

**$k = 6$  search results discussed in  
*D*-optimal and near *D*-optimal  $2^k$  fractional  
factorial designs of resolution V  
by Bulutoglu and Ryan (2006)**

The table below lists search results for  $k = 6$  factor designs. Column definitions are the number of runs  $N$ , the number of factors  $k$ , determinant of the information matrix  $\det(\mathbf{X}_M^T \mathbf{X}_M)$ , a lower bound for *D*-efficiency  $\underline{e}(\mathbf{X})$ , an indicator for type 1 optimality  $I_1$ , and an indicator for type 2 optimality  $I_2$ . For  $N \equiv 1$  or  $2 \pmod{16}$ , type 1 optimality is restricted generalized type 1 optimality as studied in Chadjiconstantinidis et al. (1989). For the remaining cases, generalized type 1 optimality is as in Cheng (1980).

$N$	$k$	$\det(\mathbf{X}_M^T \mathbf{X}_M)$	$\underline{e}(\mathbf{X})$	$I_1$	$I_2$
22	6	6.2741479150568e+28	95.21424%	0	0
23	6	1.47233337740000e+29	95.40039%	0	0
24	6	3.44907726372407e+29	91.70893%	0	0
25	6	8.06450915769297e+29	92.54131%	0	0
26	6	2.17606647530633e+30	93.99942%	0	0
27	6	5.640364303994e+30	94.96306%	0	0
28	6	1.52415177636816e+31	93.37967%	0	0
29	6	4.11788374667888e+31	95.1539%	0	0
30	6	1.21694457621910e+32	97.36503%	0	0
31	6	4.05648192073034e+32	99.78737%	0	1
32	6	1.29807421463371e+33	100%	1	1
33	6	2.19050023719438e+33	100%	1	0
34	6	3.69139854786461e+33	100%	1	0
35	6	6.21275559171855e+33	99.59017%	0	0
36	6	1.04438563826303e+34	97.72583%	0	0
37	6	1.78109907514975e+34	97.97881%	0	0

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Table 1 – continued from previous page

$N$	$k$	$\det(\mathbf{X}_M^T \mathbf{X}_M)$	$\underline{e}(\mathbf{X})$	$I_1$	$I_2$
38	6	3.17437819038785e+34	98.43479%	0	0
39	6	5.31744256145512e+34	98.20738%	0	0
40	6	8.89748484951124e+34	96.94894%	0	0
41	6	1.51656818122001e+35	97.36854%	0	0
42	6	2.7901965220612e+35	98.13477%	0	0
43	6	4.89707961014824e+35	98.28797%	0	0
44	6	8.59022602710388e+35	97.70374%	0	0
45	6	1.50607858916756e+36	98.39902%	0	0
46	6	2.63922343244601e+36	99.10118%	0	0
47	6	4.62273917981227e+36	99.41415%	0	0
48	6	8.09330628441298e+36	99.17469%	0	0
49	6	1.41632859977227e+37	100%	1	0
50	6	2.06379310252531e+37	100%	1	0
51	6	3.00492097566763e+37	99.63061%	0	0
52	6	4.37202466279571e+37	98.84092%	0	0
53	6	6.44611305629518e+37	99.00022%	0	0
54	6	9.64992745591651e+37	99.23172%	0	0
55	6	1.40082695671131e+38	98.98946%	0	0
56	6	2.03206938480919e+38	98.41967%	0	0
57	6	2.99179225068415e+38	98.66809%	0	0
58	6	4.60372674823138e+38	99.11893%	0	0
59	6	6.84332242131778e+38	99.10712%	0	0
60	6	1.01677309484019e+39	98.83355%	0	0
61	6	1.52861219515265e+39	99.26284%	0	0
62	6	2.33944127258145e+39	99.7775%	0	0

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Table 1 – continued from previous page

$N$	$k$	$\det(\mathbf{X}_M^T \mathbf{X}_M)$	$\underline{e}(\mathbf{X})$	$I_1$	$I_2$
63	6	3.57296485266985e+39	100%	0	1
64	6	5.44451787073501e+39	100%	1	1
65	6	7.31607088880016e+39	100%	1	0
66	6	9.82565334484208e+39	100%	1	0
67	6	1.31892647881758e+40	99.73634%	0	0
68	6	1.76955969241359e+40	99.29777%	0	0
69	6	2.39808510052858e+40	99.40452%	0	0
70	6	3.2725163904234e+40	99.54505%	0	0
71	6	4.38380517891316e+40	99.36254%	0	0
72	6	5.86962681310273e+40	99.03442%	0	0
73	6	7.96354588573327e+40	99.20768%	0	0
74	6	1.10641283125499e+41	99.49063%	0	0
75	6	1.50367085078572e+41	99.45383%	0	0
76	6	2.04283279097525e+41	99.29429%	0	0
77	6	2.80206042479648e+41	99.57353%	0	0
78	6	3.87381625547900e+41	99.89117%	0	0
79	6	5.34955578137577e+41	100%	0	1
80	6	7.37869762948381e+41	100%	1	1
81	6	9.40783947759186e+41	100%	1	0
82	6	1.19903836479112e+42	100%	1	0
83	6	1.52762099360407e+42	99.80927%	0	0
84	6	1.94555503902405e+42	99.52907%	0	0
85	6	2.49668304342352e+42	99.60508%	0	0
86	6	3.21585160891925e+42	99.69958%	0	0
87	6	4.09106990150336e+42	99.56301%	0	0

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Table 1 – continued from previous page

$N$	$k$	$\det(\mathbf{X}_M^T \mathbf{X}_M)$	$\underline{e}(\mathbf{X})$	$I_1$	$I_2$
88	6	5.2026573687302e+42	99.3491%	0	0
89	6	6.69368727023077e+42	99.47947%	0	0
90	6	8.72241055788183e+42	99.6692%	0	0
91	6	1.12047101903329e+43	99.63183%	0	0
92	6	1.43894382610629e+43	99.52712%	0	0
93	6	1.86171425150006e+43	99.72265%	0	0
94	6	2.41863731818812e+43	99.93867%	0	0
95	6	3.13998529027931e+43	100%	0	1
96	6	4.07349443063262e+43	100%	1	1
97	6	5.00700357098593e+43	100%	1	0
98	6	6.15267387960135e+43	100%	1	0
99	6	7.5583889534825e+43	99.85708%	0	0
100	6	9.28277550434532e+43	99.66228%	0	0
101	6	1.14676428520005e+44	99.719%	0	0
102	6	1.41979255723239e+44	99.78694%	0	0
103	6	1.74223461994948e+44	99.68225%	0	0
104	6	2.13733577198405e+44	99.53158%	0	0
105	6	2.64760018541731e+44	99.63207%	0	0
106	6	3.30470001342516e+44	99.76827%	0	0
107	6	4.08371949759543e+44	99.73512%	0	0
108	6	5.0452663561013e+44	99.66106%	0	0
109	6	6.26953929388052e+44	99.80545%	0	0
110	6	7.80963888831538e+44	99.96203%	0	0
111	6	9.72346343802111e+44	100%	0	1
112	6	1.21003100562041e+45	100%	1	1

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Table 1 – continued from previous page

$N$	$k$	$\det(\mathbf{X}_M^T \mathbf{X}_M)$	$\underline{e}(\mathbf{X})$	$I_1$	$I_2$
113	6	1.4477156674387e+45	100%	1	0
114	6	1.73170253610472e+45	100%	1	0
115	6	2.07094888377649e+45	99.88937%	0	0
116	6	2.47613453495015e+45	99.74598%	0	0
117	6	2.97440214494639e+45	99.78988%	0	0
118	6	3.57793127802337e+45	99.84109%	0	0
119	6	4.27514575227403e+45	99.75872%	0	0
120	6	5.10715770538664e+45	99.64678%	0	0
121	6	6.15036193403115e+45	99.72622%	0	0
122	6	7.4429280954769e+45	99.8288%	0	0
123	6	8.940454168741e+45	99.80034%	0	0
124	6	1.07373750806805e+46	99.74517%	0	0
125	6	1.29553391637714e+46	99.85609%	0	0
126	6	1.56551231293685e+46	99.97487%	0	0
127	6	1.89110319283539e+46	100%	0	1
128	6	2.28359630832953e+46	100%	1	1
129	6	2.67608942382368e+46	100%	1	0
130	6	3.13548477491341e+46	100%	1	0
131	6	3.67310695876986e+46	99.912%	0	0
132	6	4.30218615381890e+46	99.80199%	0	0
133	6	5.05804435293692e+46	99.83696%	0	0
134	6	5.95227548583515e+46	99.87695%	0	0
135	6	6.96802498213857e+46	99.81061%	0	0
136	6	8.15574272916089e+46	99.72415%	0	0
137	6	9.61020157985594e+46	99.78837%	0	0

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Table 1 – continued from previous page

$N$	$k$	$\det(\mathbf{X}_M^T \mathbf{X}_M)$	$\underline{e}(\mathbf{X})$	$I_1$	$I_2$
138	6	1.13617004066686e+47	99.86843%	0	0
139	6	1.33556811477001e+47	99.84412%	0	0
140	6	1.56973117529909e+47	99.80143%	0	0
141	6	1.85191217564105e+47	99.88929%	0	0
142	6	2.18702009313800e+47	99.9825%	0	0
143	6	2.58209469060809e+47	100%	0	1
144	6	3.04771832334070e+47	100%	1	1
145	6	3.5133419560733e+47	100%	1	0
146	6	4.04951462406842e+47	100%	1	0
147	6	4.66685134420583e+47	99.92841%	0	0
148	6	5.37755484956529e+47	99.84132%	0	0
149	6	6.21581827710462e+47	99.86981%	0	0
150	6	7.18945708298433e+47	99.90192%	0	0
151	6	8.28074860483353e+47	99.84742%	0	0
152	6	9.5363734668082e+47	99.77861%	0	0
153	6	1.10447160559993e+48	99.83153%	0	0
154	6	1.28217837897626e+48	99.89576%	0	0
155	6	1.48171653660976e+48	99.87494%	0	0
156	6	1.71209869073087e+48	99.84091%	0	0
157	6	1.98447591141380e+48	99.91222%	0	0
158	6	2.30179476054625e+48	99.98733%	0	0
159	6	2.6693082097091e+48	100%	0	1
160	6	3.09485009821345e+48	100%	1	1
161	6	3.5203919867178e+48	100%	1	0
162	6	4.00396231456365e+48	100%	1	0

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Table 1 – continued from previous page

$N$	$k$	$\det(\mathbf{X}_M^T \mathbf{X}_M)$	$\underline{e}(\mathbf{X})$	$I_1$	$I_2$
163	6	4.55341909957850e+48	99.94066%	0	0
164	6	5.17767816968201e+48	99.86999%	0	0
165	6	5.90292749674928e+48	99.89365%	0	0
166	6	6.73294498134535e+48	99.91999%	0	0
167	6	7.65325791135227e+48	99.87447%	0	0
168	6	8.69836432115254e+48	99.8184%	0	0
169	6	9.93397276061285e+48	99.86272%	0	0
170	6	1.1364717247186e+49	99.9154%	0	0
171	6	1.29534380241065e+49	99.89745%	0	0
172	6	1.47627263038668e+49	99.86968%	0	0
173	6	1.68688296029087e+49	99.92871%	0	0
174	6	1.92850843428324e+49	99.99053%	0	0
175	6	2.20438143567868e+49	100%	0	1
176	6	2.51929306934706e+49	100%	1	1
177	6	2.83420470301544e+49	100%	1	0
178	6	3.18815496895677e+49	100%	1	0
179	6	3.58594975940160e+49	99.95003%	0	0
180	6	4.03298310024508e+49	99.89154%	0	0
181	6	4.54583916801844e+49	99.9115%	0	0
182	6	5.1257074618996e+49	99.93349%	0	0
183	6	5.76293766456657e+49	99.89492%	0	0
184	6	6.47875529638396e+49	99.84835%	0	0
185	6	7.3137786744074e+49	99.88599%	0	0
186	6	8.267191754626e+49	99.92998%	0	0
187	6	9.3162001724349e+49	99.91438%	0	0

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Table 1 – continued from previous page

$N$	$k$	$\det(\mathbf{X}_M^T \mathbf{X}_M)$	$\underline{e}(\mathbf{X})$	$I_1$	$I_2$
188	6	1.04973848075462e+50	99.8913%	0	0
189	6	1.18547160799825e+50	99.94096%	0	0
190	6	1.33925199721313e+50	99.99274%	0	0
191	6	1.51277634236698e+50	100%	0	1
192	6	1.70854739843801e+50	100%	1	1
193	6	1.90431845450904e+50	100%	1	0
194	6	2.12233622149722e+50	100%	1	0
195	6	2.36511117893315e+50	99.95736%	0	0
196	6	2.63543543065372e+50	99.90814%	0	0
197	6	2.94228136121591e+50	99.9252%	0	0
198	6	3.28572501028234e+50	99.94385%	0	0
199	6	3.66031819961294e+50	99.91075%	0	0
200	6	4.07727499852259e+50	99.87145%	0	0
201	6	4.55813686210630e+50	99.9038%	0	0
202	6	5.10083827729442e+50	99.9411%	0	0
203	6	5.69337389459162e+50	99.92744%	0	0
204	6	6.35425300813026e+50	99.90795%	0	0
205	6	7.10546674599276e+50	99.9503%	0	0
206	6	7.94771657995706e+50	99.99431%	0	0
207	6	8.88879680404082e+50	100%	0	1
208	6	9.94015986688434e+50	100%	1	1
209	6	1.09915229297279e+51	100%	1	0
210	6	1.21531688313312e+51	100%	1	0
211	6	1.34365853673986e+51	99.96319%	0	0
212	6	1.48544498982779e+51	99.9212%	0	0

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Table 1 – continued from previous page

$N$	$k$	$\det(\mathbf{X}_M^T \mathbf{X}_M)$	$\underline{e}(\mathbf{X})$	$I_1$	$I_2$
213	6	1.64492785781772e+51	99.93595%	0	0
214	6	1.82190611928013e+51	99.95196%	0	0
215	6	2.01370378322536e+51	99.92326%	0	0
216	6	2.22553033182582e+51	99.88965%	0	0
217	6	2.46742432807687e+51	99.91775%	0	0
218	6	2.73777618625883e+51	99.94977%	0	0
219	6	3.03102593587913e+51	99.93773%	0	0
220	6	3.35546098640289e+51	99.92104%	0	0
221	6	3.7208277033468e+51	99.9576%	0	0
222	6	4.12686754204214e+51	99.99546%	0	0
223	6	4.57677702309614e+51	100%	0	1
224	6	5.0752378869977e+51	100%	1	1
225	6	5.57369875089924e+51	100%	1	0
226	6	6.12071099764837e+51	100%	1	0
227	6	6.72097081755024e+51	99.96791%	0	0
228	6	7.37962595767017e+51	99.93165%	0	0
229	6	8.11466753420432e+51	99.94453%	0	0
230	6	8.92435261701721e+51	99.95843%	0	0
231	6	9.7970039904909e+51	99.93331%	0	0
232	6	1.07542989116925e+52	99.90424%	0	0
233	6	1.18381199453341e+52	99.92887%	0	0
234	6	1.30394246887036e+52	99.95666%	0	0
235	6	1.43351453158435e+52	99.94597%	0	0
236	6	1.57586876711519e+52	99.93153%	0	0
237	6	1.73489849098103e+52	99.9634%	0	0

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Table 1 – continued from previous page

$N$	$k$	$\det(\mathbf{X}_M^T \mathbf{X}_M)$	$\underline{e}(\mathbf{X})$	$I_1$	$I_2$
238	6	1.91029863871785e+52	99.99631%	0	0
239	6	2.10325809717420e+52	100%	0	1
240	6	2.31551350147619e+52	100%	1	1
241	6	2.52776890577818e+52	100%	1	0
242	6	2.75932025592580e+52	100%	1	0
243	6	3.01190954703011e+52	99.97177%	0	0
244	6	3.28743510709678e+52	99.94016%	0	0
245	6	3.59280118791015e+52	99.9515%	0	0
246	6	3.92703199162051e+52	99.96368%	0	0
247	6	4.28552512043581e+52	99.94151%	0	0
248	6	4.67648060959958e+52	99.91612%	0	0
249	6	5.11577776934818e+52	99.93788%	0	0
250	6	5.59921914106816e+52	99.96223%	0	0