 26 35 45 46 49 60 67 77 78 81 95 101 108 116 120 123
29-22.12a	7 11 19 29 35 45 53 54 60 67 69 70 81 82 92 97 98 111 116 120 123 125
29-22.12b	7 11 19 29 30 35 45 54 57 60 67 69 70 73 74 81 82 95 111 116 120 125
29-22.14a	7 11 19 29 30 35 41 47 53 59 77 82 84 88 102 104 107 112 121 122 124 127
29-22.14b	7 11 19 29 30 35 41 44 47 53 54 56 67 78 81 84 88 104 112 121 122 124
29-22.16a	7 11 19 29 30 35 45 49 52 56 73 79 85 88 102 104 112 115 121 122 124 127
29-22.16b	7 11 19 29 35 38 41 42 49 60 67 77 78 85 86 89 90 95 97 98 111 120
29-22.18	7 11 19 29 35 45 53 54 60 67 69 70 73 81 82 92 97 98 111 116 120 123
29-22.19	7 11 19 30 35 41 47 53 54 59 77 82 84 88 102 104 107 112 121 122 124 127
29-22.114	7 11 13 19 21 35 38 57 60 67 69 70 73 76 81 84 93 98 103 110 118 120
29-22.147	7 11 19 29 35 37 38 57 63 67 69 70 73 79 81 97 98 103 109 117 120 123
29-22.152	7 11 13 19 25 26 35 38 41 42 52 67 69 73 74 87 100 103 109 114 120 123
29-22.181	7 11 13 21 25 31 37 41 51 61 78 86 88 97 98 100 104 112 117 121 122 124
29-22.182	7 11 13 21 25 28 31 37 41 51 61 78 86 88 97 98 104 112 117 121 122 124
29-22.224	7 11 13 14 19 21 35 38 57 60 67 69 70 74 79 81 84 93 98 103 110 120
29-22.379	7 11 19 21 26 28 35 37 41 52 59 62 73 79 86 91 97 100 112 121 122 124
29-22.390	7 14 19 22 31 35 38 41 42 50 59 62 70 77 87 98 104 112 117 121 122 124
29-22.405	7 11 25 31 37 38 41 47 51 61 62 76 82 93 98 103 104 112 118 121 122 124
29-22.424	7 11 19 21 26 28 35 41 52 56 59 62 73 79 86 91 97 100 112 121 122 124
29-22.432b	7 11 13 21 22 44 55 62 73 74 76 79 83 93 97 98 103 104 112 121 122 124
29-22.434b	7 11 25 31 37 38 41 47 51 61 76 82 87 93 98 103 104 112 118 121 122 124
29-22.1725	7 11 29 37 41 42 44 47 51 78 81 82 84 87 88 104 112 118 121 122 124 127
29-22.1912	7 11 19 30 35 41 42 44 47 56 59 67 81 87 88 104 112 117 121 122 124 127
29-22.1917	7 11 19 29 35 38 41 42 44 47 56 67 87 88 91 104 107 112 121 122 124 127
29-22.1936	7 11 19 30 35 41 42 44 47 56 59 74 81 82 87 88 104 115 121 122 124 127
29-22.2140	7 19 21 22 35 37 38 49 50 52 56 67 69 70 81 82 84 98 111 112 115 118
29-22.2141	7 19 21 22 35 37 38 49 50 56 67 69 70 81 84 98 100 111 112 115 117 118
29-22.2142	7 19 21 22 35 37 38 49 50 52 55 56 67 69 70 81 84 98 111 112 115 118
29-22.2143	7 19 21 22 35 37 38 52 67 69 70 81 82 84 87 88 97 98 100 111 112 115
29-22.2147	7 19 21 22 35 37 38 49 50 52 67 69 70 81 82 84 87 97 98 100 111 112
29-22.2148	7 19 21 22 35 37 38 49 50 52 55 67 69 70 81 82 84 87 97 98 111 112
29-22.2149	7 19 21 22 35 37 38 49 50 52 55 67 69 70 81 82 84 87 97 111 112 118

k = 30, Designs sorted based on word length pattern

Design	wlp(w_4,...)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
30-23.1	335 972 4662	1	0 0 0 40 40 0 0 0 0 2 5 0 0 0 0	117	0	11	773	799	182	5.8661	1
30-23.2	336 972 4650	2	0 0 0 42 36 2 0 0 0 3 3 1 0 0 0	117	0	12	774	800	379	5.8668	2
30-23.3	336 972 4651	3	0 0 0 42 36 2 0 0 0 3 3 1 0 0 0	117	0	12	775	801	380	5.8668	3
30-23.4	336 972 4652	4	0 0 0 42 36 2 0 0 0 3 3 1 0 0 0	117	0	12	776	802	381	5.8668	4
30-23.5	337 968 4644	5	0 0 0 44 32 4 0 0 0 4 1 2 0 0 0	117	0	12	777	803	382	5.8673	6
30-23.6	337 972 4640	6	0 0 0 44 32 4 0 0 0 4 1 2 0 0 0	117	0	12	778	804	383	5.8675	7
30-23.7	337 976 4644	7	0 0 0 44 32 4 0 0 0 4 1 2 0 0 0	117	0	12	779	805	384	5.8679	9
30-23.8	338 968 4633	8	0 0 0 46 28 6 0 0 0 4 2 0 1 0 0	117	0	13	780	806	586	5.8680	10
30-23.9	338 972 4630	9	0 0 0 46 28 6 0 0 0 4 2 0 1 0 0	117	0	13	781	807	587	5.8683	11
30-23.10	338 976 4633	10	0 0 0 46 28 6 0 0 0 4 2 0 1 0 0	117	0	13	782	808	588	5.8686	13
30-23.11	339 968 4620	11	0 0 0 48 24 8 0 0 0 5 0 1 1 0 0	117	0	13	783	809	589	5.8687	14
30-23.12	339 976 4620	12	0 0 0 48 24 8 0 0 0 5 0 1 1 0 0	117	0	13	784	810	590	5.8693	16
30-23.13	341 945 4723	13	0 0 6 35 33 6 0 0 0 1 6 0 0 0 0	117	0	11	785	811	183	5.8691	15
30-23.14	341 968 4600	14	0 0 0 52 16 12 0 0 0 5 1 0 0 1 0	117	0	14	786	812	863	5.8701	24
30-23.15	341 976 4600	15	0 0 0 52 16 12 0 0 0 5 1 0 0 1 0	117	0	14	787	813	864	5.8708	28
30-23.16	342 944 4712	16	0 0 6 37 29 8 0 0 0 2 4 1 0 0 0	117	0	12	788	814	385	5.8697	19
30-23.17	342 944 4712	17	0 0 8 31 35 6 0 0 0 2 4 1 0 0 0	117	0	12	789	815	386	5.8697	20
30-23.18	342 945 4711	18	0 0 8 31 35 6 0 0 0 2 4 1 0 0 0	117	0	12	790	816	387	5.8698	21
30-23.19	342 946 4712	19	0 0 8 31 35 6 0 0 0 2 4 1 0 0 0	117	0	12	791	817	388	5.8699	22
30-23.20	342 946 4712	20	0 0 6 37 29 8 0 0 0 2 4 1 0 0 0	117	0	12	792	818	389	5.8699	22

k = 30, Designs sorted based on degrees of freedom used

Design	wlp(w_4,...)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
30-23.30	345 935 4855	30	0 30 0 15 36 0 5 0 0 10 0 0 0 0 0	126	0	10	1	828	31	5.8722	36
30-23.156	370 840 5068	156	8 22 0 18 33 0 0 5 0 4 6 0 0 0 0	126	8	11	2	635	188	5.8858	231
30-23.161	371 806 5286	161	12 12 21 3 12 21 3 0 9 0 0 3 0 0 0	126	12	12	3	585	440	5.8851	215
30-23.239	387 758 5398	239	14 10 24 0 17 16 0 3 2 7 0 3 0 0 0	126	14	12	4	572	454	5.8948	481
30-23.126	366 840 5181	126	8 6 24 25 0 0 24 0 1 0 6 0 0 0 0	124	8	11	5	627	184	5.8834	163
30-23.134	367 836 5172	134	8 6 24 25 0 3 18 3 1 0 6 0 0 0 0	124	8	11	6	630	185	5.8838	174
30-23.135	367 838 5170	135	8 6 24 25 0 3 18 3 1 0 6 0 0 0 0	124	8	11	7	631	186	5.8840	176
30-23.145	369 828 5192	145	8 6 24 25 0 7 11 6 0 1 6 0 0 0 0	124	8	11	8	632	187	5.8849	210

k = 30, Designs sorted based on the number of clear two-factor interactions

Design	wlp(w_4,…)			wlp rank	alp															df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
30-23.975	706	113	11548	975	57	0	0	0	0	0	0	0	0	0	0	25	6	0	0	118	57	13	771	1	862	6.1552	975
30-23.976	707	112	11536	976	57	0	0	0	0	0	0	0	0	0	0	28	0	3	0	118	57	14	772	2	961	6.1558	976
30-23.866	448	371	7098	866	36	0	0	0	0	21	27	0	0	0	0	7	0	0	0	121	36	12	643	3	558	5.9216	835
30-23.867	449	370	7086	867	36	0	0	0	0	24	21	3	0	0	0	7	0	0	0	121	36	12	644	4	559	5.9223	837
30-23.880	454	365	7096	880	36	0	0	0	6	16	20	6	0	0	0	6	1	0	0	121	36	13	651	5	821	5.9260	850
30-23.911	466	353	7148	911	36	0	0	5	3	16	16	3	5	0	0	4	3	0	0	121	36	13	673	6	829	5.9353	901
30-23.899	461	358	7138	899	35	0	0	0	12	12	9	15	0	0	0	6	1	0	0	120	35	13	735	7	827	5.9315	885

k = 30, Designs sorted based on minimizing Lmax

Design	wlp(w_4,…)			wlp rank	alp															df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
30-23.245c	389	430	7378	245	29	0	0	0	15	16	13	18	0	0	0	0	0	0	0	121	29	8	146	129	1	5.8807	119
30-23.230	386	433	7404	230	29	0	0	2	5	22	26	4	3	0	0	0	0	0	0	121	29	9	141	125	2	5.8788	88
30-23.235	387	432	7396	235	29	0	0	1	9	21	18	12	1	0	0	0	0	0	0	121	29	9	141	126	3	5.8794	96
30-23.241	388	431	7386	241	29	0	0	1	12	15	21	12	1	0	0	0	0	0	0	121	29	9	145	128	4	5.8801	107
30-23.245a	389	430	7378	245	29	0	0	3	6	22	19	9	3	0	0	0	0	0	0	121	29	9	146	129	5	5.8807	119
30-23.255	390	429	7376	255	29	0	0	0	15	16	16	12	3	0	0	0	0	0	0	121	29	9	151	133	6	5.8815	132

k = 30, Design generators

Design	Design Generators
30-23.1	7 11 19 21 22 25 26 35 45 46 49 60 67 77 78 81 95 101 108 116 120 123 126
30-23.2	7 11 19 29 30 35 45 46 49 52 56 73 79 85 88 102 104 112 115 121 122 124 127
30-23.3	7 11 19 21 22 25 26 35 45 46 49 60 67 77 78 81 95 101 108 116 120 123 125
30-23.4	7 11 19 29 30 35 41 44 47 53 54 56 67 77 78 81 84 88 104 112 121 122 124
30-23.5	7 11 19 29 35 45 46 53 57 58 60 67 86 92 97 98 100 103 104 107 112 115 125
30-23.6	7 11 19 29 30 35 45 54 57 60 67 69 70 73 74 81 82 95 97 111 116 120 125
30-23.7	7 19 29 30 35 49 50 52 55 56 67 79 85 86 88 101 102 104 112 115 121 122 124
30-23.8	7 11 19 29 35 45 46 53 57 58 60 63 67 86 97 98 100 103 104 107 112 115 125
30-23.9	7 11 19 29 30 35 41 47 53 54 59 77 82 84 88 102 104 107 112 121 122 124 127
30-23.10	7 11 19 30 35 41 47 53 54 59 77 82 84 88 101 102 104 107 112 121 122 124 127
30-23.11	7 11 19 29 30 35 41 47 53 54 59 78 82 84 88 102 104 107 112 121 122 124 127
30-23.12	7 11 13 14 19 21 22 38 41 47 50 52 73 79 82 84 91 99 101 106 113 120 126
30-23.13	7 11 19 29 30 35 45 49 50 52 56 73 79 85 86 102 104 112 115 121 122 124 127
30-23.14	7 11 19 29 30 35 41 47 53 59 78 82 84 88 101 102 104 107 112 121 122 124 127
30-23.15	7 11 13 14 19 21 22 38 41 47 50 52 70 73 79 84 91 99 101 106 108 120 126
30-23.16	7 11 19 29 30 35 41 47 53 56 59 77 82 84 88 102 104 107 112 121 122 124 127
30-23.17	7 11 19 29 30 35 41 44 47 53 54 56 67 78 81 84 88 104 112 121 122 124 127
30-23.18	7 11 19 21 22 25 26 35 45 46 49 60 67 77 78 81 95 101 105 108 116 120 123
30-23.19	7 11 19 29 30 35 41 44 47 53 54 56 67 77 81 84 88 104 112 121 122 124 127
30-23.20	7 11 19 30 35 41 47 53 54 56 59 77 82 84 88 102 104 107 112 121 122 124 127
30-23.30	7 11 19 29 35 37 38 57 63 67 69 70 73 79 81 87 97 98 103 109 117 120 123
30-23.126	7 19 21 30 35 37 38 44 49 58 67 69 73 81 84 95 98 100 103 104 112 117 126
30-23.134	7 11 13 19 21 25 26 28 31 35 49 52 69 81 82 106 108 111 119 120 123 125 126
30-23.135	7 11 13 19 21 25 26 28 31 35 38 49 67 69 82 106 108 111 119 120 123 125 126
30-23.145	7 11 13 14 19 21 26 35 38 63 67 69 73 74 76 79 81 82 84 100 120 123 125
30-23.156	7 11 19 29 35 37 38 57 63 67 69 70 73 79 81 97 98 100 103 109 117 120 123
30-23.161	7 11 13 14 19 25 26 35 38 41 42 52 67 69 73 74 87 100 103 109 114 120 123
30-23.230	7 11 13 14 21 26 31 35 37 41 52 56 59 69 79 86 97 103 104 112 121 122 124
30-23.235	7 11 13 14 19 31 35 38 42 49 50 52 59 67 79 85 98 104 109 112 121 122 124
30-23.239	7 11 14 25 26 28 31 45 53 67 70 85 88 97 98 100 103 104 112 121 122 124 127
30-23.241	7 11 25 31 37 38 41 47 51 61 62 76 82 87 93 98 103 104 112 118 121 122 124
30-23.245a	7 11 13 14 21 26 31 35 41 52 56 59 61 69 79 86 97 103 104 112 121 122 124
30-23.245c	7 14 19 22 31 35 38 41 42 44 50 59 62 70 77 87 98 104 112 117 121 122 124
30-23.255	7 11 13 14 21 26 28 31 35 37 41 52 59 69 79 86 97 103 104 112 121 122 124
30-23.866	7 11 19 30 35 41 42 44 47 56 59 67 81 87 88 91 104 112 117 121 122 124 127
30-23.867	7 11 19 30 35 41 42 44 47 56 59 67 81 87 88 104 112 115 117 121 122 124 127
30-23.880	7 11 19 30 35 41 42 44 47 56 59 69 81 82 87 88 104 112 115 121 122 124 127
30-23.899	7 11 19 30 35 37 41 42 44 47 56 67 81 82 87 88 104 112 115 121 122 124 127
30-23.911	7 11 19 30 35 41 42 44 47 56 69 81 82 84 87 88 104 112 115 121 122 124 127
30-23.975	7 19 21 22 35 37 38 49 50 52 55 67 69 70 81 82 84 87 97 98 100 111 112
30-23.976	7 19 21 22 35 37 38 49 50 52 55 67 69 70 81 82 84 87 97 98 111 112 115

k = 31, Designs sorted based on word length pattern

Design	wlp(W_4,...)			wlp rank	alp															df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
31-24.1	391	1134	5826	1	0	0	0	24	48	8	0	0	0	0	3	4	0	0	0	118	0	12	323	331	96	5.3525	1
31-24.2	391	1134	5827	2	0	0	0	24	48	8	0	0	0	0	3	4	0	0	0	118	0	12	324	332	97	5.3525	2
31-24.3	392	1132	5817	3	0	0	0	26	44	10	0	0	0	0	4	2	1	0	0	118	0	13	325	333	174	5.3531	3
31-24.4	392	1134	5815	4	0	0	0	26	44	10	0	0	0	0	4	2	1	0	0	118	0	13	326	334	175	5.3532	5
31-24.5	392	1136	5817	5	0	0	0	26	44	10	0	0	0	0	4	2	1	0	0	118	0	13	327	335	176	5.3533	6
31-24.6	393	1132	5804	6	0	0	0	28	40	12	0	0	0	0	5	0	2	0	0	118	0	13	328	336	177	5.3537	8
31-24.7	393	1136	5804	7	0	0	0	28	40	12	0	0	0	0	5	0	2	0	0	118	0	13	329	337	178	5.3540	9
31-24.8	394	1132	5793	8	0	0	0	30	36	14	0	0	0	0	5	1	0	1	0	118	0	14	330	338	275	5.3543	10
31-24.9	394	1136	5793	9	0	0	0	30	36	14	0	0	0	0	5	1	0	1	0	118	0	14	331	339	276	5.3546	11
31-24.10	397	1128	5760	10	0	0	0	36	24	20	0	0	0	0	6	0	0	0	1	118	0	15	332	340	399	5.3560	14
31-24.11	397	1136	5760	11	0	0	0	36	24	20	0	0	0	0	6	0	0	0	1	118	0	15	333	341	400	5.3566	19
31-24.12	398	1102	5906	12	0	0	4	26	34	15	1	0	0	0	2	5	0	0	0	118	0	12	334	342	98	5.3557	12
31-24.13	398	1103	5906	13	0	0	4	26	34	15	1	0	0	0	2	5	0	0	0	118	0	12	335	343	99	5.3557	13
31-24.14a	399	1102	5894	14	0	0	6	22	36	15	1	0	0	0	3	3	1	0	0	118	0	13	336	344	179	5.3563	15
31-24.14b	399	1102	5894	14	0	0	4	28	30	17	1	0	0	0	3	3	1	0	0	118	0	13	336	344	179	5.3563	15
31-24.16	399	1103	5894	16	0	0	6	22	36	15	1	0	0	0	3	3	1	0	0	118	0	13	338	346	181	5.3564	17
31-24.17	399	1104	5894	17	0	0	4	28	30	17	1	0	0	0	3	3	1	0	0	118	0	13	339	347	182	5.3564	18

k = 31, Designs sorted based on degrees of freedom used

Design	wlp(W_4,...)			wlp rank	alp															df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
31-24.43	410	1060	6148	43	0	30	0	0	51	0	0	5	0	0	10	0	0	0	0	127	0	11	1	371	28	5.3625	47
31-24.104	439	914	6688	104	12	9	24	3	0	33	0	3	0	9	0	0	3	0	0	127	12	13	2	237	220	5.3756	163
31-24.86	434	952	6549	86	8	6	16	33	0	0	9	15	0	1	0	6	0	0	0	125	8	12	3	250	102	5.3742	149
31-24.99	437	940	6576	99	8	6	16	33	0	0	16	2	6	0	1	6	0	0	0	125	8	12	4	251	103	5.3757	164
31-24.105	439	938	6552	105	8	10	8	37	0	0	16	2	6	1	0	5	1	0	0	125	8	13	5	252	221	5.3768	183
31-24.119	445	892	6772	119	11	6	22	10	14	0	9	15	0	0	4	0	3	0	0	125	11	13	6	243	225	5.3789	206
31-24.125	449	880	6788	125	11	6	24	6	16	0	16	2	6	0	3	1	3	0	0	125	11	13	7	244	227	5.3810	229
31-24.130	451	878	6768	130	13	2	28	2	18	0	16	2	6	0	4	0	2	1	0	125	13	14	8	236	324	5.3821	241
31-24.37	408	848	7637	37	6	26	0	0	3	27	24	6	0	0	0	0	0	1	0	124	6	14	9	264	283	5.3531	4

k = 31, Designs sorted based on the number of clear two-factor interactions

Design	wlp(w_4,...)			wlp rank	alp															df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
31-24.433	819	126	14560	433	59	0	0	0	0	0	0	0	0	0	0	0	28	3	0	121	59	14	313	1	398	5.6579	433
31-24.390	525	420	8876	390	37	0	0	0	0	14	19	15	0	0	0	0	7	0	0	123	37	13	234	2	267	5.4124	376
31-24.397	531	414	8896	397	37	0	0	0	6	2	32	2	6	0	0	0	6	1	0	123	37	14	236	3	381	5.4165	387
31-24.401	539	406	8960	401	36	0	0	0	6	18	0	17	7	0	0	0	6	1	0	122	36	14	304	4	382	5.4223	396
31-24.412	563	382	9184	412	35	0	0	0	24	0	0	0	24	0	0	0	4	3	0	121	35	14	312	5	386	5.4401	412
31-24.429	643	302	10672	429	35	2	24	0	0	0	0	0	0	0	24	2	4	1	0	123	35	14	252	6	395	5.5057	429
31-24.422	591	354	9744	422	34	2	0	24	0	0	0	0	0	24	0	1	5	1	0	122	34	14	308	7	391	5.4633	422
31-24.431	719	226	12176	431	34	26	0	0	0	0	0	0	0	0	0	25	5	1	0	122	34	14	310	8	397	5.5695	431

k = 31, Designs sorted based on minimizing Lmax

Design	wlp(w_4,...)			wlp rank	alp															df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
31-24.128a	451	494	9208	128	30	0	0	0	6	19	12	18	7	0	0	0	0	0	0	123	30	9	45	44	1	5.3661	65
31-24.135	453	492	9188	135	30	0	0	0	9	14	15	15	9	0	0	0	0	0	0	123	30	9	49	48	2	5.3673	75
31-24.121	447	498	9240	121	30	0	0	2	1	8	40	8	0	3	0	0	0	0	0	123	30	10	43	42	3	5.3637	56
31-24.123	449	496	9224	123	30	0	0	1	4	13	25	14	4	1	0	0	0	0	0	123	30	10	44	43	4	5.3649	59
31-24.128b	451	494	9208	128	30	0	0	3	0	16	24	15	1	3	0	0	0	0	0	123	30	10	45	44	5	5.3661	66
31-24.142	455	490	9160	142	30	0	0	0	11	10	20	10	10	1	0	0	0	0	0	123	30	10	51	50	6	5.3684	79
31-24.144	455	490	9172	144	30	0	0	2	5	17	14	16	6	2	0	0	0	0	0	123	30	10	53	52	7	5.3685	82
31-24.145	455	490	9184	145	30	0	0	0	11	10	20	10	10	1	0	0	0	0	0	123	30	10	54	53	8	5.3686	83

k = 31, Design generators

Design	Design Generators
31-24.1	7 11 19 21 22 25 26 35 45 46 49 60 67 77 78 81 95 101 105 108 116 120 123 126
31-24.2	7 11 19 29 30 35 41 44 47 53 54 56 67 77 78 81 84 88 104 112 121 122 124 127
31-24.3	7 11 19 29 30 35 45 46 53 57 58 60 67 86 92 97 98 100 103 104 107 112 115 125
31-24.4	7 11 19 29 30 35 41 47 53 54 56 59 77 82 84 88 102 104 107 112 121 122 124 127
31-24.5	7 11 19 30 35 41 47 53 54 56 59 77 82 84 88 101 102 104 107 112 121 122 124 127
31-24.6	7 11 19 29 30 35 45 46 53 57 58 60 67 86 95 97 98 100 103 104 107 112 115 125
31-24.7	7 19 29 30 35 49 50 52 55 56 67 79 85 86 88 101 102 104 112 115 121 122 124 127
31-24.8	7 11 19 29 30 35 45 46 53 57 58 60 63 67 86 97 98 100 103 104 107 112 115 125
31-24.9	7 11 19 29 30 35 41 47 53 54 59 77 82 84 88 91 102 104 107 112 121 122 124 127
31-24.10	7 11 19 29 30 35 41 47 53 59 78 82 84 88 91 101 102 104 107 112 121 122 124 127
31-24.11	7 11 19 29 30 35 41 47 53 59 78 82 84 88 101 102 104 107 112 115 121 122 124 127
31-24.12	7 11 19 29 30 35 41 42 47 53 56 59 77 82 84 88 102 104 107 112 121 122 124 127
31-24.13	7 11 19 30 35 41 42 47 53 54 56 59 77 82 84 88 102 104 107 112 121 122 124 127
31-24.14a	7 11 19 29 30 35 41 42 47 53 54 56 59 82 84 88 102 104 107 112 121 122 124 127
31-24.14b	7 11 19 29 30 35 41 47 53 54 56 59 82 84 88 91 102 104 107 112 121 122 124 127
31-24.16	7 11 19 29 30 35 41 42 44 47 53 54 56 67 77 81 84 88 104 112 121 122 124 127
31-24.17	7 11 19 30 35 41 47 53 54 56 59 77 82 84 88 91 102 104 107 112 121 122 124 127
31-24.37	7 11 19 29 30 35 37 38 41 42 49 67 69 70 76 84 104 107 112 115 121 122 124 127
31-24.43	7 11 19 29 35 37 38 57 63 67 69 70 73 79 81 87 97 98 100 103 109 117 120 123
31-24.86	7 11 13 14 19 21 22 26 35 38 63 67 69 73 74 76 79 81 82 84 100 120 123 125
31-24.99	7 13 19 21 22 35 37 38 44 49 50 52 55 56 67 69 81 84 90 95 97 106 112 126
31-24.104	7 11 14 25 26 28 31 45 53 56 67 70 85 88 97 98 100 103 104 112 121 122 124 127
31-24.105	7 13 19 21 22 25 35 37 38 49 50 52 55 56 67 69 81 84 95 97 106 111 112 126
31-24.119	7 11 19 25 35 41 42 44 54 56 59 67 77 78 81 88 104 107 112 115 121 122 124 127
31-24.121	7 11 13 14 21 26 31 35 37 41 52 56 59 69 74 79 86 97 103 104 112 121 122 124
31-24.123	7 11 13 14 19 28 31 35 38 42 49 50 52 59 67 76 85 98 104 109 112 121 122 124
31-24.125	7 13 19 21 22 25 35 37 38 44 49 50 52 55 56 67 69 81 84 95 97 106 112 126
31-24.128a	7 11 13 14 21 26 28 31 35 37 41 52 56 59 69 79 86 97 103 104 112 121 122 124
31-24.128b	7 11 13 14 21 26 31 35 41 52 56 59 61 69 74 79 86 97 103 104 112 121 122 124
31-24.130	7 13 19 21 22 25 35 37 38 41 49 50 52 55 56 67 69 81 84 95 97 111 112 126
31-24.135	7 11 13 14 21 26 28 31 35 41 52 56 59 61 69 79 86 97 103 104 112 121 122 124
31-24.142	7 11 19 21 22 25 31 35 38 47 49 56 59 61 67 78 82 84 98 103 112 121 122 124
31-24.144	7 11 13 14 19 25 28 31 35 38 49 50 52 59 67 79 85 98 104 109 112 121 122 124
31-24.145	7 11 13 14 19 28 31 35 38 42 49 50 52 59 62 67 85 98 104 109 112 121 122 124
31-24.390	7 11 19 30 35 37 41 42 44 47 56 67 81 82 87 88 104 107 112 115 121 122 124 127
31-24.397	7 11 19 30 35 41 42 44 47 56 59 69 81 82 84 87 88 104 112 115 121 122 124 127
31-24.401	7 11 19 30 35 37 41 42 44 47 56 67 81 82 84 87 88 104 112 115 121 122 124 127
31-24.412	7 11 19 30 35 37 41 42 44 47 56 81 82 84 87 88 91 104 112 115 121 122 124 127
31-24.422	7 11 19 30 35 37 38 41 42 44 47 81 82 84 87 88 91 104 112 115 121 122 124 127
31-24.429	7 19 21 22 35 37 38 49 50 52 56 67 69 70 81 82 88 97 98 111 112 115 117 118
31-24.431	7 19 21 22 35 37 38 49 50 52 55 56 67 69 70 81 82 84 97 98 111 112 115 118
31-24.433	7 19 21 22 35 37 38 49 50 52 55 67 69 70 81 82 84 87 97 98 100 111 112 115

k = 32, Designs sorted based on word length pattern

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
32-25.1	452 1322 7219	1	0 0 0 12 48 19 1 0 0 0 0 4 3 0 0 0	119	0	13	130	125	46	4.8919	2
32-25.2	452 1323 7218	2	0 0 0 12 48 19 1 0 0 0 0 4 3 0 0 0	119	0	13	131	126	47	4.8920	3
32-25.3	452 1324 7219	3	0 0 0 12 48 19 1 0 0 0 0 4 3 0 0 0	119	0	13	132	127	48	4.8921	4
32-25.4	453 1322 7206	4	0 0 0 14 44 21 1 0 0 0 0 5 1 1 0 0	119	0	14	133	128	75	4.8925	5
32-25.5	453 1324 7206	5	0 0 0 14 44 21 1 0 0 0 0 5 1 1 0 0	119	0	14	134	129	76	4.8926	6
32-25.6	455 1320 7182	6	0 0 0 18 36 25 1 0 0 0 0 6 0 0 1 0	119	0	15	135	130	127	4.8935	7
32-25.7	455 1324 7182	7	0 0 0 18 36 25 1 0 0 0 0 6 0 0 1 0	119	0	15	136	131	128	4.8938	8
32-25.8	458 1296 7272	8	0 0 0 24 24 32 0 0 0 0 0 3 4 0 0 0	119	0	13	137	132	49	4.8944	9
32-25.9	458 1296 7273	9	0 0 0 24 24 32 0 0 0 0 0 3 4 0 0 0	119	0	13	138	133	50	4.8944	10
32-25.10	459 1296 7260	10	0 0 0 26 20 34 0 0 0 0 0 4 2 1 0 0	119	0	14	139	134	77	4.8949	11
32-25.11	459 1296 7262	11	0 0 0 26 20 34 0 0 0 0 0 4 2 1 0 0	119	0	14	140	135	78	4.8950	12
32-25.12	460 1286 7320	12	0 0 2 21 27 27 3 0 0 0 0 3 4 0 0 0	119	0	13	141	136	51	4.8952	13
32-25.13	460 1287 7320	13	0 0 2 21 27 27 3 0 0 0 0 3 4 0 0 0	119	0	13	142	137	52	4.8953	14
32-25.14	460 1296 7248	14	0 0 0 28 16 36 0 0 0 0 0 5 0 2 0 0	119	0	14	143	138	79	4.8955	15
32-25.15	461 1285 7308	15	0 0 4 17 29 27 3 0 0 0 0 4 2 1 0 0	119	0	14	144	139	80	4.8957	16

k = 32, Designs sorted based on degrees of freedom used

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
32-25.66	509 1080 8232	66	8 6 8 41 0 0 0 17 7 0 1 0 6 0 0 0	126	8	13	1	92	57	4.9180	97
32-25.76	521 1012 8504	76	11 3 25 5 19 0 0 17 7 0 0 4 0 3 0 0	126	11	14	2	88	107	4.9225	115
32-25.25	471 976 9510	25	4 28 0 0 0 13 33 14 0 0 0 0 0 0 1 0	125	4	15	3	98	131	4.8919	1
32-25.42	489 940 9408	42	4 28 0 0 12 18 0 17 13 0 0 0 0 0 1 0	125	4	15	4	99	135	4.9007	27
32-25.57	501 916 9340	57	4 28 0 1 21 8 0 8 20 2 0 0 0 0 1 0	125	4	15	5	100	139	4.9065	44
32-25.60	503 912 9382	60	4 28 0 12 0 1 33 2 0 12 0 0 0 0 1 0	125	4	15	6	101	141	4.9078	52
32-25.61	505 908 9344	61	4 28 0 6 12 12 0 11 13 6 0 0 0 0 1 0	125	4	15	7	102	142	4.9086	56
32-25.64	507 904 9354	64	4 28 0 12 0 10 16 10 0 11 1 0 0 0 1 0	125	4	15	8	104	145	4.9097	62
32-25.71	517 568 11424	71	31 0 0 1 2 4 24 24 4 2 1 0 0 0 0 0	125	31	11	9	17	5	4.9035	34
32-25.73	519 880 9382	73	4 28 6 6 0 7 21 8 0 6 6 0 0 0 1 0	125	4	15	10	105	149	4.9162	88

k = 32, Designs sorted based on the number of clear two-factor interactions

Design	wlp(w_4,...)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
32-25.197	945 140 18200	197	61 0 0 0 0 0 0 0 0 0 0 0 0 30 1 0	124	61	15	104	1	186	5.2139	197
32-25.178	609 476 11032	178	38 0 0 0 0 7 17 17 7 0 0 0 0 7 0 0	125	38	14	85	2	123	4.9554	172
32-25.180	625 460 11160	180	37 0 0 0 0 24 0 0 24 0 0 0 0 6 1 0	124	37	15	101	3	177	4.9659	177
32-25.184	633 452 11640	184	34 0 4 5 19 0 0 0 0 19 5 4 0 3 0 0	125	34	14	89	4	124	4.9742	185
32-25.189	681 404 12280	189	34 3 1 24 0 0 0 0 0 0 24 1 3 3 0 0	125	34	14	91	5	125	5.0077	189
32-25.194	745 340 13432	194	34 3 25 0 0 0 0 0 0 0 0 25 3 3 0 0	125	34	14	93	6	126	5.0549	194
32-25.186	641 444 11576	186	33 4 0 0 24 0 0 0 0 24 0 0 4 2 1 0	124	33	15	102	7	179	4.9785	186
32-25.196	833 252 15288	196	33 28 0 0 0 0 0 0 0 0 0 0 28 2 1 0	124	33	15	103	8	185	5.1225	196
32-25.89	529 556 11320	89	32 0 0 0 0 13 17 17 13 0 0 0 0 1 0 0	125	32	14	18	9	111	4.9099	64
32-25.123	545 540 11224	123	32 0 0 0 12 1 17 17 1 12 0 0 0 1 0 0	125	32	14	44	10	114	4.9187	101

k = 32, Designs sorted based on minimizing Lmax

Design	wlp(w_4,...)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
32-25.75	521 564 11392	75	31 0 0 0 3 13 15 15 13 3 0 0 0 0 0 0	125	31	10	12	19	1	4.9056	41
32-25.79c	525 560 11336	79	31 0 0 0 6 10 15 15 10 6 0 0 0 0 0 0	125	31	10	13	22	2	4.9076	47
32-25.82	525 560 11352	82	31 0 0 0 6 10 15 15 10 6 0 0 0 0 0 0	125	31	10	15	23	3	4.9077	50
32-25.93	529 556 11344	93	31 0 0 0 9 7 15 15 7 9 0 0 0 0 0 0	125	31	10	22	29	4	4.9101	68
32-25.71	517 568 11424	71	31 0 0 1 2 4 24 24 4 2 1 0 0 0 0 0	125	31	11	9	17	5	4.9035	34
32-25.83	525 560 11360	83	31 0 0 2 1 13 15 15 13 1 2 0 0 0 0 0	125	31	11	16	24	6	4.9078	51
32-25.91	529 556 11320	91	31 0 0 2 4 10 15 15 10 4 2 0 0 0 0 0	125	31	11	20	27	7	4.9099	63
32-25.92	529 556 11344	92	31 0 0 3 0 16 12 12 16 0 3 0 0 0 0 0	125	31	11	21	28	8	4.9100	67
32-25.96	533 552 11288	96	31 0 0 3 3 13 12 12 13 3 3 0 0 0 0 0	125	31	11	24	30	9	4.9120	71
32-25.98	533 552 11312	98	31 0 0 2 7 7 15 15 7 7 2 0 0 0 0 0	125	31	11	26	32	10	4.9122	73

k = 32, Design generators

Design	Design Generators
32-25.1	7 11 19 29 30 35 45 46 53 54 57 60 67 86 89 95 97 98 100 103 104 107 112 115 125
32-25.2	7 11 19 29 30 35 41 42 47 53 54 56 59 77 82 84 88 102 104 107 112 121 122 124 127
32-25.3	7 11 19 30 35 41 42 47 53 54 56 59 77 82 84 88 101 102 104 107 112 121 122 124 127
32-25.4	7 11 19 29 30 35 45 46 53 54 57 58 60 67 86 92 97 98 100 103 104 107 112 115 125
32-25.5	7 11 19 29 30 35 41 47 53 54 56 59 77 82 84 88 91 102 104 107 112 121 122 124 127
32-25.6	7 11 19 29 30 35 45 46 53 54 57 58 67 86 92 95 97 98 100 103 104 107 112 115 125
32-25.7	7 11 19 29 30 35 45 46 53 54 57 58 60 63 67 86 97 98 100 103 104 107 112 115 125
32-25.8	7 11 13 14 19 21 22 25 26 35 41 42 52 61 67 73 84 87 93 101 102 108 114 120 123
32-25.9	7 11 13 14 19 21 22 25 26 35 41 42 52 61 67 73 84 87 93 101 102 108 111 114 120
32-25.10	7 11 13 14 19 21 22 25 26 35 41 42 52 61 67 73 74 84 93 101 102 108 113 114 120
32-25.11	7 11 13 14 19 21 22 25 26 35 41 42 52 61 67 73 74 84 93 101 102 108 111 114 120
32-25.12	7 11 19 29 30 35 41 42 44 47 53 56 59 77 82 84 88 102 104 107 112 121 122 124 127
32-25.13	7 11 19 30 35 41 42 44 47 53 54 56 59 77 82 84 88 102 104 107 112 121 122 124 127
32-25.14	7 14 22 25 26 28 38 43 45 51 53 56 70 77 85 88 97 98 100 103 104 112 121 122 124
32-25.15	7 11 19 29 30 35 45 46 53 54 57 58 67 77 86 92 97 98 100 103 104 107 112 115 125
32-25.25	7 11 19 29 30 35 37 38 41 42 49 50 67 69 70 76 84 104 107 112 115 121 122 124 127
32-25.42	7 11 19 29 38 41 42 47 49 56 62 70 73 82 87 88 101 104 107 112 115 121 122 124 127
32-25.57	7 11 19 30 35 37 38 41 42 44 47 67 73 74 76 88 104 107 112 115 121 122 124 127
32-25.60	7 11 19 25 26 28 31 35 37 38 41 42 44 67 69 70 73 74 76 109 110 117 118 120 123
32-25.61	7 11 19 29 30 35 37 38 41 42 44 47 67 73 76 88 91 104 107 112 115 121 122 124 127
32-25.64	7 11 19 25 31 35 46 50 52 56 59 74 76 86 88 97 103 104 107 112 115 121 122 124 127
32-25.66	7 13 19 21 22 25 35 37 38 49 50 52 55 56 67 69 81 84 95 97 100 106 111 112 126
32-25.71	7 11 13 14 19 28 31 35 38 42 49 50 52 59 67 76 79 85 98 104 109 112 121 122 124
32-25.73	7 11 19 25 31 35 46 50 52 56 59 67 74 86 88 97 103 104 107 112 115 121 122 124 127
32-25.75	7 11 13 14 19 25 28 31 35 38 42 49 50 52 59 67 79 85 98 104 109 112 121 122 124
32-25.76	7 13 19 21 22 25 35 37 38 41 49 50 52 55 56 67 69 81 84 95 97 100 111 112 126
32-25.79c	7 11 19 21 22 25 31 35 38 47 49 56 59 61 67 78 82 84 98 100 103 112 121 122 124
32-25.82	7 11 13 14 19 25 28 31 35 38 49 50 52 59 62 67 79 85 98 104 109 112 121 122 124
32-25.83	7 11 13 14 19 25 28 31 35 38 42 49 50 52 59 67 79 85 98 104 107 112 121 122 124
32-25.91	7 19 22 29 35 37 38 41 42 44 50 67 69 76 82 84 91 104 107 112 115 121 122 124 127
32-25.92	7 11 13 14 19 25 28 31 35 38 42 49 50 52 59 67 85 98 104 107 109 112 121 122 124
32-25.93	7 11 13 14 19 25 28 31 35 38 42 49 50 52 59 62 67 79 85 98 104 112 121 122 124
32-25.96	7 19 22 29 35 37 38 41 42 44 50 67 69 73 76 82 91 104 107 112 115 121 122 124 127
32-25.98	7 11 19 30 35 38 41 42 44 47 67 69 74 76 81 87 88 104 109 112 117 121 122 124 127
32-25.178	7 11 19 30 35 37 41 42 44 47 56 67 81 82 84 87 88 104 107 112 115 121 122 124 127
32-25.180	7 11 19 30 35 37 41 42 44 47 56 67 81 82 84 87 88 91 104 112 115 121 122 124 127
32-25.184	7 11 19 30 35 37 41 42 44 47 56 81 82 84 87 88 93 104 112 115 117 121 122 124 127
32-25.186	7 11 19 30 35 37 41 42 44 47 56 81 82 84 87 88 91 93 104 112 115 121 122 124 127
32-25.189	7 11 19 30 35 37 38 41 42 44 47 81 82 84 87 88 91 93 104 112 115 121 122 124 127
32-25.194	7 19 21 22 35 37 38 49 50 52 56 67 69 70 81 82 84 88 97 98 100 111 112 115 118
32-25.196	7 19 21 22 35 37 38 49 50 52 55 56 67 69 70 81 82 84 97 98 100 111 112 115 118
32-25.197	7 19 21 22 35 37 38 49 50 52 55 67 69 70 81 82 84 87 97 98 100 111 112 115 117

k = 33, Designs sorted based on word length pattern

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
33-26.1	518 1543 8863	1	0 0 0 4 40 33 3 0 0 0 0 0 5 2 0 0	120	0	14	67	67	27	4.4789	2
33-26.2	518 1544 8863	2	0 0 0 4 40 33 3 0 0 0 0 0 5 2 0 0	120	0	14	68	68	28	4.4790	3
33-26.3	519 1542 8850	3	0 0 0 6 36 35 3 0 0 0 0 0 6 0 1 0	120	0	15	69	69	46	4.4794	4
33-26.4	519 1544 8850	4	0 0 0 6 36 35 3 0 0 0 0 0 6 0 1 0	120	0	15	70	70	47	4.4795	5
33-26.5	525 1512 8935	5	0 0 0 12 30 30 8 0 0 0 0 0 4 3 0 0	120	0	14	71	71	29	4.4815	6
33-26.6	525 1512 8936	6	0 0 0 12 30 30 8 0 0 0 0 0 4 3 0 0	120	0	14	72	72	30	4.4815	7
33-26.7	526 1512 8922	7	0 0 0 14 26 32 8 0 0 0 0 0 5 1 1 0	120	0	15	73	73	48	4.4820	8
33-26.8	527 1500 8992	8	0 0 0 20 12 42 6 0 0 0 0 0 4 3 0 0	120	0	14	74	74	31	4.4822	9
33-26.9	527 1501 8992	9	0 0 0 20 12 42 6 0 0 0 0 0 4 3 0 0	120	0	14	75	75	32	4.4822	10
33-26.10	527 1501 8992	10	0 0 0 20 12 42 6 0 0 0 0 0 4 3 0 0	120	0	14	76	76	33	4.4822	11
33-26.11	528 1512 8896	11	0 0 0 18 18 36 8 0 0 0 0 0 6 0 0 1	120	0	16	77	77	74	4.4830	12
33-26.12	534 1470 9067	12	0 0 2 16 26 19 17 0 0 0 0 0 3 4 0 0	120	0	14	78	78	34	4.4848	13
33-26.13	535 1470 9054	13	0 0 4 12 28 19 17 0 0 0 0 0 4 2 1 0	120	0	15	79	79	49	4.4853	14
33-26.14	540 1120 11756	14	2 30 0 0 0 0 30 30 0 0 0 0 0 0 0 1	126	2	16	43	55	75	4.4784	1
33-26.15	541 1440 9144	15	0 0 4 16 20 32 0 8 0 0 0 0 2 5 0 0	120	0	14	80	80	35	4.4875	16
33-26.16a	542 1440 9130	16	0 0 4 18 16 34 0 8 0 0 0 0 3 3 1 0	120	0	15	81	81	50	4.4880	17
33-26.16b	542 1440 9130	16	0 0 6 12 22 32 0 8 0 0 0 0 3 3 1 0	120	0	15	81	81	50	4.4880	17
33-26.18	543 1440 9118	18	0 0 8 8 24 32 0 8 0 0 0 0 4 1 2 0	120	0	15	83	83	52	4.4885	19
33-26.19	544 1440 9104	19	0 0 8 10 20 34 0 8 0 0 0 0 4 2 0 1	120	0	16	84	84	76	4.4890	20
33-26.20	551 1400 9270	20	0 1 5 12 38 0 16 8 0 0 0 0 2 4 1 0	120	0	15	85	85	53	4.4915	22

k = 33, Designs sorted based on degrees of freedom used

Design	wlp(w_4,...)	wlp rank	alp																df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
33-26.38	592 648 14048	38	32	0	0	1	0	6	0	48	0	6	0	1	0	0	0	0	127	32	12	1	8	7	4.4900	21
33-26.39	592 1224 10272	39	8	6	0	49	0	0	0	0	24	0	0	1	0	6	0	0	127	8	14	2	49	38	4.5096	61
33-26.41	597 643 14008	41	32	0	0	0	3	0	28	0	28	0	3	0	0	0	0	0	127	32	11	3	9	3	4.4924	24
33-26.42c	600 640 13952	42	32	0	0	0	0	16	0	30	0	16	0	0	0	0	0	0	127	32	10	4	11	1	4.4937	27
33-26.42b	600 640 13952	42	32	0	0	4	0	0	0	54	0	0	0	4	0	0	0	0	127	32	12	4	11	8	4.4937	28
33-26.45	600 640 13984	45	32	0	0	0	0	16	0	30	0	16	0	0	0	0	0	0	127	32	10	6	13	2	4.4939	30
33-26.50	605 635 13928	50	33	0	0	0	0	0	30	0	30	0	0	0	0	0	1	0	127	33	15	7	5	64	4.4962	35
33-26.51b	605 635 13928	50	32	0	1	0	3	0	27	0	27	0	3	0	1	0	0	0	127	32	13	8	14	19	4.4962	35
33-26.51a	605 635 13928	50	32	0	0	0	6	0	25	0	25	0	6	0	0	0	0	0	127	32	11	8	14	4	4.4962	35
33-26.53	605 1147 10600	53	11	0	28	0	24	0	0	0	24	0	0	0	4	0	3	0	127	11	15	10	48	65	4.5138	69
33-26.54b	608 632 13920	54	32	1	0	0	0	13	0	34	0	13	0	0	0	1	0	0	127	32	14	11	16	39	4.4978	39
33-26.54a	608 632 13920	54	32	0	0	2	0	14	0	30	0	14	0	2	0	0	0	0	127	32	12	11	16	9	4.4978	39
33-26.56b	613 627 13912	56	32	0	0	0	9	0	22	0	22	0	9	0	0	0	0	0	127	32	11	13	18	5	4.5004	42
33-26.56a	613 627 13912	56	32	0	1	0	6	0	24	0	24	0	6	0	1	0	0	0	127	32	13	13	18	20	4.5004	42
33-26.58	616 624 13856	58	32	0	0	3	0	16	0	24	0	16	0	3	0	0	0	0	127	32	12	15	20	10	4.5016	44
33-26.59b	616 624 13888	59	32	0	0	3	0	16	0	24	0	16	0	3	0	0	0	0	127	32	12	16	21	11	4.5018	45
33-26.59a	616 624 13888	59	32	0	0	7	0	0	0	48	0	0	0	7	0	0	0	0	127	32	12	16	21	11	4.5018	45
33-26.61	621 619 13832	61	32	0	1	0	9	0	21	0	21	0	9	0	1	0	0	0	127	32	13	18	23	21	4.5042	50
33-26.62	624 616 13792	62	32	1	0	1	0	21	0	16	0	21	0	1	0	1	0	0	127	32	14	19	24	40	4.5055	52
33-26.63	624 616 13792	63	32	0	0	7	0	6	0	36	0	6	0	7	0	0	0	0	127	32	12	20	25	13	4.5055	52
33-26.64	624 616 13920	64	32	0	0	3	0	22	0	12	0	22	0	3	0	0	0	0	127	32	12	21	26	14	4.5063	55
33-26.66	629 611 13816	66	32	0	2	0	9	0	20	0	20	0	9	0	2	0	0	0	127	32	13	22	27	22	4.5083	59
33-26.68	632 608 13824	68	32	0	0	6	0	16	0	18	0	16	0	6	0	0	0	0	127	32	12	23	28	15	4.5100	62
33-26.69	632 608 13856	69	32	0	0	6	0	16	0	18	0	16	0	6	0	0	0	0	127	32	12	24	29	16	4.5102	63
33-26.71	637 603 13736	71	33	0	0	0	12	0	18	0	18	0	12	0	0	0	1	0	127	33	15	25	6	67	4.5121	66
33-26.73	640 600 13792	73	32	1	0	6	0	13	0	22	0	13	0	6	0	1	0	0	127	32	14	26	31	41	4.5141	70
33-26.75	645 595 13720	75	32	0	7	0	0	0	24	0	24	0	0	0	7	0	0	0	127	32	13	27	32	23	4.5163	71
33-26.76	645 595 13976	76	32	0	0	0	21	0	10	0	10	0	21	0	0	0	0	0	127	32	11	28	33	6	4.5179	72
33-26.78	653 587 13896	78	32	0	3	0	15	0	13	0	13	0	15	0	3	0	0	0	127	32	13	29	34	24	4.5217	74
33-26.79	656 584 13792	79	32	2	0	9	0	4	0	32	0	4	0	9	0	2	0	0	127	32	14	30	35	42	4.5226	75
33-26.81	661 579 13880	81	32	0	6	0	9	0	16	0	16	0	9	0	6	0	0	0	127	32	13	31	36	25	4.5259	77
33-26.83	669 571 13800	83	33	0	6	0	6	0	18	0	18	0	6	0	6	0	1	0	127	33	15	32	7	68	4.5296	81
33-26.84	672 568 13664	84	32	7	0	0	0	7	0	34	0	7	0	0	0	7	0	0	127	32	14	33	38	43	4.5304	83
33-26.85	680 560 14112	85	32	0	0	15	0	16	0	0	0	16	0	15	0	0	0	0	127	32	12	34	39	17	4.5376	85
33-26.86	680 560 14144	86	32	0	0	15	0	16	0	0	0	16	0	15	0	0	0	0	127	32	12	35	40	18	4.5377	86
33-26.88	688 552 14048	88	32	3	0	9	0	19	0	0	0	19	0	9	0	3	0	0	127	32	14	36	41	44	4.5414	87
33-26.90	701 539 13608	90	39	0	0	0	0	0	24	0	24	0	0	0	0	0	7	0	127	39	15	37	2	70	4.5456	88
33-26.92	725 515 14520	92	32	0	10	0	21	0	0	0	0	0	21	0	10	0	0	0	127	32	13	38	43	26	4.5644	93
33-26.94	733 507 14440	94	35	0	4	0	24	0	0	0	0	0	24	0	4	0	3	0	127	35	15	39	3	71	4.5682	94
33-26.96	784 456 15328	96	32	6	0	25	0	0	0	0	0	0	0	25	0	6	0	0	127	32	14	40	45	45	4.6017	96
33-26.99	861 379 16744	99	35	0	28	0	0	0	0	0	0	0	0	0	28	0	3	0	127	35	15	41	4	72	4.6532	99

k = 33, Designs sorted based on degrees of freedom used (Continued)

Design	wlp(w_4,...)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
33-26.101	1085 155 22568	101	63 0 0 0 0 0 0 0 0 0 0 0 0 0 31 0	127	63	15	42	1	73	4.8177	101
33-26.14	540 1120 11756	14	2 30 0 0 0 0 30 30 0 0 0 0 0 0 0 1	126	2	16	43	55	75	4.4784	1
33-26.24	560 1080 11632	24	2 30 0 0 0 30 0 0 30 0 0 0 0 0 0 1	126	2	16	44	56	77	4.4871	15
33-26.29	576 1048 11552	29	2 30 0 0 12 18 0 0 18 12 0 0 0 0 0 1	126	2	16	45	57	79	4.4942	31

k = 33, Designs sorted based on the number of clear two-factor interactions

Design	wlp(w_4,...)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
33-26.101	1085 155 22568	101	63 0 0 0 0 0 0 0 0 0 0 0 0 0 31 0	127	63	15	42	1	73	4.8177	101
33-26.90	701 539 13608	90	39 0 0 0 0 0 24 0 24 0 0 0 0 0 7 0	127	39	15	37	2	70	4.5456	88
33-26.94	733 507 14440	94	35 0 4 0 24 0 0 0 0 0 24 0 4 0 3 0	127	35	15	39	3	71	4.5682	94
33-26.99	861 379 16744	99	35 0 28 0 0 0 0 0 0 0 0 0 28 0 3 0	127	35	15	41	4	72	4.6532	99
33-26.50	605 635 13928	50	33 0 0 0 0 0 30 0 30 0 0 0 0 0 1 0	127	33	15	7	5	64	4.4962	35
33-26.71	637 603 13736	71	33 0 0 0 12 0 18 0 18 0 12 0 0 0 1 0	127	33	15	25	6	67	4.5121	66
33-26.83	669 571 13800	83	33 0 6 0 6 0 18 0 18 0 6 0 6 0 1 0	127	33	15	32	7	68	4.5296	81
33-26.38	592 648 14048	38	32 0 0 1 0 6 0 48 0 6 0 1 0 0 0 0	127	32	12	1	8	7	4.4900	21
33-26.41	597 643 14008	41	32 0 0 0 3 0 28 0 28 0 3 0 0 0 0 0	127	32	11	3	9	3	4.4924	24

k = 33, Designs sorted based on minimizing Lmax

Design	wlp(w_4,...)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
33-26.42c	600 640 13952	42	32 0 0 0 0 16 0 30 0 16 0 0 0 0 0 0	127	32	10	4	11	1	4.4937	27
33-26.45	600 640 13984	45	32 0 0 0 0 16 0 30 0 16 0 0 0 0 0 0	127	32	10	6	13	2	4.4939	30
33-26.41	597 643 14008	41	32 0 0 0 3 0 28 0 28 0 3 0 0 0 0 0	127	32	11	3	9	3	4.4924	24
33-26.51a	605 635 13928	50	32 0 0 0 6 0 25 0 25 0 6 0 0 0 0 0	127	32	11	9	14	4	4.4962	35
33-26.56b	613 627 13912	56	32 0 0 0 9 0 22 0 22 0 9 0 0 0 0 0	127	32	11	13	19	5	4.5004	42
33-26.76	645 595 13976	76	32 0 0 0 21 0 10 0 10 0 21 0 0 0 0 0	127	32	11	28	33	6	4.5179	72
33-26.38	592 648 14048	38	32 0 0 1 0 6 0 48 0 6 0 1 0 0 0 0	127	32	12	1	8	7	4.4900	21
33-26.42b	600 640 13952	42	32 0 0 4 0 0 0 54 0 0 0 4 0 0 0 0	127	32	12	4	11	8	4.4937	28
33-26.54a	608 632 13920	54	32 0 0 2 0 14 0 30 0 14 0 2 0 0 0 0	127	32	12	12	16	9	4.4978	39
33-26.58	616 624 13856	58	32 0 0 3 0 16 0 24 0 16 0 3 0 0 0 0	127	32	12	15	20	10	4.5016	44

k = 33, Design generators

Design	Design Generators
33-26.1	7 11 19 29 30 35 45 46 53 54 57 58 60 67 77 86 92 97 98 100 103 104 107 112 115 125
33-26.2	7 11 19 29 30 35 41 42 44 47 53 54 56 59 77 82 84 88 102 104 107 112 121 122 124 127
33-26.3	7 11 19 29 30 35 45 46 53 54 57 58 60 67 86 92 95 97 98 100 103 104 107 112 115 125
33-26.4	7 11 19 29 30 35 45 46 53 54 57 58 60 63 67 77 86 97 98 100 103 104 107 112 115 125
33-26.5	7 11 13 14 19 21 22 25 26 28 35 41 42 52 61 67 73 84 87 93 101 102 108 111 114 120
33-26.6	7 11 13 14 19 21 22 25 26 28 35 41 42 52 61 67 73 84 87 93 101 108 111 113 114 120
33-26.7	7 11 13 14 19 21 22 25 26 28 35 41 42 52 61 67 73 74 84 93 101 102 108 111 114 120
33-26.8	7 11 19 29 30 35 45 46 53 54 57 58 60 67 77 86 89 97 98 100 103 104 107 112 115 125
33-26.9	7 11 19 29 30 35 45 46 53 54 57 58 60 67 77 86 90 97 98 100 103 104 107 112 115 125
33-26.10	7 11 19 29 30 35 41 42 44 47 53 54 56 59 82 84 88 91 102 104 107 112 121 122 124 127
33-26.11	7 11 13 14 19 21 22 25 26 28 35 41 42 52 61 67 73 74 84 93 101 108 113 114 120 123
33-26.12	7 11 13 14 19 21 22 25 26 28 35 41 42 52 55 61 67 73 74 84 93 101 102 108 114 120
33-26.13	7 11 13 14 19 21 22 25 26 28 35 41 42 52 55 61 67 73 74 84 93 101 108 113 114 120
33-26.14	7 11 19 29 30 35 37 38 41 42 49 50 67 69 70 76 79 84 104 107 112 115 121 122 124 127
33-26.15	7 13 19 21 22 25 28 35 37 38 44 49 50 52 55 56 69 75 78 81 84 95 97 112 123 126
33-26.16a	7 13 19 21 22 25 28 35 37 38 41 49 50 52 55 56 69 75 78 81 84 95 97 106 112 126
33-26.16b	7 13 19 21 22 25 28 35 37 38 44 49 50 52 55 56 69 75 78 81 84 95 97 106 112 126
33-26.18	7 13 19 21 22 25 28 35 37 38 44 49 50 52 55 56 69 75 78 81 84 90 95 97 112 126
33-26.19	7 13 19 21 22 25 28 35 37 38 41 49 50 52 55 56 69 75 78 81 84 90 95 97 112 126
33-26.20	7 13 19 21 22 25 28 35 37 38 49 50 52 55 56 69 75 78 81 84 95 97 100 106 112 126
33-26.24	7 11 19 29 38 41 42 47 49 56 62 70 73 82 87 88 94 101 104 107 112 115 121 122 124 127
33-26.29	7 11 19 29 30 35 37 38 41 42 44 47 67 73 74 76 79 88 104 107 112 115 121 122 124 127
33-26.38	7 11 13 14 19 28 31 35 38 42 49 50 52 59 67 76 79 85 98 104 107 109 112 121 122 124
33-26.39	7 13 19 21 22 25 35 37 38 49 50 52 55 56 67 69 81 84 95 97 100 106 111 112 117 126
33-26.41	7 11 13 14 19 25 28 31 35 38 42 49 50 52 59 67 79 85 98 104 107 109 112 121 122 124
33-26.42a	7 11 19 30 38 41 44 49 52 59 61 70 74 79 82 87 91 93 104 107 112 115 121 122 124 127
33-26.42b	7 11 21 22 31 35 38 41 56 59 67 77 81 84 87 94 97 98 103 104 112 115 121 122 124 127
33-26.42c	7 11 19 21 22 25 31 35 38 47 49 56 59 61 67 78 82 84 98 100 103 107 112 121 122 124
33-26.45	7 11 13 14 19 25 28 31 35 38 42 49 50 52 59 62 67 79 85 98 104 109 112 121 122 124
33-26.50	7 11 21 25 28 31 35 50 52 56 61 69 76 86 88 91 97 103 104 109 112 115 121 122 124 127
33-26.51a	7 19 22 29 35 37 38 41 42 44 50 67 69 73 76 82 87 91 104 107 112 115 121 122 124 127
33-26.51b	7 11 13 14 19 25 28 31 35 38 49 50 52 56 59 67 79 85 98 104 107 112 121 122 124 127
33-26.53	7 13 19 21 22 25 35 37 38 41 49 50 52 55 56 67 69 81 84 95 97 100 111 112 117 126
33-26.54a	7 11 19 30 35 37 41 42 44 47 56 67 69 74 76 81 87 88 104 109 112 117 121 122 124 127
33-26.54b	7 11 13 14 19 28 31 35 38 49 50 52 56 59 67 76 79 85 98 104 107 112 121 122 124 127
33-26.56a	7 11 19 30 35 37 41 42 44 47 56 67 74 76 81 87 88 91 104 109 112 117 121 122 124 127
33-26.56b	7 11 19 30 35 37 38 41 42 44 47 67 69 74 76 81 87 88 104 109 112 117 121 122 124 127
33-26.58	7 19 21 22 25 26 31 35 38 45 49 67 69 70 73 74 82 87 91 94 97 98 112 117 121 124
33-26.59a	7 11 19 30 35 41 42 44 47 56 59 67 74 76 81 87 88 91 104 109 112 117 121 122 124 127
33-26.59b	7 19 21 22 25 26 31 35 38 45 49 67 69 73 74 81 82 87 91 94 97 98 107 112 117 121
33-26.61	7 11 19 30 35 37 41 42 44 47 56 67 69 74 76 81 87 88 104 112 115 117 121 122 124 127

k = 33, Design generators (Continued)

Design	Design Generators
33-26.62	7 19 22 29 35 37 38 41 42 44 47 67 73 74 76 82 88 91 104 107 112 115 121 122 124 127
33-26.63	7 11 19 30 35 41 42 44 47 56 59 67 69 74 76 81 87 88 104 112 115 117 121 122 124 127
33-26.64	7 11 19 30 35 37 38 41 42 44 47 67 74 76 81 87 88 91 104 109 112 117 121 122 124 127
33-26.66	7 11 19 30 35 37 41 42 44 47 56 67 69 74 81 82 87 88 104 110 115 117 121 122 124 127
33-26.68	7 11 13 21 25 28 31 35 41 59 69 76 86 88 97 98 100 103 104 107 110 112 115 121 122 124
33-26.69	7 11 19 30 35 37 41 42 44 47 56 69 74 81 82 87 88 93 104 110 115 117 121 122 124 127
33-26.71	7 11 13 14 19 21 22 26 35 37 38 49 50 56 59 67 69 70 81 82 88 91 111 112 115 118
33-26.73	7 11 19 30 35 37 41 42 44 47 56 67 69 74 81 82 87 88 104 112 115 117 121 122 124 127
33-26.75	7 11 19 30 35 37 41 42 44 47 56 67 69 74 81 82 87 88 104 107 112 115 121 122 124 127
33-26.76	7 11 19 30 35 37 38 41 42 44 47 69 74 81 82 87 88 93 104 110 115 117 121 122 124 127
33-26.78	7 11 19 30 35 37 41 42 44 47 56 69 74 81 82 87 88 93 104 112 115 117 121 122 124 127
33-26.79	7 11 19 30 35 37 41 42 44 47 56 67 69 81 82 84 87 88 104 110 115 117 121 122 124 127
33-26.81	7 11 19 30 35 37 41 42 44 47 56 69 81 82 84 87 88 93 104 110 115 117 121 122 124 127
33-26.83	7 11 19 30 35 37 41 42 44 47 56 67 69 81 82 84 87 88 104 112 115 117 121 122 124 127
33-26.84	7 11 19 30 35 37 41 42 44 47 56 67 69 81 82 84 87 88 104 107 112 115 121 122 124 127
33-26.85	7 11 19 30 35 37 38 41 42 44 47 69 74 81 82 87 88 93 104 112 115 117 121 122 124 127
33-26.86	7 11 19 30 35 37 38 41 42 44 47 69 81 82 84 87 88 93 104 110 115 117 121 122 124 127
33-26.88	7 11 19 30 35 37 41 42 44 47 56 69 81 82 84 87 88 93 104 112 115 117 121 122 124 127
33-26.90	7 11 19 30 35 37 41 42 44 47 56 67 81 82 84 87 88 91 104 107 112 115 121 122 124 127
33-26.92	7 11 19 30 35 37 38 41 42 44 47 69 81 82 84 87 88 93 104 112 115 117 121 122 124 127
33-26.94	7 11 19 30 35 37 41 42 44 47 56 81 82 84 87 88 91 93 104 112 115 117 121 122 124 127
33-26.96	7 11 19 30 35 37 38 41 42 44 47 81 82 84 87 88 91 93 104 112 115 117 121 122 124 127
33-26.99	7 19 21 22 35 37 38 49 50 52 56 67 69 70 81 82 84 88 97 98 100 111 112 115 117 118
33-26.101	7 19 21 22 35 37 38 49 50 52 55 67 69 70 81 82 84 87 97 98 100 111 112 115 117 118

k = 34, Designs sorted based on word length pattern

Design	wlp(w_4,…)			wlp rank	alp																	df	C2FI	Lmax	df rank	Lmax rank	CD2*	CD2 rank
34-27.1	589	1800	10788	1	0	0	0	0	24	50	6	0	0	0	0	0	0	6	1	0	0	121	0	15	11	1	4.1085	2
34-27.2	589	1801	10788	2	0	0	0	0	24	50	6	0	0	0	0	0	0	6	1	0	0	121	0	15	12	2	4.1086	3
34-27.3	597	1764	10882	3	0	0	0	4	28	31	17	0	0	0	0	0	0	5	2	0	0	121	0	15	13	3	4.1111	4
34-27.4	598	1764	10868	4	0	0	0	6	24	33	17	0	0	0	0	0	0	6	0	1	0	121	0	16	14	10	4.1116	5
34-27.5	605	1728	10978	5	0	0	0	12	12	48	0	8	0	0	0	0	0	4	3	0	0	121	0	15	15	4	4.1138	6
34-27.6	605	1728	10979	6	0	0	0	12	12	48	0	8	0	0	0	0	0	4	3	0	0	121	0	15	16	5	4.1138	7
34-27.7	606	1728	10964	7	0	0	0	14	8	50	0	8	0	0	0	0	0	5	1	1	0	121	0	16	17	11	4.1142	8
34-27.8	607	1715	11046	8	0	0	0	15	17	21	27	0	0	0	0	0	0	4	3	0	0	121	0	15	18	6	4.1144	9
34-27.9	608	1728	10936	9	0	0	0	18	0	54	0	8	0	0	0	0	0	6	0	0	1	121	0	17	19	22	4.1152	10
34-27.10	615	1680	11146	10	0	0	2	11	25	18	16	8	0	0	0	0	0	3	4	0	0	121	0	15	20	7	4.1171	11
34-27.11	616	1280	14432	11	0	32	0	0	0	0	0	60	0	0	0	0	0	0	0	0	1	127	0	17	1	23	4.1081	1
34-27.12	616	1680	11132	12	0	0	4	7	27	18	16	8	0	0	0	0	0	4	2	1	0	121	0	16	21	12	4.1176	12
34-27.13	634	1600	11412	13	0	1	5	2	48	0	0	24	0	0	0	0	0	2	4	1	0	121	0	16	22	13	4.1239	14
34-27.14	636	1600	11384	14	0	4	0	3	49	0	0	24	0	0	0	0	0	4	0	3	0	121	0	16	23	14	4.1248	17
34-27.15	637	1568	11578	15	0	0	8	24	0	7	33	8	0	0	0	0	0	1	6	0	0	121	0	15	24	8	4.1242	15
34-27.16	638	1568	11564	16	0	0	8	24	0	7	33	8	0	0	0	0	0	4	0	3	0	121	0	16	25	15	4.1247	16
34-27.17	645	1536	11691	17	0	0	8	24	0	24	0	24	0	0	0	0	0	0	7	0	0	121	0	15	26	9	4.1272	18
34-27.18a	646	1536	11676	18	0	2	4	26	0	24	0	24	0	0	0	0	0	1	5	1	0	121	0	16	27	16	4.1277	19
34-27.18b	646	1536	11676	18	0	0	8	24	0	24	0	24	0	0	0	0	0	3	1	3	0	121	0	16	27	16	4.1277	19
34-27.20	648	1536	11648	20	0	4	0	28	0	24	0	24	0	0	0	0	0	4	0	2	1	121	0	17	29	24	4.1286	21

k = 34, Designs sorted based on degrees of freedom used

Design	wlp(w_4,…)			wlp rank	alp																	df	C2FI	Lmax	df rank	Lmax rank	CD2*	CD2 rank
34-27.11	616	1280	14432	11	0	32	0	0	0	0	0	60	0	0	0	0	0	0	0	0	1	127	0	17	1	23	4.1081	1
34-27.21	656	1200	14184	21	0	32	0	0	0	30	0	0	0	30	0	0	0	0	0	0	1	127	0	17	2	25	4.1238	13
34-27.23	680	1152	14240	23	0	32	0	12	0	0	0	36	0	0	0	12	0	0	0	0	1	127	0	17	3	26	4.1342	22
34-27.26	720	1072	14504	26	0	38	0	0	0	24	0	0	0	24	0	0	0	6	0	0	1	127	0	17	4	28	4.1525	26
34-27.31	976	560	19880	31	0	62	0	0	0	0	0	0	0	0	0	0	0	30	0	0	1	127	0	17	5	31	4.2919	31
34-27.22	674	1424	12740	22	0	0	16	44	0	0	0	0	0	19	9	0	0	0	0	3	0	125	0	16	6	18	4.1410	24
34-27.24	680	1408	12704	24	0	8	0	52	0	0	0	0	0	24	0	4	0	0	0	2	1	125	0	17	7	27	4.1431	25
34-27.27	730	1200	13972	27	0	3	33	24	0	0	0	0	0	0	24	4	0	0	0	3	0	125	0	16	8	20	4.1639	28
34-27.29	794	1008	15316	29	0	3	57	0	0	0	0	0	0	0	0	28	0	0	0	3	0	125	0	16	9	21	4.1941	29
34-27.30	808	896	15904	30	0	32	0	28	0	0	0	0	0	0	0	28	0	0	0	2	1	125	0	17	10	30	4.1975	30

k = 34, Designs sorted based on minimizing Lmax

Design	wlp(w_4,…)			wlp rank	alp																	df	C2FI	Lmax	df rank	Lmax rank	CD2*	CD2 rank
34-27.1	589	1800	10788	1	0	0	0	0	24	50	6	0	0	0	0	0	0	6	1	0	0	121	0	15	11	1	4.1085	2
34-27.2	589	1801	10788	2	0	0	0	0	24	50	6	0	0	0	0	0	0	6	1	0	0	121	0	15	12	2	4.1086	3
34-27.3	597	1764	10882	3	0	0	0	4	28	31	17	0	0	0	0	0	0	5	2	0	0	121	0	15	13	3	4.1111	4
34-27.5	605	1728	10978	5	0	0	0	12	12	48	0	8	0	0	0	0	0	4	3	0	0	121	0	15	15	4	4.1138	6
34-27.6	605	1728	10979	6	0	0	0	12	12	48	0	8	0	0	0	0	0	4	3	0	0	121	0	15	16	5	4.1138	7
34-27.8	607	1715	11046	8	0	0	0	15	17	21	27	0	0	0	0	0	0	4	3	0	0	121	0	15	18	6	4.1144	9
34-27.10	615	1680	11146	10	0	0	2	11	25	18	16	8	0	0	0	0	0	3	4	0	0	121	0	15	20	7	4.1171	11
34-27.15	637	1568	11578	15	0	0	8	24	0	7	33	8	0	0	0	0	0	1	6	0	0	121	0	15	24	8	4.1242	15
34-27.17	645	1536	11691	17	0	0	8	24	0	24	0	24	0	0	0	0	0	0	7	0	0	121	0	15	26	9	4.1272	18
34-27.4	598	1764	10868	4	0	0	0	6	24	33	17	0	0	0	0	0	0	6	0	1	0	121	0	16	14	10	4.1116	5

k = 34, Design generators

Design	Design Generators
34-27.1	7 11 19 29 30 35 45 46 53 54 57 58 60 67 77 86 89 92 97 98 100 103 104 107 112 115 125
34-27.2	7 11 19 29 30 35 45 46 53 54 57 58 60 63 67 77 86 89 97 98 100 103 104 107 112 115 125
34-27.3	7 11 13 14 19 21 22 25 26 28 35 41 42 52 55 61 67 73 74 84 93 101 102 108 111 114 120
34-27.4	7 11 13 14 19 21 22 25 26 28 35 41 42 52 55 61 67 73 74 84 93 101 108 113 114 120 123
34-27.5	7 13 19 21 22 25 28 35 37 38 44 49 50 52 55 56 69 75 78 81 84 95 97 106 111 112 126
34-27.6	7 13 19 21 22 25 28 35 37 38 44 49 50 52 55 56 69 75 78 81 84 90 95 97 112 123 126
34-27.7	7 13 19 21 22 25 28 35 37 38 41 49 50 52 55 56 69 75 78 81 84 90 95 97 106 112 126
34-27.8	7 11 13 14 19 21 22 25 26 28 35 41 42 52 55 61 67 73 74 84 87 93 101 102 108 114 120
34-27.9	7 13 19 21 22 25 28 35 37 38 41 49 50 52 55 56 69 75 78 81 84 90 95 97 111 112 126
34-27.10	7 13 19 21 22 25 28 35 37 38 41 44 49 50 52 55 56 69 75 78 81 84 95 97 106 112 126
34-27.11	7 11 19 29 30 35 37 38 41 42 49 50 67 69 70 76 79 84 87 104 107 112 115 121 122 124 127
34-27.12	7 13 19 21 22 25 28 35 37 38 41 44 49 50 52 55 56 69 75 78 81 84 90 95 97 112 126
34-27.13	7 13 19 21 22 25 28 35 37 38 49 50 52 55 56 69 75 78 81 84 95 97 100 106 112 117 126
34-27.14	7 13 19 21 22 25 28 35 37 38 49 50 52 55 56 69 75 78 81 84 90 95 97 100 112 117 126
34-27.15	7 13 19 21 22 25 28 35 37 38 41 44 49 50 52 55 56 69 75 78 81 84 95 97 100 112 126
34-27.16	7 13 19 21 22 25 28 35 37 38 41 44 49 50 52 55 56 69 75 81 84 95 97 100 106 112 126
34-27.17	7 13 19 21 22 25 28 35 37 38 41 44 49 50 52 55 56 61 69 75 81 84 95 97 112 123 126
34-27.18a	7 13 19 21 22 25 28 35 37 38 41 44 49 50 52 55 56 61 69 75 78 81 84 95 97 112 126
34-27.18b	7 13 19 21 22 25 28 35 37 38 41 44 49 50 52 55 56 61 69 75 81 84 95 97 106 112 126
34-27.20	7 13 19 21 22 25 28 35 37 38 41 44 49 50 52 55 56 61 69 78 81 84 95 97 111 112 126
34-27.21	7 11 19 29 30 35 37 38 41 42 44 47 67 73 74 76 79 88 91 104 107 112 115 121 122 124 127
34-27.22	7 19 21 22 25 35 37 38 41 49 50 52 55 56 67 69 78 81 82 84 95 97 98 100 111 112 126
34-27.23	7 11 14 19 22 25 26 28 31 45 53 56 67 70 88 91 94 97 98 100 103 104 112 121 122 124 127
34-27.24	7 19 21 22 25 35 37 38 41 49 50 52 55 56 67 69 78 81 82 84 95 97 98 111 112 115 126
34-27.26	7 13 19 21 22 25 35 37 38 41 44 49 50 52 55 56 67 69 81 84 95 97 98 100 112 117 126
34-27.27	7 19 21 22 25 35 37 38 41 49 50 52 55 56 67 69 78 81 82 84 95 97 98 100 112 115 126
34-27.29	7 19 21 22 25 35 37 38 49 50 52 55 56 67 69 78 81 82 84 95 97 98 100 112 115 117 126
34-27.30	7 19 21 22 25 35 37 38 41 49 50 52 55 56 67 69 81 82 84 95 97 98 100 112 115 117 126
34-27.31	7 19 21 30 35 37 38 44 49 52 55 58 67 69 70 81 82 84 87 97 98 100 103 112 115 117 118

k = 35, Designs sorted based on word length pattern

Design	wlp $(w_4,\ldots)$			wlp rank	alp																	df	C2FI	Lmax	df rank	Lmax rank	CD2*	CD2 rank
35-28.1	665	2100	13020	1	0	0	0	0	0	70	10	0	0	0	0	0	0	0	7	0	0	122	0	15	3	1	3.7764	1
35-28.2	665	2101	13020	2	0	0	0	0	0	70	10	0	0	0	0	0	0	0	7	0	0	122	0	15	4	2	3.7764	2
35-28.3	674	2058	13140	3	0	0	0	0	18	35	27	0	0	0	0	0	0	0	6	1	0	122	0	16	5	3	3.7790	3
35-28.4	683	2016	13263	4	0	0	0	4	16	36	16	8	0	0	0	0	0	0	5	2	0	122	0	16	6	4	3.7816	4
35-28.5	684	2016	13248	5	0	0	0	6	12	38	16	8	0	0	0	0	0	0	6	0	1	122	0	17	7	8	3.7820	5
35-28.6	694	1960	13468	6	0	0	0	10	22	7	33	8	0	0	0	0	0	0	4	3	0	122	0	16	8	5	3.7848	6
35-28.7	703	1920	13599	7	0	0	2	6	24	24	0	24	0	0	0	0	0	0	3	4	0	122	0	16	9	6	3.7876	7
35-28.8	704	1920	13584	8	0	0	4	2	26	24	0	24	0	0	0	0	0	0	4	2	1	122	0	17	10	9	3.7880	8
35-28.9	727	1792	14127	9	0	0	4	28	0	0	24	24	0	0	0	0	0	0	1	6	0	122	0	16	11	7	3.7945	9
35-28.10	728	1792	14112	10	0	0	4	28	0	0	24	24	0	0	0	0	0	0	4	0	3	122	0	17	12	10	3.7949	10
35-28.11	776	1536	15264	11	0	0	32	0	0	0	0	48	0	0	0	0	0	0	0	4	3	122	0	17	13	11	3.8090	11
35-28.12	776	1600	15712	12	0	0	8	52	0	0	0	0	0	0	24	4	0	0	0	0	3	126	0	17	1	12	3.8146	12
35-28.13	840	1344	17248	13	0	0	32	28	0	0	0	0	0	0	0	28	0	0	0	0	3	126	0	17	2	13	3.8387	13

k = 35, Designs sorted based on degrees of freedom used

Design	wlp $(w_4,\ldots)$			wlp rank	alp																	df	C2FI	Lmax	df rank	Lmax rank	CD2*	CD2 rank
35-28.12	776	1600	15712	12	0	0	8	52	0	0	0	0	0	0	24	4	0	0	0	0	3	126	0	17	1	12	3.8146	12
35-28.13	840	1344	17248	13	0	0	32	28	0	0	0	0	0	0	0	28	0	0	0	0	3	126	0	17	2	13	3.8387	13
35-28.1	665	2100	13020	1	0	0	0	0	0	70	10	0	0	0	0	0	0	0	7	0	0	122	0	15	3	1	3.7764	1
35-28.2	665	2101	13020	2	0	0	0	0	0	70	10	0	0	0	0	0	0	0	7	0	0	122	0	15	4	2	3.7764	2
35-28.3	674	2058	13140	3	0	0	0	0	18	35	27	0	0	0	0	0	0	0	6	1	0	122	0	16	5	3	3.7790	3
35-28.4	683	2016	13263	4	0	0	0	4	16	36	16	8	0	0	0	0	0	0	5	2	0	122	0	16	6	4	3.7816	4
35-28.5	684	2016	13248	5	0	0	0	6	12	38	16	8	0	0	0	0	0	0	6	0	1	122	0	17	7	8	3.7820	5
35-28.6	694	1960	13468	6	0	0	0	10	22	7	33	8	0	0	0	0	0	0	4	3	0	122	0	16	8	5	3.7848	6
35-28.7	703	1920	13599	7	0	0	2	6	24	24	0	24	0	0	0	0	0	0	3	4	0	122	0	16	9	6	3.7876	7
35-28.8	704	1920	13584	8	0	0	4	2	26	24	0	24	0	0	0	0	0	0	4	2	1	122	0	17	10	9	3.7880	8

k = 35, Designs sorted based on minimizing Lmax

Design	wlp(w_4,...)			wlp rank	alp																	df	C2FI	Lmax	df rank	Lmax rank	CD2*	CD2 rank
35-28.1	665	2100	13020	1	0	0	0	0	0	70	10	0	0	0	0	0	0	0	7	0	0	122	0	15	3	1	3.7764	1
35-28.2	665	2101	13020	2	0	0	0	0	0	70	10	0	0	0	0	0	0	0	7	0	0	122	0	15	4	2	3.7764	2
35-28.3	674	2058	13140	3	0	0	0	0	18	35	27	0	0	0	0	0	0	0	6	1	0	122	0	16	5	3	3.7790	3
35-28.4	683	2016	13263	4	0	0	0	4	16	36	16	8	0	0	0	0	0	0	5	2	0	122	0	16	6	4	3.7816	4
35-28.6	694	1960	13468	6	0	0	0	10	22	7	33	8	0	0	0	0	0	0	4	3	0	122	0	16	8	5	3.7848	6
35-28.7	703	1920	13599	7	0	0	2	6	24	24	0	24	0	0	0	0	0	0	3	4	0	122	0	16	9	6	3.7876	7
35-28.9	727	1792	14127	9	0	0	4	28	0	0	24	24	0	0	0	0	0	0	1	6	0	122	0	16	11	7	3.7945	9
35-28.5	684	2016	13248	5	0	0	0	6	12	38	16	8	0	0	0	0	0	0	6	0	1	122	0	17	7	8	3.7820	5
35-28.8	704	1920	13584	8	0	0	4	2	26	24	0	24	0	0	0	0	0	0	4	2	1	122	0	17	10	9	3.7880	8
35-28.10	728	1792	14112	10	0	0	4	28	0	0	24	24	0	0	0	0	0	0	4	0	3	122	0	17	12	10	3.7949	10

k = 35, Design generators

Design	Design Generators
35-28.1	15 23 25 26 28 39 43 45 46 51 53 54 56 71 73 74 76 81 82 84 88 99 101 104 111 112 119 126
35-28.2	15 23 25 26 28 39 43 45 46 51 53 54 56 71 73 74 76 81 82 84 88 101 104 111 112 119 123 126
35-28.3	15 23 25 26 28 39 43 45 46 51 53 54 56 63 71 73 74 76 81 82 84 88 101 104 111 112 119 126
35-28.4	15 23 25 26 28 39 43 45 46 51 53 54 56 63 71 73 76 81 82 84 88 95 101 104 111 112 119 126
35-28.5	15 23 25 26 28 39 43 45 46 51 53 54 56 63 71 74 81 82 84 88 95 101 104 112 119 123 125 126
35-28.6	15 23 25 26 28 39 43 45 46 51 54 56 63 71 73 76 81 82 84 88 95 99 101 104 112 119 123 126
35-28.7	15 23 25 26 28 39 43 45 46 51 54 56 63 71 73 76 81 82 84 88 95 101 102 104 111 112 119 126
35-28.8	15 23 25 26 28 39 43 45 46 51 53 54 56 63 71 74 81 82 84 88 95 101 104 111 112 119 125 126
35-28.9	15 23 27 29 30 41 42 44 51 53 54 56 63 67 69 73 86 90 92 95 97 104 107 109 114 116 121 126
35-28.10	15 23 27 29 30 41 42 44 51 53 54 63 67 69 73 86 90 92 95 97 102 104 107 109 114 116 121 126
35-28.11	15 23 27 29 30 37 43 44 51 52 58 63 69 70 75 76 83 84 90 95 97 100 104 111 112 119 123 126
35-28.12	15 23 25 30 39 41 46 51 53 54 56 63 71 73 78 83 85 86 88 95 97 98 100 104 111 112 121 126
35-28.13	15 23 25 30 39 41 42 44 49 54 56 63 71 75 77 78 81 86 88 95 99 102 104 111 112 119 121 126

k = 36, Designs sorted based on word length pattern

Design	wlp(w_4,...)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
36-29.1	756 2401 15736	1	0 0 0 0 0 42 38 0 0 0 0 0 0 0 0 7 0 0	123	0	16	2	1	1	3.4811	1
36-29.2	766 2352 15890	2	0 0 0 0 12 27 33 8 0 0 0 0 0 0 0 6 1 0	123	0	17	3	2	2	3.4837	2
36-29.3	776 2304 16048	3	0 0 0 4 4 48 0 24 0 0 0 0 0 0 0 5 2 0	123	0	17	4	3	3	3.4864	3
36-29.4	777 2304 16032	4	0 0 0 6 0 50 0 24 0 0 0 0 0 0 0 6 0 1	123	0	18	5	4	6	3.4867	4
36-29.5	788 2240 16300	5	0 0 0 5 27 0 24 24 0 0 0 0 0 0 0 4 3 0	123	0	17	6	5	4	3.4894	5
36-29.6	824 2048 17104	6	0 0 0 32 0 0 0 48 0 0 0 0 0 0 0 1 6 0	123	0	17	7	6	5	3.4987	6
36-29.7	825 2048 17088	7	0 0 0 32 0 0 0 48 0 0 0 0 0 0 0 4 0 3	123	0	18	8	7	7	3.4991	7
36-29.8	889 1792 19264	8	0 0 0 60 0 0 0 0 0 0 0 28 0 0 0 0 0 3	127	0	18	1	8	8	3.5229	8

k = 36, Design generators

Design	Design Generators
36-29.1	15 23 25 26 28 39 43 45 46 51 53 54 56 63 71 73 74 76 81 82 84 88 99 101 104 111 112 119 126
36-29.2	15 23 25 26 28 39 43 45 46 51 53 54 56 63 71 73 74 76 81 82 84 88 95 101 104 111 112 119 126
36-29.3	15 23 25 26 28 39 43 45 46 51 53 54 56 63 71 73 76 81 82 84 88 95 101 102 104 111 112 119 126
36-29.4	15 23 25 26 28 39 43 45 46 51 53 54 56 63 71 74 81 82 84 88 95 101 104 111 112 119 123 125 126
36-29.5	15 23 25 26 28 39 43 45 46 51 54 56 63 71 73 76 81 82 84 88 95 99 101 102 104 112 119 123 126
36-29.6	15 23 27 29 30 41 42 44 51 53 54 56 63 67 69 73 86 90 92 95 97 104 107 109 114 116 119 121 126
36-29.7	15 23 27 29 30 41 42 44 51 53 54 63 67 69 73 86 90 92 95 97 102 104 107 109 114 116 119 121 126
36-29.8	15 23 25 30 39 41 46 51 53 54 56 63 71 73 78 83 85 86 88 95 97 98 100 104 111 112 119 121 126

k = 37, Designs sorted based on word length pattern

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	C2FI rank	Lmax rank	CD2*	CD2 rank
37-30.1	854 2744 18886	1	0 0 0 0 0 21 51 8 0 0 0 0 0 0 0 0 7 0	124	0	17	1	1	1	3.2166	1
37-30.2	865 2688 19080	2	0 0 0 0 6 26 24 24 0 0 0 0 0 0 0 0 6 1	124	0	18	2	2	2	3.2191	2
37-30.3	889 2560 19584	3	0 0 0 0 32 0 0 48 0 0 0 0 0 0 0 0 4 3	124	0	18	3	3	3	3.2246	3

k = 37, Design generators

Design	Design Generators
37-30.1	15 23 25 26 28 39 43 45 46 51 53 54 56 63 71 73 74 76 81 82 84 88 95 99 101 104 111 112 119 126
37-30.2	15 23 25 26 28 39 43 45 46 51 53 54 56 63 71 73 74 76 81 82 84 88 95 101 102 104 111 112 119 126
37-30.3	15 23 25 26 28 39 43 45 46 51 54 56 63 71 73 76 81 82 84 88 95 99 101 102 104 111 112 119 123 126

k = 38, Designs sorted based on word length pattern

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	Lmax rank	CD2*	CD2 rank
38-31.1	959 3136 22512	1	0 0 0 0 0 7 49 24 0 0 0 0 0 0 0 0 0 7 0	125	0	18	1	1	2.9795	1
38-31.2	971 3072 22752	2	0 0 0 0 0 32 0 48 0 0 0 0 0 0 0 0 0 6 1	125	0	19	2	2	2.9819	2

k = 38, Design generators

Design	Design Generators
38-31.1	15 23 25 26 28 39 43 45 46 51 53 54 56 63 71 73 74 76 81 82 84 88 95 99 101 102 104 111 112 119 126
38-31.2	15 23 25 26 28 39 43 45 46 51 53 54 56 63 71 73 74 76 81 82 84 88 95 101 102 104 111 112 119 125 126

k = 39, Designs sorted based on word length pattern

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	Lmax rank	CD2*	CD2 rank
39-32.1	1071 3584 26656	1	0 0 0 0 0 0 32 48 0 0 0 0 0 0 0 0 0 0 7	126	0	19	1	1	2.7671	1

k = 39, Design generators

Design	Design Generators
39-32.1	15 23 25 26 28 39 43 45 46 51 53 54 56 63 71 73 74 76 81 82 84 88 95 99 101 102 104 111 112 119 123 126

k = 40, Designs sorted based on word length pattern

Design	wlp(w_4,…)	wlp rank	alp	df	C2FI	Lmax	df rank	Lmax rank	CD2*	CD2 rank
40-33.1	1190 4096 31360	1	0 0 0 0 0 0 0 80 0 0 0 0 0 0 0 0 0 0 0 7	127	0	20	1	1	2.5767	1

k = 40, Design generators

Design	Design Generators
40-33.1	15 23 25 26 28 39 43 45 46 51 53 54 56 63 71 73 74 76 81 82 84 88 95 99 101 102 104 111 112 119 123 125 126

Vita

Robert M. Block is a 1987 National Merit Scholar. He graduated with Military Distinction from the United States Air Force Academy with a Bachelor of Science in Operations Research. He earned a Master of Science in Operations Research from the Industrial and Systems Engineering College at Georgia Tech. He received his Doctorate in Business Administration with a concentration in Statistics from the University of Tennessee, Knoxville.

Rob has experience as a Logistics Operations Research Analyst, and as a Financial Analyst. He has worked as a Logistics Research Analyst for Air Force Materiel Command Headquarters in Dayton, Ohio, as the Chief of Financial Analysis for the 39th Wing, Incirlik AB, Turkey, and as an Assistant Professor and Course Director in the Math Department at the United States Air Force Academy. He has been a command briefer for Air Force Materiel Command, and a Technical Editor for the Air Force Scientific Advisory Board.

Rob is a Distinguished Graduate from the Air Force Financial Management (Analysis) Officer Course, a Chief of Staff Award Winner at Squadron Officer School, and was named the 1997 USAFE Financial Analysis Officer of the Year. He was awarded the 1998 Distinguished Performance in Budgeting from the American Society of Military Comptrollers. He was honored as the 1999 Company Grade Officer of the Year for the Academy Math Department. He has also received the University of Tennessee's 2003 Provost award for Extraordinary Professional Promise. He has been awarded the Air Force Meritorious Service Medal with two oak leaf clusters.