

**$k = 3$ 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 $k = 3$ 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 $e(\mathbf{X})$, 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	$\det(\mathbf{X}_M^T \mathbf{X}_M)$	$e(\mathbf{X})$	I_1	I_2
7	3	262144	100.00000%	0	1
8	3	2097152	100.00000%	1	1
9	3	3932160	100.00000%	1	0
10	3	7340032	100.00000%	1	0
11	3	13631488	98.94690%	0	0
12	3	25165824	95.14596%	0	0
13	3	46137344	97.11675%	0	0
14	3	83886080	99.09609%	0	0
15	3	150994944	100.00000%	0	1
16	3	268435456	100.00000%	1	1
17	3	385875968	100.00000%	1	0
18	3	553648128	100.00000%	1	0
19	3	792723456	99.31525%	0	0
20	3	1132462080	98.26804%	0	0
21	3	1613758464	99.02934%	0	0
22	3	2293235712	99.77665%	0	0

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N	k	$\det(\mathbf{X}_M^T \mathbf{X}_M)$	$e(\mathbf{X})$	I_1	I_2
23	3	3248750592	100.00000%	0	1
24	3	4586471424	100.00000%	1	1
25	3	5924192256	100.00000%	1	0
26	3	7644119040	100.00000%	1	0
27	3	9852420096	99.61856%	0	0
28	3	12683575296	99.12033%	0	0
29	3	16307453952	99.51998%	0	0
30	3	20937965568	99.91338%	0	0
31	3	26843545600	100.00000%	0	1
32	3	34359738368	100.00000%	1	1
33	3	41875931136	100.00000%	1	0
34	3	51002736640	100.00000%	1	0
35	3	62075699200	99.76046%	0	0
36	3	75497472000	99.46905%	0	0
37	3	91750400000	99.71507%	0	0
38	3	111411200000	99.95775%	0	0
39	3	135168000000	100.00000%	0	1
40	3	163840000000	100.00000%	1	1
41	3	192512000000	100.00000%	1	0
42	3	226099200000	100.00000%	1	0
43	3	265420800000	99.83624%	0	0
44	3	311427072000	99.64497%	0	0
45	3	365219020800	99.81161%	0	0
46	3	428070666240	99.97628%	0	0
47	3	501454209024	100.00000%	0	1

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N	k	$\det(\mathbf{X}_M^T \mathbf{X}_M)$	$e(\mathbf{X})$	I_1	I_2
48	3	587068342272	100.00000%	1	1
49	3	672682475520	100.00000%	1	0
50	3	770527199232	100.00000%	1	0
51	3	882301206528	99.88114%	0	0
52	3	1.009930e+012	99.74598%	0	0
53	3	1.155593e+012	99.86630%	0	0
54	3	1.321756e+012	99.98538%	0	0
55	3	1.511208e+012	100.00000%	0	1
56	3	1.727095e+012	100.00000%	1	1
57	3	1.942982e+012	100.00000%	1	0
58	3	2.185304e+012	100.00000%	1	0
59	3	2.457208e+012	99.90986%	0	0
60	3	2.762201e+012	99.80928%	0	0
61	3	3.104188e+012	99.90024%	0	0
62	3	3.487513e+012	99.99036%	0	0
63	3	3.917010e+012	100.00000%	0	1
64	3	4.398047e+012	100.00000%	1	1
65	3	4.879083e+012	100.00000%	1	0
66	3	5.411659e+012	100.00000%	1	0
67	3	6.001143e+012	99.92932%	0	0
68	3	6.653441e+012	99.85156%	0	0
69	3	7.375046e+012	99.92273%	0	0
70	3	8.173092e+012	99.99331%	0	0
71	3	9.055415e+012	100.00000%	0	1
72	3	1.003061e+013	100.00000%	1	1

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N	k	$\det(\mathbf{X}_M^T \mathbf{X}_M)$	$e(\mathbf{X})$	I_1	I_2
73	3	1.100581e+013	100.00000%	1	0
74	3	1.207389e+013	100.00000%	1	0
75	3	1.324344e+013	99.94311%	0	0
76	3	1.452383e+013	99.88119%	0	0
77	3	1.592525e+013	99.93839%	0	0
78	3	1.745879e+013	99.99517%	0	0
79	3	1.913651e+013	100.00000%	0	1
80	3	2.097152e+013	100.00000%	1	1
81	3	2.280653e+013	100.00000%	1	0
82	3	2.479882e+013	100.00000%	1	0
83	3	2.696151e+013	99.95323%	0	0
84	3	2.930875e+013	99.90276%	0	0
85	3	3.185582e+013	99.94974%	0	0
86	3	3.461921e+013	99.99640%	0	0
87	3	3.761673e+013	100.00000%	0	1
88	3	4.086756e+013	100.00000%	1	1
89	3	4.411839e+013	100.00000%	1	0
90	3	4.762253e+013	100.00000%	1	0
91	3	5.139917e+013	99.96087%	0	0
92	3	5.546890e+013	99.91894%	0	0
93	3	5.985379e+013	99.95822%	0	0
94	3	6.457752e+013	99.99724%	0	0
95	3	6.966544e+013	100.00000%	0	1
96	3	7.514475e+013	100.00000%	1	1
97	3	8.062405e+013	100.00000%	1	0

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N	k	$\det(\mathbf{X}_M^T \mathbf{X}_M)$	$e(\mathbf{X})$	I_1	I_2
98	3	8.649474e+013	100.00000%	1	0
99	3	9.278398e+013	99.96678%	0	0
100	3	9.952077e+013	99.93140%	0	0
101	3	1.067360e+014	99.96472%	0	0
102	3	1.144627e+014	99.99784%	0	0
103	3	1.227359e+014	100.00000%	0	1
104	3	1.315932e+014	100.00000%	1	1
105	3	1.404504e+014	100.00000%	1	0
106	3	1.498916e+014	100.00000%	1	0
107	3	1.599543e+014	99.97145%	0	0
108	3	1.706781e+014	99.94119%	0	0
109	3	1.821053e+014	99.96981%	0	0
110	3	1.942805e+014	99.99828%	0	0
111	3	2.072514e+014	100.00000%	0	1
112	3	2.210681e+014	100.00000%	1	1
113	3	2.348849e+014	100.00000%	1	0
114	3	2.495476e+014	100.00000%	1	0
115	3	2.651065e+014	99.97520%	0	0
116	3	2.816150e+014	99.94902%	0	0
117	3	2.991292e+014	99.97388%	0	0
118	3	3.177087e+014	99.99861%	0	0
119	3	3.374162e+014	100.00000%	0	1
120	3	3.583181e+014	100.00000%	1	1
121	3	3.792200e+014	100.00000%	1	0
122	3	4.013162e+014	100.00000%	1	0

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N	k	$\det(\mathbf{X}_M^T \mathbf{X}_M)$	$e(\mathbf{X})$	I_1	I_2
123	3	4.246733e+014	99.97826%	0	0
124	3	4.493610e+014	99.95539%	0	0
125	3	4.754529e+014	99.97718%	0	0
126	3	5.030266e+014	99.99886%	0	0
127	3	5.321636e+014	100.00000%	0	1
128	3	5.629500e+014	100.00000%	1	1
129	3	5.937363e+014	100.00000%	1	0
130	3	6.261719e+014	100.00000%	1	0
131	3	6.603426e+014	99.98078%	0	0
132	3	6.963388e+014	99.96064%	0	0
133	3	7.342549e+014	99.97989%	0	0
134	3	7.741905e+014	99.99905%	0	0
135	3	8.162499e+014	100.00000%	0	1
136	3	8.605426e+014	100.00000%	1	1
137	3	9.048352e+014	100.00000%	1	0
138	3	9.513611e+014	100.00000%	1	0
139	3	1.000230e+015	99.98289%	0	0
140	3	1.051556e+015	99.96501%	0	0
141	3	1.105459e+015	99.98214%	0	0
142	3	1.162065e+015	99.99920%	0	0
143	3	1.221506e+015	100.00000%	0	1
144	3	1.283918e+015	100.00000%	1	1
145	3	1.346331e+015	100.00000%	1	0
146	3	1.411716e+015	100.00000%	1	0
147	3	1.480210e+015	99.98467%	0	0

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N	k	$\det(\mathbf{X}_M^T \mathbf{X}_M)$	$e(\mathbf{X})$	I_1	I_2
148	3	1.551958e+015	99.96869%	0	0
149	3	1.627109e+015	99.98404%	0	0
150	3	1.705820e+015	99.99932%	0	0
151	3	1.788255e+015	100.00000%	0	1
152	3	1.874585e+015	100.00000%	1	1
153	3	1.960914e+015	100.00000%	1	0
154	3	2.051139e+015	100.00000%	1	0
155	3	2.145428e+015	99.98619%	0	0
156	3	2.243961e+015	99.97182%	0	0
157	3	2.346923e+015	99.98565%	0	0
158	3	2.454507e+015	99.99942%	0	0
159	3	2.566914e+015	100.00000%	0	1
160	3	2.684355e+015	100.00000%	1	1
161	3	2.801795e+015	100.00000%	1	0
162	3	2.924269e+015	100.00000%	1	0
163	3	3.051985e+015	99.98749%	0	0
164	3	3.185163e+015	99.97450%	0	0
165	3	3.324028e+015	99.98702%	0	0
166	3	3.468817e+015	99.99950%	0	0
167	3	3.619775e+015	100.00000%	0	1
168	3	3.777156e+015	100.00000%	1	1
169	3	3.934538e+015	100.00000%	1	0
170	3	4.098343e+015	100.00000%	1	0
171	3	4.268827e+015	99.98862%	0	0
172	3	4.446254e+015	99.97682%	0	0

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N	k	$\det(\mathbf{X}_M^T \mathbf{X}_M)$	$e(\mathbf{X})$	I_1	I_2
173	3	4.630899e+015	99.98821%	0	0
174	3	4.823048e+015	99.99957%	0	0
175	3	5.022995e+015	100.00000%	0	1
176	3	5.231048e+015	100.00000%	1	1
177	3	5.439101e+015	100.00000%	1	0
178	3	5.655260e+015	100.00000%	1	0
179	3	5.879832e+015	99.98960%	0	0
180	3	6.113135e+015	99.97883%	0	0
181	3	6.355499e+015	99.98924%	0	0
182	3	6.607266e+015	99.99962%	0	0
183	3	6.868789e+015	100.00000%	0	1
184	3	7.140436e+015	100.00000%	1	1
185	3	7.412084e+015	100.00000%	1	0
186	3	7.693854e+015	100.00000%	1	0
187	3	7.986115e+015	99.99046%	0	0
188	3	8.289246e+015	99.98060%	0	0
189	3	8.603639e+015	99.99015%	0	0
190	3	8.929701e+015	99.99967%	0	0
191	3	9.267852e+015	100.00000%	0	1
192	3	9.618528e+015	100.00000%	1	1
193	3	9.969203e+015	100.00000%	1	0
194	3	1.033240e+016	100.00000%	1	0
195	3	1.070856e+016	99.99121%	0	0
196	3	1.109813e+016	99.98215%	0	0
197	3	1.150157e+016	99.99094%	0	0

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N	k	$\det(\mathbf{X}_M^T \mathbf{X}_M)$	$e(\mathbf{X})$	I_1	I_2
198	3	1.191936e+016	99.99971%	0	0
199	3	1.235200e+016	100.00000%	0	1
200	3	1.280000e+016	100.00000%	1	1
201	3	1.324800e+016	100.00000%	1	0
202	3	1.371136e+016	100.00000%	1	0
203	3	1.419059e+016	99.99188%	0	0
204	3	1.468622e+016	99.98352%	0	0
205	3	1.519880e+016	99.99164%	0	0
206	3	1.572889e+016	99.99974%	0	0
207	3	1.627706e+016	100.00000%	0	1
208	3	1.684393e+016	100.00000%	1	1
209	3	1.741079e+016	100.00000%	1	0
210	3	1.799634e+016	100.00000%	1	0
211	3	1.860118e+016	99.99248%	0	0
212	3	1.922592e+016	99.98474%	0	0
213	3	1.987120e+016	99.99227%	0	0
214	3	2.053768e+016	99.99977%	0	0
215	3	2.122603e+016	100.00000%	0	1
216	3	2.193695e+016	100.00000%	1	1
217	3	2.264787e+016	100.00000%	1	0
218	3	2.338136e+016	100.00000%	1	0
219	3	2.413811e+016	99.99301%	0	0
220	3	2.491885e+016	99.98583%	0	0
221	3	2.572431e+016	99.99282%	0	0
222	3	2.655525e+016	99.99979%	0	0

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N	k	$\det(\mathbf{X}_M^T \mathbf{X}_M)$	$e(\mathbf{X})$	I_1	I_2
223	3	2.741245e+016	100.00000%	0	1
224	3	2.829672e+016	100.00000%	1	1
225	3	2.918099e+016	100.00000%	1	0
226	3	3.009234e+016	100.00000%	1	0
227	3	3.103155e+016	99.99349%	0	0
228	3	3.199948e+016	99.98681%	0	0
229	3	3.299695e+016	99.99332%	0	0
230	3	3.402486e+016	99.99981%	0	0
231	3	3.508411e+016	100.00000%	0	1
232	3	3.617561e+016	100.00000%	1	1
233	3	3.726712e+016	100.00000%	1	0
234	3	3.839088e+016	100.00000%	1	0
235	3	3.954784e+016	99.99392%	0	0
236	3	4.073894e+016	99.98769%	0	0
237	3	4.196515e+016	99.99377%	0	0
238	3	4.322749e+016	99.99983%	0	0
239	3	4.452699e+016	100.00000%	0	1
240	3	4.586471e+016	100.00000%	1	1
241	3	4.720244e+016	100.00000%	1	0
242	3	4.857838e+016	100.00000%	1	0
243	3	4.999360e+016	99.99431%	0	0
244	3	5.144920e+016	99.98848%	0	0
245	3	5.294628e+016	99.99417%	0	0
246	3	5.448601e+016	99.99985%	0	0
247	3	5.606956e+016	100.00000%	0	1

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N	k	$\det(\mathbf{X}_M^T \mathbf{X}_M)$	$e(\mathbf{X})$	I_1	I_2
248	3	5.769813e+016	100.00000%	1	1
249	3	5.932671e+016	100.00000%	1	0
250	3	6.100032e+016	100.00000%	1	0
