materials

MDPI

In-silico Conceptualisation of Continuous Millifluidic Separators for Magnetic Nanoparticles

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Supplementary Information

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S1. Time Discretisation

In order to determine the best compromise between accuracy and computational effort three different time steps, i.e., $\Delta t = 0.1\ s$, $\Delta t = 0.01\ s$, and $\Delta t = 0.001\ s$, were used for otherwise identical simulations conditions. There was no considerable difference in the separator efficiency for all separation conditions simulated using different time steps (see Error! Reference source not found.). Therefore, $\Delta t = 0.01\ s$ was considered as sufficiently small and used for all simulations.

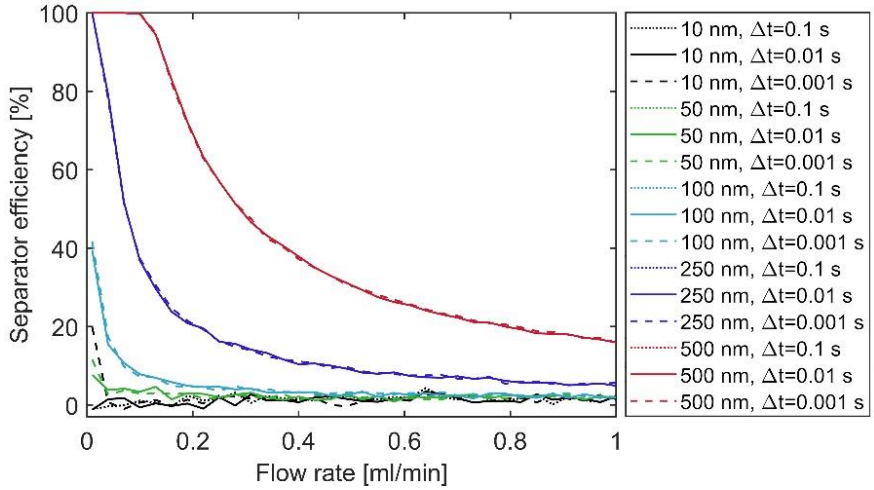

Figure S1. Reproduction of results shown in Figure 4b using different time steps (Δt= 0.1 s, 0.01 s, and 0.001 s)

S2. Particle Trajectories

Particle trajectories (20 out of 10,000 trajectories calculated) for additional separation conditions presented in **Figure 4a** are shown in **Error! Reference source not found.**.

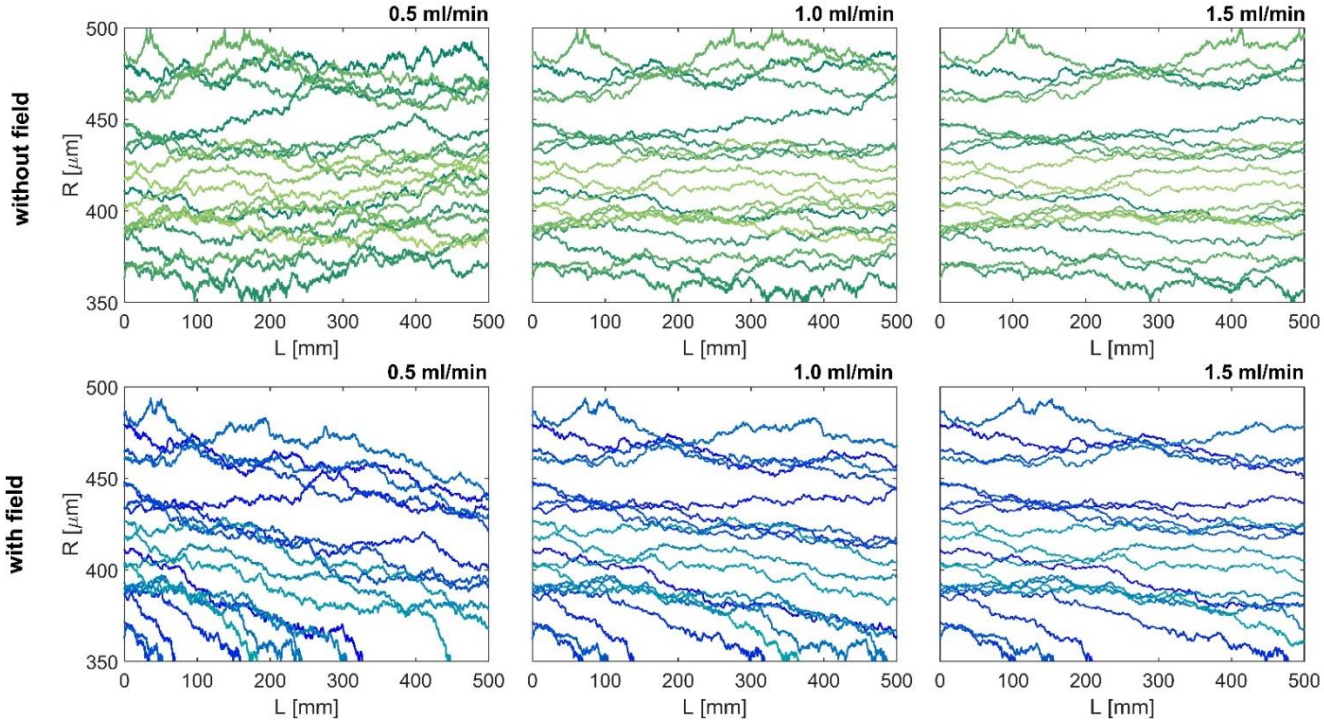

Figure S2. 20 particle trajectories of 250 nm IONPs in the magnetic separator (r_{tube}= 500 µm,and r_{wire}/r_{tube}= 0.7) operated without and with magnetic at a flowrate of 0.5 ml/min (identical to Figure 4a), 1.0 ml/min, and 1.5 ml/min.

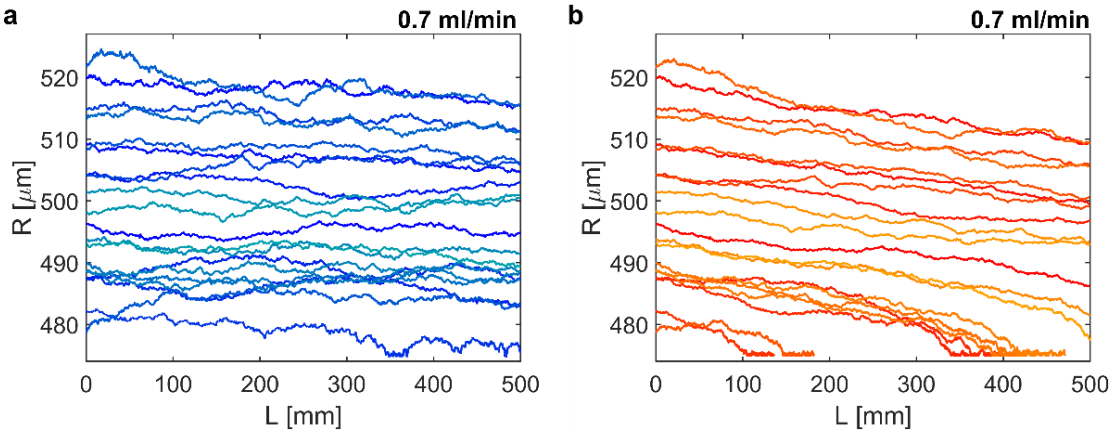

Figure S3. 20 particle trajectories (out of 10,000) for the optimum separation condition cosidering the temperature constraint ($\Delta T < 10\ °C$) for (**a**) 250 nm MNPs yielding 13% separator efficiency at 0.7 ml/min (r_{tube} = 527 μm, r_{wire} = 474 μm, r_{wire}/r_{tube} = 0.9), and (**b**) 500 nm MNPs yielding 44% separator efficiency at 0.7 ml/min (r_{tube} = 527 μm, r_{wire} = 474 μm, r_{wire}/r_{tube} = 0.9).

S3. Potential to Retain Particles via Multiple Separation Steps

The potential to retain particles was discussed in terms of the probability for particles to touch the wire in a single separation step, i.e., the percentage of MNPs that touched the wire surface when the solution passed through the separator (q_{retain}). The article reports these percentages for the optimum separation conditions for 250 and 500 nm particles, as well as the best separation conditions considering the temperature constraint for 250 and 500 nm particles.

When multiple separators are used in series, more particles can be retained. The concentration of MNPs left in solution (MNP_N) after each separation step (N) is given by

$$MNP_N = MNP_{N-1} \cdot (1 - q_{retain}/100) \quad \text{(S1)}$$

It should be highlighted that eq. S1 assusmes that the MNPs solution is homogenised before each separation step, i.e., q_{retain} is the same for each separation step as the MNPs have the same radially dependent initialisation likelihood as when entering the previous separator. This reflects the experimental constraints, since the MNP solutions would be mixed when transferred between separators. Although the structure of eq. S1 is similar to the exponential decay law (see eq. S2), the discrete nature of N requires the use of eq. S1.

$$MNP_N = MNP_{N=0} \cdot \exp(-q_{retain} \cdot N/100) \quad \text{(S2)}$$

The drop of non retained MNPs with the increase in separation steps is shown in **Error! Reference source not found.** for the four cases reported in the main article, i.e., 250 nm MNPs for optimum conditions (q_{retain} = 51.57%), 500 nm MNPs for optimum conditions (q_{retain} = 47.34%), 250 nm MNPs for conditions considering the temperature constraint (q_{retain} = 7.56%) and 500 nm MNPs for conditions considering the temperature constraint (q_{retain} = 25.46%).

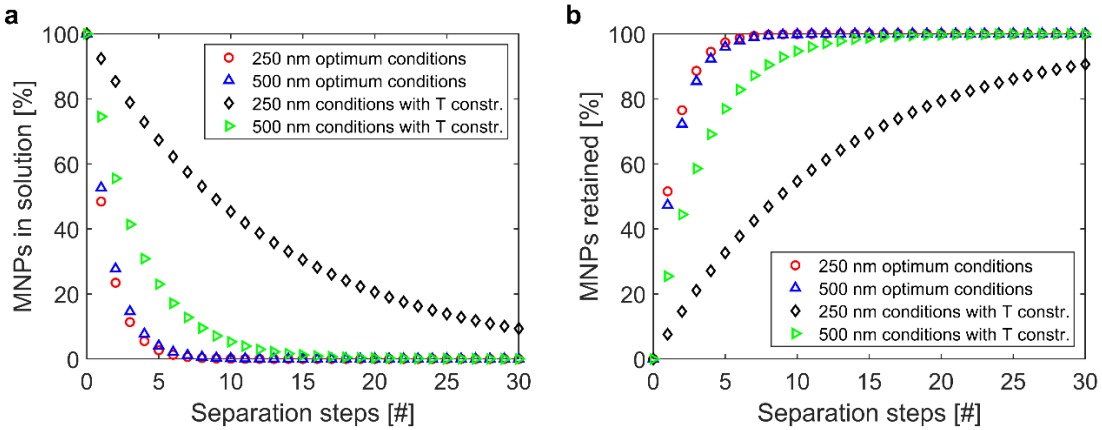

Figure S4. Relative concentration of MNPs in (**a**) solution and (**b**) retained (=100 - MNPs in solution), after multiple separation steps calculated via eq. S1 using the percentages of particles that touched the wire in a single separation step for the four cases discussed in the article; 250 nm MNPs for optimum conditions (q_{retain} = 51.57%), 500 nm MNPs for optimum conditions (q_{retain} = 47.34%), 250 nm MNPs for conditions considering the temperature constraint (q_{retain} = 7.56%), 500 nm MNPs for conditions considering the temperature constraint (q_{retain} = 25.46%).

S4. Initial Screening Optimisation Study for 250 nm IONPs

The results of the initial optimisation design space screening for 250 nm IONPs computing 1,000 particle trajectories are shown in **Table S1**.

Table S1. Capture and separator efficiency for the 900 simulations (10 tubing radii, 9 wire-to-tube radius ratios, and 10 flowrates between 0.01 ml/min and 1.00 ml/min) performed for the initial screening of the design space optimisation.

	Flowrate	Tubing radius	Wire-to-tubing rad.	Capture Efficiency	Separator Efficiency
	[ml/min]	[µm]	[-]	[%]	[%]
1	0.01	300	0.1	57.7	1.65
2	0.01	300	0.2	60.8	12.92
3	0.01	300	0.3	59	11.35
4	0.01	300	0.4	63.6	22.78
5	0.01	300	0.5	69.4	36.03
6	0.01	300	0.6	77.1	52.69
7	0.01	300	0.7	84.7	68.70
8	0.01	300	0.8	97.9	95.74
9	0.01	300	0.9	96.9	93.76
10	0.01	328.40	0.1	59.3	5.37
11	0.01	328.40	0.2	57.7	6.03
12	0.01	328.40	0.3	60.9	15.46
13	0.01	328.40	0.4	63.4	22.36
14	0.01	328.40	0.5	71.9	41.26
15	0.01	328.40	0.6	79.1	56.82
16	0.01	328.40	0.7	94.1	87.93
17	0.01	328.40	0.8	99.5	98.99
18	0.01	328.40	0.9	98.6	97.18
19	0.01	356.79	0.1	58.8	4.21
20	0.01	356.79	0.2	57	4.47
21	0.01	356.79	0.3	60.3	14.16
22	0.01	356.79	0.4	66.3	28.51
23	0.01	356.79	0.5	73.1	43.76
24	0.01	356.79	0.6	86	71.08
25	0.01	356.79	0.7	99.2	98.36
26	0.01	356.79	0.8	99.7	99.39
27	0.01	356.79	0.9	99.5	98.99

28	0.01	385.19	0.1	59.6	6.07
29	0.01	385.19	0.2	60.9	13.14
30	0.01	385.19	0.3	61.7	17.19
31	0.01	385.19	0.4	69.7	35.72
32	0.01	385.19	0.5	74.5	46.69
33	0.01	385.19	0.6	93	85.54
34	0.01	385.19	0.7	99.6	99.18
35	0.01	385.19	0.8	100	100.00
36	0.01	385.19	0.9	99.9	99.80
37	0.01	413.58	0.1	57.9	2.12
38	0.01	413.58	0.2	59.6	10.25
39	0.01	413.58	0.3	64.1	22.38
40	0.01	413.58	0.4	69.8	35.94
41	0.01	413.58	0.5	76	49.83
42	0.01	413.58	0.6	96.7	93.18
43	0.01	413.58	0.7	100	100.00
44	0.01	413.58	0.8	100	100.00
45	0.01	413.58	0.9	100	100.00
46	0.01	441.98	0.1	58.1	2.58
47	0.01	441.98	0.2	58.9	8.70
48	0.01	441.98	0.3	61.5	16.76
49	0.01	441.98	0.4	70.7	37.84
50	0.01	441.98	0.5	83	64.46
51	0.01	441.98	0.6	98.3	96.49
52	0.01	441.98	0.7	100	100.00
53	0.01	441.98	0.8	100	100.00
54	0.01	441.98	0.9	100	100.00
55	0.01	470.37	0.1	59.1	4.91
56	0.01	470.37	0.2	58.8	8.47
57	0.01	470.37	0.3	63.8	21.73
58	0.01	470.37	0.4	69.6	35.51
59	0.01	470.37	0.5	89.1	77.21
60	0.01	470.37	0.6	99	97.93
61	0.01	470.37	0.7	99.9	99.80
62	0.01	470.37	0.8	100	100.00
63	0.01	470.37	0.9	100	100.00
64	0.01	498.77	0.1	58	2.35
65	0.01	498.77	0.2	60.7	12.69
66	0.01	498.77	0.3	63.4	20.86
67	0.01	498.77	0.4	68.9	34.03
68	0.01	498.77	0.5	93.9	87.25
69	0.01	498.77	0.6	99.8	99.59
70	0.01	498.77	0.7	100	100.00
71	0.01	498.77	0.8	100	100.00
72	0.01	498.77	0.9	100	100.00
73	0.01	527.16	0.1	58.9	4.44
74	0.01	527.16	0.2	58.2	7.14
75	0.01	527.16	0.3	62.4	18.70
76	0.01	527.16	0.4	72	40.60
77	0.01	527.16	0.5	94.9	89.34
78	0.01	527.16	0.6	99.7	99.38
79	0.01	527.16	0.7	100	100.00
80	0.01	527.16	0.8	100	100.00
81	0.01	527.16	0.9	100	100.00

82	0.01	555.56	0.1	59	4.68
83	0.01	555.56	0.2	59.4	9.81
84	0.01	555.56	0.3	63.6	21.30
85	0.01	555.56	0.4	75.9	48.88
86	0.01	555.56	0.5	96.9	93.52
87	0.01	555.56	0.6	100	100.00
88	0.01	555.56	0.7	100	100.00
89	0.01	555.56	0.8	100	100.00
90	0.01	555.56	0.9	100	100.00
91	0.12	300	0.1	57.4	0.96
92	0.12	300	0.2	56.2	2.70
93	0.12	300	0.3	55.2	3.13
94	0.12	300	0.4	53.3	0.93
95	0.12	300	0.5	52.6	0.91
96	0.12	300	0.6	55.8	8.69
97	0.12	300	0.7	54.5	6.93
98	0.12	300	0.8	59.4	17.65
99	0.12	300	0.9	61.2	21.89
100	0.12	328.40	0.1	57.7	1.65
101	0.12	328.40	0.2	56.2	2.70
102	0.12	328.40	0.3	54.8	2.27
103	0.12	328.40	0.4	54.9	4.33
104	0.12	328.40	0.5	53.5	2.79
105	0.12	328.40	0.6	54.1	5.17
106	0.12	328.40	0.7	57.4	12.86
107	0.12	328.40	0.8	61.7	22.32
108	0.12	328.40	0.9	63.3	26.11
109	0.12	356.79	0.1	58.7	3.98
110	0.12	356.79	0.2	56.4	3.14
111	0.12	356.79	0.3	55.8	4.43
112	0.12	356.79	0.4	55.4	5.39
113	0.12	356.79	0.5	54.6	5.09
114	0.12	356.79	0.6	54.8	6.62
115	0.12	356.79	0.7	60.5	19.20
116	0.12	356.79	0.8	62.4	23.74
117	0.12	356.79	0.9	67.3	34.17
118	0.12	385.19	0.1	58.1	2.58
119	0.12	385.19	0.2	56	2.25
120	0.12	385.19	0.3	54.2	0.97
121	0.12	385.19	0.4	54.8	4.11
122	0.12	385.19	0.5	54.6	5.09
123	0.12	385.19	0.6	57.3	11.78
124	0.12	385.19	0.7	60.7	19.61
125	0.12	385.19	0.8	64	26.98
126	0.12	385.19	0.9	69.2	37.99
127	0.12	413.58	0.1	57.8	1.89
128	0.12	413.58	0.2	56.4	3.14
129	0.12	413.58	0.3	55.3	3.35
130	0.12	413.58	0.4	55.3	5.18
131	0.12	413.58	0.5	55.1	6.14
132	0.12	413.58	0.6	60.1	17.57
133	0.12	413.58	0.7	63	24.31
134	0.12	413.58	0.8	67.2	33.47
135	0.12	413.58	0.9	74	47.66

136	0.12	441.98	0.1	57.2	0.49
137	0.12	441.98	0.2	55.8	1.81
138	0.12	441.98	0.3	54.1	0.75
139	0.12	441.98	0.4	54.8	4.11
140	0.12	441.98	0.5	56.3	8.64
141	0.12	441.98	0.6	59.9	17.16
142	0.12	441.98	0.7	62.3	22.88
143	0.12	441.98	0.8	68.6	36.31
144	0.12	441.98	0.9	76.2	52.08
145	0.12	470.37	0.1	58.2	2.82
146	0.12	470.37	0.2	56.6	3.59
147	0.12	470.37	0.3	55.4	3.57
148	0.12	470.37	0.4	55	4.54
149	0.12	470.37	0.5	57.7	11.57
150	0.12	470.37	0.6	62.7	22.94
151	0.12	470.37	0.7	65	28.40
152	0.12	470.37	0.8	70.4	39.96
153	0.12	470.37	0.9	76.3	52.29
154	0.12	498.77	0.1	57.8	1.89
155	0.12	498.77	0.2	56.5	3.36
156	0.12	498.77	0.3	55.1	2.92
157	0.12	498.77	0.4	55.4	5.39
158	0.12	498.77	0.5	57.4	10.94
159	0.12	498.77	0.6	62.2	21.91
160	0.12	498.77	0.7	66.4	31.27
161	0.12	498.77	0.8	74.8	48.89
162	0.12	498.77	0.9	79.8	59.33
163	0.12	527.16	0.1	58.7	3.98
164	0.12	527.16	0.2	56.6	3.59
165	0.12	527.16	0.3	55.3	3.35
166	0.12	527.16	0.4	56.1	6.87
167	0.12	527.16	0.5	58.3	12.82
168	0.12	527.16	0.6	61.9	21.29
169	0.12	527.16	0.7	69.4	37.40
170	0.12	527.16	0.8	74.2	47.67
171	0.12	527.16	0.9	81	61.75
172	0.12	555.56	0.1	57.9	2.12
173	0.12	555.56	0.2	56	2.25
174	0.12	555.56	0.3	56.3	5.51
175	0.12	555.56	0.4	56.4	7.51
176	0.12	555.56	0.5	59	14.29
177	0.12	555.56	0.6	63.6	24.80
178	0.12	555.56	0.7	71.5	41.70
179	0.12	555.56	0.8	76.9	53.15
180	0.12	555.56	0.9	81.8	63.36
181	0.23	300	0.1	57.2	0.49
182	0.23	300	0.2	55	0.03
183	0.23	300	0.3	54.4	1.40
184	0.23	300	0.4	53.9	2.21
185	0.23	300	0.5	53.5	2.79
186	0.23	300	0.6	53.3	3.52
187	0.23	300	0.7	52.9	3.65
188	0.23	300	0.8	56.1	10.96
189	0.23	300	0.9	57	13.43

190	0.23	328.40	0.1	57.5	1.19
191	0.23	328.40	0.2	55.1	0.25
192	0.23	328.40	0.3	54	0.54
193	0.23	328.40	0.4	53.8	1.99
194	0.23	328.40	0.5	53.9	3.63
195	0.23	328.40	0.6	54.6	6.21
196	0.23	328.40	0.7	55	7.95
197	0.23	328.40	0.8	57.2	13.19
198	0.23	328.40	0.9	58.5	16.45
199	0.23	356.79	0.1	57.4	0.96
200	0.23	356.79	0.2	56.1	2.48
201	0.23	356.79	0.3	55.1	2.92
202	0.23	356.79	0.4	54.5	3.48
203	0.23	356.79	0.5	53.8	3.42
204	0.23	356.79	0.6	55.1	7.24
205	0.23	356.79	0.7	56.1	10.20
206	0.23	356.79	0.8	58.5	15.83
207	0.23	356.79	0.9	59.9	19.27
208	0.23	385.19	0.1	58.4	3.28
209	0.23	385.19	0.2	56	2.25
210	0.23	385.19	0.3	54.1	0.75
211	0.23	385.19	0.4	54	2.42
212	0.23	385.19	0.5	54.6	5.09
213	0.23	385.19	0.6	56	9.10
214	0.23	385.19	0.7	57.4	12.86
215	0.23	385.19	0.8	59.3	17.45
216	0.23	385.19	0.9	61.5	22.49
217	0.23	413.58	0.1	57.6	1.42
218	0.23	413.58	0.2	55.6	1.36
219	0.23	413.58	0.3	54.8	2.27
220	0.23	413.58	0.4	54.9	4.33
221	0.23	413.58	0.5	53.8	3.42
222	0.23	413.58	0.6	55.5	8.07
223	0.23	413.58	0.7	58	14.08
224	0.23	413.58	0.8	59.1	17.04
225	0.23	413.58	0.9	63.1	25.71
226	0.23	441.98	0.1	57.4	0.96
227	0.23	441.98	0.2	56	2.25
228	0.23	441.98	0.3	55.2	3.13
229	0.23	441.98	0.4	54.1	2.63
230	0.23	441.98	0.5	54.8	5.51
231	0.23	441.98	0.6	57	11.16
232	0.23	441.98	0.7	57.9	13.88
233	0.23	441.98	0.8	61.9	22.72
234	0.23	441.98	0.9	63.4	26.31
235	0.23	470.37	0.1	57.5	1.19
236	0.23	470.37	0.2	55.8	1.81
237	0.23	470.37	0.3	55	2.70
238	0.23	470.37	0.4	54.5	3.48
239	0.23	470.37	0.5	54.9	5.72
240	0.23	470.37	0.6	56.9	10.96
241	0.23	470.37	0.7	58.4	14.90
242	0.23	470.37	0.8	63	24.95
243	0.23	470.37	0.9	66.8	33.16

244	0.23	498.77	0.1	57.6	1.42
245	0.23	498.77	0.2	55.9	2.03
246	0.23	498.77	0.3	54.4	1.40
247	0.23	498.77	0.4	54.4	3.27
248	0.23	498.77	0.5	55.3	6.55
249	0.23	498.77	0.6	56.8	10.75
250	0.23	498.77	0.7	60.6	19.40
251	0.23	498.77	0.8	64.3	27.59
252	0.23	498.77	0.9	66.6	32.76
253	0.23	527.16	0.1	57.8	1.89
254	0.23	527.16	0.2	55.8	1.81
255	0.23	527.16	0.3	55.3	3.35
256	0.23	527.16	0.4	54.4	3.27
257	0.23	527.16	0.5	56.6	9.27
258	0.23	527.16	0.6	59.5	16.33
259	0.23	527.16	0.7	61.5	21.24
260	0.23	527.16	0.8	64.9	28.81
261	0.23	527.16	0.9	67.9	35.37
262	0.23	555.56	0.1	57.5	1.19
263	0.23	555.56	0.2	55.8	1.81
264	0.23	555.56	0.3	54.9	2.48
265	0.23	555.56	0.4	54.4	3.27
266	0.23	555.56	0.5	56.2	8.43
267	0.23	555.56	0.6	58	13.23
268	0.23	555.56	0.7	62	22.27
269	0.23	555.56	0.8	65.6	30.23
270	0.23	555.56	0.9	67.2	33.97
271	0.34	300	0.1	57.8	1.89
272	0.34	300	0.2	55.9	2.03
273	0.34	300	0.3	54	0.54
274	0.34	300	0.4	54.3	3.05
275	0.34	300	0.5	53.5	2.79
276	0.34	300	0.6	52.9	2.69
277	0.34	300	0.7	54.9	7.74
278	0.34	300	0.8	53.7	6.09
279	0.34	300	0.9	55.8	11.01
280	0.34	328.40	0.1	57.4	0.96
281	0.34	328.40	0.2	56.1	2.48
282	0.34	328.40	0.3	54.7	2.05
283	0.34	328.40	0.4	53.8	1.99
284	0.34	328.40	0.5	53.6	3.00
285	0.34	328.40	0.6	53.5	3.93
286	0.34	328.40	0.7	54.2	6.31
287	0.34	328.40	0.8	55.3	9.34
288	0.34	328.40	0.9	56.7	12.83
289	0.34	356.79	0.1	57.7	1.65
290	0.34	356.79	0.2	55.6	1.36
291	0.34	356.79	0.3	53.9	0.32
292	0.34	356.79	0.4	54.3	3.05
293	0.34	356.79	0.5	53.2	2.16
294	0.34	356.79	0.6	54.3	5.59
295	0.34	356.79	0.7	54.8	7.54
296	0.34	356.79	0.8	53.9	6.50
297	0.34	356.79	0.9	55.8	11.01

298	0.34	385.19	0.1	57.4	0.96
299	0.34	385.19	0.2	55.5	1.14
300	0.34	385.19	0.3	53.8	0.11
301	0.34	385.19	0.4	53.8	1.99
302	0.34	385.19	0.5	53.4	2.58
303	0.34	385.19	0.6	53.8	4.55
304	0.34	385.19	0.7	55	7.95
305	0.34	385.19	0.8	56.2	11.16
306	0.34	385.19	0.9	59.8	19.07
307	0.34	413.58	0.1	58.4	3.28
308	0.34	413.58	0.2	55.9	2.03
309	0.34	413.58	0.3	54.6	1.84
310	0.34	413.58	0.4	54.2	2.84
311	0.34	413.58	0.5	54.3	4.46
312	0.34	413.58	0.6	54.9	6.83
313	0.34	413.58	0.7	55.5	8.97
314	0.34	413.58	0.8	56.8	12.38
315	0.34	413.58	0.9	59.5	18.46
316	0.34	441.98	0.1	57.6	1.42
317	0.34	441.98	0.2	55.8	1.81
318	0.34	441.98	0.3	54	0.54
319	0.34	441.98	0.4	54.7	3.90
320	0.34	441.98	0.5	54.2	4.25
321	0.34	441.98	0.6	55.6	8.27
322	0.34	441.98	0.7	57.4	12.86
323	0.34	441.98	0.8	58.1	15.01
324	0.34	441.98	0.9	58.7	16.85
325	0.34	470.37	0.1	58.2	2.82
326	0.34	470.37	0.2	56.4	3.14
327	0.34	470.37	0.3	54.6	1.84
328	0.34	470.37	0.4	53.9	2.21
329	0.34	470.37	0.5	54.6	5.09
330	0.34	470.37	0.6	55.2	7.45
331	0.34	470.37	0.7	57.3	12.65
332	0.34	470.37	0.8	59	16.84
333	0.34	470.37	0.9	61.5	22.49
334	0.34	498.77	0.1	57.4	0.96
335	0.34	498.77	0.2	55.8	1.81
336	0.34	498.77	0.3	54.5	1.62
337	0.34	498.77	0.4	53.6	1.57
338	0.34	498.77	0.5	55	5.93
339	0.34	498.77	0.6	56.2	9.51
340	0.34	498.77	0.7	57.1	12.24
341	0.34	498.77	0.8	60.4	19.68
342	0.34	498.77	0.9	61.2	21.89
343	0.34	527.16	0.1	58.2	2.82
344	0.34	527.16	0.2	55.3	0.70
345	0.34	527.16	0.3	55	2.70
346	0.34	527.16	0.4	54.7	3.90
347	0.34	527.16	0.5	55.2	6.34
348	0.34	527.16	0.6	55.5	8.07
349	0.34	527.16	0.7	58.9	15.93
350	0.34	527.16	0.8	60.8	20.49
351	0.34	527.16	0.9	62.4	24.30

352	0.34	555.56	0.1	58	2.35
353	0.34	555.56	0.2	55.3	0.70
354	0.34	555.56	0.3	55	2.70
355	0.34	555.56	0.4	54.4	3.27
356	0.34	555.56	0.5	54.4	4.67
357	0.34	555.56	0.6	56.7	10.54
358	0.34	555.56	0.7	59.3	16.74
359	0.34	555.56	0.8	61.2	21.30
360	0.34	555.56	0.9	63	25.51
361	0.45	300	0.1	58.6	3.75
362	0.45	300	0.2	55.1	0.25
363	0.45	300	0.3	53.9	0.32
364	0.45	300	0.4	54	2.42
365	0.45	300	0.5	52.9	1.54
366	0.45	300	0.6	52.5	1.87
367	0.45	300	0.7	51.6	0.99
368	0.45	300	0.8	53.4	5.48
369	0.45	300	0.9	53.6	6.59
370	0.45	328.40	0.1	58	2.35
371	0.45	328.40	0.2	56.3	2.92
372	0.45	328.40	0.3	54.4	1.40
373	0.45	328.40	0.4	54.1	2.63
374	0.45	328.40	0.5	54	3.84
375	0.45	328.40	0.6	53.4	3.73
376	0.45	328.40	0.7	53.4	4.68
377	0.45	328.40	0.8	54	6.70
378	0.45	328.40	0.9	53.3	5.98
379	0.45	356.79	0.1	58	2.35
380	0.45	356.79	0.2	55.5	1.14
381	0.45	356.79	0.3	53.9	0.32
382	0.45	356.79	0.4	53.9	2.21
383	0.45	356.79	0.5	52.3	0.28
384	0.45	356.79	0.6	52.7	2.28
385	0.45	356.79	0.7	53.2	4.27
386	0.45	356.79	0.8	55.3	9.34
387	0.45	356.79	0.9	56	11.42
388	0.45	385.19	0.1	57.8	1.89
389	0.45	385.19	0.2	54.9	-0.19
390	0.45	385.19	0.3	54	0.54
391	0.45	385.19	0.4	53.6	1.57
392	0.45	385.19	0.5	53.1	1.95
393	0.45	385.19	0.6	53.7	4.35
394	0.45	385.19	0.7	54.1	6.11
395	0.45	385.19	0.8	55.3	9.34
396	0.45	385.19	0.9	55.9	11.22
397	0.45	413.58	0.1	57.8	1.89
398	0.45	413.58	0.2	55.9	2.03
399	0.45	413.58	0.3	55	2.70
400	0.45	413.58	0.4	53.9	2.21
401	0.45	413.58	0.5	52.4	0.49
402	0.45	413.58	0.6	53.3	3.52
403	0.45	413.58	0.7	54.3	6.52
404	0.45	413.58	0.8	55.3	9.34
405	0.45	413.58	0.9	56.9	13.23

406	0.45	441.98	0.1	57.5	1.19
407	0.45	441.98	0.2	55.5	1.14
408	0.45	441.98	0.3	54.7	2.05
409	0.45	441.98	0.4	53.5	1.36
410	0.45	441.98	0.5	53.7	3.21
411	0.45	441.98	0.6	54	4.97
412	0.45	441.98	0.7	54.2	6.31
413	0.45	441.98	0.8	56.7	12.18
414	0.45	441.98	0.9	57.6	14.64
415	0.45	470.37	0.1	58	2.35
416	0.45	470.37	0.2	56	2.25
417	0.45	470.37	0.3	54.7	2.05
418	0.45	470.37	0.4	54.2	2.84
419	0.45	470.37	0.5	54	3.84
420	0.45	470.37	0.6	54.5	6.00
421	0.45	470.37	0.7	55.9	9.79
422	0.45	470.37	0.8	57.7	14.20
423	0.45	470.37	0.9	59.2	17.86
424	0.45	498.77	0.1	58.3	3.05
425	0.45	498.77	0.2	55.5	1.14
426	0.45	498.77	0.3	54.9	2.48
427	0.45	498.77	0.4	53.7	1.78
428	0.45	498.77	0.5	53.6	3.00
429	0.45	498.77	0.6	55.9	8.89
430	0.45	498.77	0.7	55.8	9.58
431	0.45	498.77	0.8	58.5	15.83
432	0.45	498.77	0.9	60	19.47
433	0.45	527.16	0.1	57.6	1.42
434	0.45	527.16	0.2	56	2.25
435	0.45	527.16	0.3	54.1	0.75
436	0.45	527.16	0.4	53.7	1.78
437	0.45	527.16	0.5	54.5	4.88
438	0.45	527.16	0.6	55.5	8.07
439	0.45	527.16	0.7	56	9.99
440	0.45	527.16	0.8	57.9	14.61
441	0.45	527.16	0.9	59.8	19.07
442	0.45	555.56	0.1	57.8	1.89
443	0.45	555.56	0.2	56.1	2.48
444	0.45	555.56	0.3	54.3	1.19
445	0.45	555.56	0.4	54	2.42
446	0.45	555.56	0.5	54	3.84
447	0.45	555.56	0.6	55.5	8.07
448	0.45	555.56	0.7	57.8	13.68
449	0.45	555.56	0.8	58.5	15.83
450	0.45	555.56	0.9	62.2	23.90
451	0.56	300	0.1	57.6	1.42
452	0.56	300	0.2	55.6	1.36
453	0.56	300	0.3	54	0.54
454	0.56	300	0.4	54.1	2.63
455	0.56	300	0.5	53.3	2.37
456	0.56	300	0.6	53	2.90
457	0.56	300	0.7	53.1	4.06
458	0.56	300	0.8	53.7	6.09
459	0.56	300	0.9	53.2	5.78

460	0.56	328.40	0.1	57.4	0.96
461	0.56	328.40	0.2	55.9	2.03
462	0.56	328.40	0.3	54.5	1.62
463	0.56	328.40	0.4	53.8	1.99
464	0.56	328.40	0.5	52.7	1.12
465	0.56	328.40	0.6	53.1	3.11
466	0.56	328.40	0.7	53	3.86
467	0.56	328.40	0.8	53.8	6.29
468	0.56	328.40	0.9	53.6	6.59
469	0.56	356.79	0.1	57.7	1.65
470	0.56	356.79	0.2	55.8	1.81
471	0.56	356.79	0.3	54.5	1.62
472	0.56	356.79	0.4	53.5	1.36
473	0.56	356.79	0.5	53.7	3.21
474	0.56	356.79	0.6	53	2.90
475	0.56	356.79	0.7	53	3.86
476	0.56	356.79	0.8	52.7	4.06
477	0.56	356.79	0.9	53.9	7.19
478	0.56	385.19	0.1	57.9	2.12
479	0.56	385.19	0.2	56	2.25
480	0.56	385.19	0.3	54.6	1.84
481	0.56	385.19	0.4	54	2.42
482	0.56	385.19	0.5	53.5	2.79
483	0.56	385.19	0.6	53.5	3.93
484	0.56	385.19	0.7	54	5.90
485	0.56	385.19	0.8	54.5	7.71
486	0.56	385.19	0.9	55.3	10.01
487	0.56	413.58	0.1	57.4	0.96
488	0.56	413.58	0.2	55.6	1.36
489	0.56	413.58	0.3	54.3	1.19
490	0.56	413.58	0.4	53.7	1.78
491	0.56	413.58	0.5	53.7	3.21
492	0.56	413.58	0.6	54.2	5.38
493	0.56	413.58	0.7	53.6	5.08
494	0.56	413.58	0.8	54.7	8.12
495	0.56	413.58	0.9	55.3	10.01
496	0.56	441.98	0.1	57.4	0.96
497	0.56	441.98	0.2	56.3	2.92
498	0.56	441.98	0.3	54.7	2.05
499	0.56	441.98	0.4	54.3	3.05
500	0.56	441.98	0.5	54	3.84
501	0.56	441.98	0.6	54	4.97
502	0.56	441.98	0.7	54.5	6.93
503	0.56	441.98	0.8	55.5	9.74
504	0.56	441.98	0.9	57.1	13.63
505	0.56	470.37	0.1	57.7	1.65
506	0.56	470.37	0.2	55.7	1.59
507	0.56	470.37	0.3	55.2	3.13
508	0.56	470.37	0.4	54.3	3.05
509	0.56	470.37	0.5	53.8	3.42
510	0.56	470.37	0.6	54	4.97
511	0.56	470.37	0.7	54.5	6.93
512	0.56	470.37	0.8	56.6	11.97
513	0.56	470.37	0.9	56.2	11.82

514	0.56	498.77	0.1	57.7	1.65
515	0.56	498.77	0.2	56	2.25
516	0.56	498.77	0.3	54.3	1.19
517	0.56	498.77	0.4	53.5	1.36
518	0.56	498.77	0.5	53.8	3.42
519	0.56	498.77	0.6	54	4.97
520	0.56	498.77	0.7	55.2	8.36
521	0.56	498.77	0.8	55.9	10.55
522	0.56	498.77	0.9	57.3	14.03
523	0.56	527.16	0.1	57.7	1.65
524	0.56	527.16	0.2	55.9	2.03
525	0.56	527.16	0.3	54.7	2.05
526	0.56	527.16	0.4	54.1	2.63
527	0.56	527.16	0.5	54.3	4.46
528	0.56	527.16	0.6	55	7.03
529	0.56	527.16	0.7	55.3	8.56
530	0.56	527.16	0.8	56.9	12.58
531	0.56	527.16	0.9	57.1	13.63
532	0.56	555.56	0.1	57.5	1.19
533	0.56	555.56	0.2	55	0.03
534	0.56	555.56	0.3	53.9	0.32
535	0.56	555.56	0.4	53.8	1.99
536	0.56	555.56	0.5	54.1	4.04
537	0.56	555.56	0.6	54.3	5.59
538	0.56	555.56	0.7	56.6	11.22
539	0.56	555.56	0.8	57	12.78
540	0.56	555.56	0.9	57.2	13.83
541	0.67	300	0.1	57.6	1.42
542	0.67	300	0.2	55.9	2.03
543	0.67	300	0.3	53.8	0.11
544	0.67	300	0.4	53.4	1.15
545	0.67	300	0.5	53	1.75
546	0.67	300	0.6	52	0.83
547	0.67	300	0.7	52.2	2.22
548	0.67	300	0.8	52.6	3.86
549	0.67	300	0.9	51.8	2.96
550	0.67	328.40	0.1	57.5	1.19
551	0.67	328.40	0.2	55.5	1.14
552	0.67	328.40	0.3	54.6	1.84
553	0.67	328.40	0.4	53.7	1.78
554	0.67	328.40	0.5	53.5	2.79
555	0.67	328.40	0.6	52.5	1.87
556	0.67	328.40	0.7	52.2	2.22
557	0.67	328.40	0.8	52.9	4.47
558	0.67	328.40	0.9	53.6	6.59
559	0.67	356.79	0.1	58.4	3.28
560	0.67	356.79	0.2	55.9	2.03
561	0.67	356.79	0.3	53.9	0.32
562	0.67	356.79	0.4	54.4	3.27
563	0.67	356.79	0.5	53.2	2.16
564	0.67	356.79	0.6	52	0.83
565	0.67	356.79	0.7	54.3	6.52
566	0.67	356.79	0.8	53.1	4.87
567	0.67	356.79	0.9	52.9	5.18

568	0.67	385.19	0.1	58.3	3.05
569	0.67	385.19	0.2	55.6	1.36
570	0.67	385.19	0.3	55	2.70
571	0.67	385.19	0.4	53.8	1.99
572	0.67	385.19	0.5	52.9	1.54
573	0.67	385.19	0.6	52.9	2.69
574	0.67	385.19	0.7	53	3.86
575	0.67	385.19	0.8	54.1	6.90
576	0.67	385.19	0.9	53.2	5.78
577	0.67	413.58	0.1	57.4	0.96
578	0.67	413.58	0.2	55.9	2.03
579	0.67	413.58	0.3	54.8	2.27
580	0.67	413.58	0.4	54.5	3.48
581	0.67	413.58	0.5	53.5	2.79
582	0.67	413.58	0.6	53	2.90
583	0.67	413.58	0.7	52.6	3.04
584	0.67	413.58	0.8	54.7	8.12
585	0.67	413.58	0.9	55	9.40
586	0.67	441.98	0.1	58.3	3.05
587	0.67	441.98	0.2	56	2.25
588	0.67	441.98	0.3	54.3	1.19
589	0.67	441.98	0.4	54	2.42
590	0.67	441.98	0.5	52.6	0.91
591	0.67	441.98	0.6	53	2.90
592	0.67	441.98	0.7	53.9	5.70
593	0.67	441.98	0.8	54.3	7.31
594	0.67	441.98	0.9	55.7	10.81
595	0.67	470.37	0.1	58.3	3.05
596	0.67	470.37	0.2	56.1	2.48
597	0.67	470.37	0.3	54.4	1.40
598	0.67	470.37	0.4	54	2.42
599	0.67	470.37	0.5	53.5	2.79
600	0.67	470.37	0.6	53.3	3.52
601	0.67	470.37	0.7	53.4	4.68
602	0.67	470.37	0.8	55	8.73
603	0.67	470.37	0.9	56.3	12.02
604	0.67	498.77	0.1	57.7	1.65
605	0.67	498.77	0.2	55.8	1.81
606	0.67	498.77	0.3	54.2	0.97
607	0.67	498.77	0.4	53.6	1.57
608	0.67	498.77	0.5	53.4	2.58
609	0.67	498.77	0.6	52.9	2.69
610	0.67	498.77	0.7	53.5	4.88
611	0.67	498.77	0.8	55	8.73
612	0.67	498.77	0.9	56.4	12.22
613	0.67	527.16	0.1	58.3	3.05
614	0.67	527.16	0.2	55.7	1.59
615	0.67	527.16	0.3	54.4	1.40
616	0.67	527.16	0.4	54.1	2.63
617	0.67	527.16	0.5	53.9	3.63
618	0.67	527.16	0.6	53.4	3.73
619	0.67	527.16	0.7	54.3	6.52
620	0.67	527.16	0.8	57.1	12.99
621	0.67	527.16	0.9	56	11.42

622	0.67	555.56	0.1	57.2	0.49
623	0.67	555.56	0.2	55	0.03
624	0.67	555.56	0.3	54.2	0.97
625	0.67	555.56	0.4	54.1	2.63
626	0.67	555.56	0.5	54.2	4.25
627	0.67	555.56	0.6	54.5	6.00
628	0.67	555.56	0.7	55.4	8.77
629	0.67	555.56	0.8	56	10.76
630	0.67	555.56	0.9	57.6	14.64
631	0.78	300	0.1	58.1	2.58
632	0.78	300	0.2	55.5	1.14
633	0.78	300	0.3	53.8	0.11
634	0.78	300	0.4	53.8	1.99
635	0.78	300	0.5	52.6	0.91
636	0.78	300	0.6	51.8	0.42
637	0.78	300	0.7	51.7	1.20
638	0.78	300	0.8	52.3	3.25
639	0.78	300	0.9	52.6	4.57
640	0.78	328.40	0.1	58.1	2.58
641	0.78	328.40	0.2	56.7	3.81
642	0.78	328.40	0.3	54.4	1.40
643	0.78	328.40	0.4	53.4	1.15
644	0.78	328.40	0.5	53	1.75
645	0.78	328.40	0.6	52.4	1.66
646	0.78	328.40	0.7	51.9	1.61
647	0.78	328.40	0.8	52.3	3.25
648	0.78	328.40	0.9	52.3	3.97
649	0.78	356.79	0.1	57.8	1.89
650	0.78	356.79	0.2	56	2.25
651	0.78	356.79	0.3	53.8	0.11
652	0.78	356.79	0.4	53.9	2.21
653	0.78	356.79	0.5	52.4	0.49
654	0.78	356.79	0.6	52.4	1.66
655	0.78	356.79	0.7	53	3.86
656	0.78	356.79	0.8	53.4	5.48
657	0.78	356.79	0.9	52.9	5.18
658	0.78	385.19	0.1	58.1	2.58
659	0.78	385.19	0.2	55.2	0.48
660	0.78	385.19	0.3	54.8	2.27
661	0.78	385.19	0.4	53.8	1.99
662	0.78	385.19	0.5	52.8	1.33
663	0.78	385.19	0.6	53.3	3.52
664	0.78	385.19	0.7	53.1	4.06
665	0.78	385.19	0.8	53.8	6.29
666	0.78	385.19	0.9	52.8	4.97
667	0.78	413.58	0.1	58.1	2.58
668	0.78	413.58	0.2	55.8	1.81
669	0.78	413.58	0.3	54.4	1.40
670	0.78	413.58	0.4	54.3	3.05
671	0.78	413.58	0.5	52.9	1.54
672	0.78	413.58	0.6	53.1	3.11
673	0.78	413.58	0.7	52.6	3.04
674	0.78	413.58	0.8	53.7	6.09
675	0.78	413.58	0.9	53.9	7.19

676	0.78	441.98	0.1	57.8	1.89
677	0.78	441.98	0.2	55.9	2.03
678	0.78	441.98	0.3	54.1	0.75
679	0.78	441.98	0.4	54.1	2.63
680	0.78	441.98	0.5	52.9	1.54
681	0.78	441.98	0.6	53.7	4.35
682	0.78	441.98	0.7	52.9	3.65
683	0.78	441.98	0.8	54.6	7.92
684	0.78	441.98	0.9	54.9	9.20
685	0.78	470.37	0.1	57.7	1.65
686	0.78	470.37	0.2	55.5	1.14
687	0.78	470.37	0.3	54.7	2.05
688	0.78	470.37	0.4	53.8	1.99
689	0.78	470.37	0.5	53.4	2.58
690	0.78	470.37	0.6	53.4	3.73
691	0.78	470.37	0.7	54.1	6.11
692	0.78	470.37	0.8	54.2	7.10
693	0.78	470.37	0.9	54.4	8.20
694	0.78	498.77	0.1	58.2	2.82
695	0.78	498.77	0.2	55.8	1.81
696	0.78	498.77	0.3	55.4	3.57
697	0.78	498.77	0.4	53.8	1.99
698	0.78	498.77	0.5	53	1.75
699	0.78	498.77	0.6	53.5	3.93
700	0.78	498.77	0.7	54.2	6.31
701	0.78	498.77	0.8	53.8	6.29
702	0.78	498.77	0.9	56	11.42
703	0.78	527.16	0.1	57.9	2.12
704	0.78	527.16	0.2	56	2.25
705	0.78	527.16	0.3	54.9	2.48
706	0.78	527.16	0.4	54.7	3.90
707	0.78	527.16	0.5	53.4	2.58
708	0.78	527.16	0.6	53.3	3.52
709	0.78	527.16	0.7	54.3	6.52
710	0.78	527.16	0.8	55.9	10.55
711	0.78	527.16	0.9	55.7	10.81
712	0.78	555.56	0.1	57.6	1.42
713	0.78	555.56	0.2	56	2.25
714	0.78	555.56	0.3	54	0.54
715	0.78	555.56	0.4	53.6	1.57
716	0.78	555.56	0.5	54	3.84
717	0.78	555.56	0.6	53.9	4.76
718	0.78	555.56	0.7	55.4	8.77
719	0.78	555.56	0.8	55.9	10.55
720	0.78	555.56	0.9	56.4	12.22
721	0.89	300	0.1	57.8	1.89
722	0.89	300	0.2	55.7	1.59
723	0.89	300	0.3	54.2	0.97
724	0.89	300	0.4	53.4	1.15
725	0.89	300	0.5	52.9	1.54
726	0.89	300	0.6	52.2	1.25
727	0.89	300	0.7	52.1	2.02
728	0.89	300	0.8	52.2	3.05
729	0.89	300	0.9	51.3	1.95

730	0.89	328.40	0.1	58.3	3.05
731	0.89	328.40	0.2	55.8	1.81
732	0.89	328.40	0.3	54.5	1.62
733	0.89	328.40	0.4	53.6	1.57
734	0.89	328.40	0.5	52.5	0.70
735	0.89	328.40	0.6	51.9	0.63
736	0.89	328.40	0.7	51.6	0.99
737	0.89	328.40	0.8	52.4	3.45
738	0.89	328.40	0.9	51.3	1.95
739	0.89	356.79	0.1	57.4	0.96
740	0.89	356.79	0.2	55.5	1.14
741	0.89	356.79	0.3	54.3	1.19
742	0.89	356.79	0.4	53.1	0.51
743	0.89	356.79	0.5	54.4	4.67
744	0.89	356.79	0.6	52.4	1.66
745	0.89	356.79	0.7	52.2	2.22
746	0.89	356.79	0.8	52.6	3.86
747	0.89	356.79	0.9	53.4	6.18
748	0.89	385.19	0.1	58	2.35
749	0.89	385.19	0.2	55.6	1.36
750	0.89	385.19	0.3	54.5	1.62
751	0.89	385.19	0.4	53.8	1.99
752	0.89	385.19	0.5	53	1.75
753	0.89	385.19	0.6	52.7	2.28
754	0.89	385.19	0.7	51.9	1.61
755	0.89	385.19	0.8	52.5	3.66
756	0.89	385.19	0.9	54.3	7.99
757	0.89	413.58	0.1	58	2.35
758	0.89	413.58	0.2	56.2	2.70
759	0.89	413.58	0.3	54.8	2.27
760	0.89	413.58	0.4	53.4	1.14
761	0.89	413.58	0.5	52.6	0.91
762	0.89	413.58	0.6	52.4	1.66
763	0.89	413.58	0.7	52.6	3.04
764	0.89	413.58	0.8	53.5	5.68
765	0.89	413.58	0.9	53.7	6.79
766	0.89	441.98	0.1	57.8	1.89
767	0.89	441.98	0.2	56.1	2.48
768	0.89	441.98	0.3	54.1	0.75
769	0.89	441.98	0.4	53.3	0.93
770	0.89	441.98	0.5	53.4	2.58
771	0.89	441.98	0.6	52.7	2.28
772	0.89	441.98	0.7	52.9	3.65
773	0.89	441.98	0.8	53.8	6.29
774	0.89	441.98	0.9	53.6	6.59
775	0.89	470.37	0.1	57.8	1.89
776	0.89	470.37	0.2	55.9	2.03
777	0.89	470.37	0.3	54.5	1.62
778	0.89	470.37	0.4	53.3	0.93
779	0.89	470.37	0.5	52.5	0.70
780	0.89	470.37	0.6	53.7	4.35
781	0.89	470.37	0.7	53.4	4.68
782	0.89	470.37	0.8	54.1	6.90
783	0.89	470.37	0.9	54.4	8.20

784	0.89	498.77	0.1	57.9	2.12
785	0.89	498.77	0.2	55.5	1.14
786	0.89	498.77	0.3	54.4	1.40
787	0.89	498.77	0.4	53.4	1.14
788	0.89	498.77	0.5	53.3	2.37
789	0.89	498.77	0.6	53.4	3.73
790	0.89	498.77	0.7	53.4	4.68
791	0.89	498.77	0.8	53.6	5.89
792	0.89	498.77	0.9	54.3	7.99
793	0.89	527.16	0.1	57.8	1.89
794	0.89	527.16	0.2	56.2	2.70
795	0.89	527.16	0.3	54.2	0.97
796	0.89	527.16	0.4	53.5	1.36
797	0.89	527.16	0.5	53.4	2.58
798	0.89	527.16	0.6	53.4	3.73
799	0.89	527.16	0.7	53.6	5.08
800	0.89	527.16	0.8	54.4	7.51
801	0.89	527.16	0.9	54.7	8.80
802	0.89	555.56	0.1	57.8	1.89
803	0.89	555.56	0.2	55.5	1.14
804	0.89	555.56	0.3	54.7	2.05
805	0.89	555.56	0.4	54	2.42
806	0.89	555.56	0.5	54	3.84
807	0.89	555.56	0.6	53.7	4.35
808	0.89	555.56	0.7	54.6	7.13
809	0.89	555.56	0.8	55.1	8.93
810	0.89	555.56	0.9	55.5	10.41
811	1	300	0.1	58.3	3.05
812	1	300	0.2	54.8	-0.41
813	1	300	0.3	54.4	1.40
814	1	300	0.4	53.3	0.93
815	1	300	0.5	52.7	1.12
816	1	300	0.6	52.3	1.45
817	1	300	0.7	52	1.81
818	1	300	0.8	51.4	1.43
819	1	300	0.9	51.6	2.56
820	1	328.40	0.1	57.3	0.72
821	1	328.40	0.2	56.1	2.48
822	1	328.40	0.3	54.8	2.27
823	1	328.40	0.4	54	2.42
824	1	328.40	0.5	53.1	1.95
825	1	328.40	0.6	51.8	0.42
826	1	328.40	0.7	52.2	2.22
827	1	328.40	0.8	51.8	2.24
828	1	328.40	0.9	52.2	3.77
829	1	356.79	0.1	58.2	2.82
830	1	356.79	0.2	55.3	0.70
831	1	356.79	0.3	54.5	1.62
832	1	356.79	0.4	53.7	1.78
833	1	356.79	0.5	53.1	1.95
834	1	356.79	0.6	52.5	1.87
835	1	356.79	0.7	52.5	2.83
836	1	356.79	0.8	52.1	2.85
837	1	356.79	0.9	52.2	3.77

838	1	385.19	0.1	57.6	1.42
839	1	385.19	0.2	55.9	2.03
840	1	385.19	0.3	54.1	0.75
841	1	385.19	0.4	53.7	1.78
842	1	385.19	0.5	53.3	2.37
843	1	385.19	0.6	52.7	2.28
844	1	385.19	0.7	52.2	2.22
845	1	385.19	0.8	52.1	2.85
846	1	385.19	0.9	53.4	6.18
847	1	413.58	0.1	57.6	1.42
848	1	413.58	0.2	56	2.25
849	1	413.58	0.3	54.4	1.40
850	1	413.58	0.4	53.3	0.93
851	1	413.58	0.5	53.2	2.16
852	1	413.58	0.6	53.2	3.31
853	1	413.58	0.7	52.7	3.24
854	1	413.58	0.8	53.4	5.48
855	1	413.58	0.9	53.4	6.18
856	1	441.98	0.1	57.8	1.89
857	1	441.98	0.2	55.7	1.59
858	1	441.98	0.3	54.7	2.05
859	1	441.98	0.4	53.9	2.21
860	1	441.98	0.5	53	1.75
861	1	441.98	0.6	52.8	2.49
862	1	441.98	0.7	52.9	3.65
863	1	441.98	0.8	53.7	6.09
864	1	441.98	0.9	53.5	6.38
865	1	470.37	0.1	57.6	1.42
866	1	470.37	0.2	56	2.25
867	1	470.37	0.3	54.6	1.84
868	1	470.37	0.4	53.8	1.99
869	1	470.37	0.5	53.1	1.95
870	1	470.37	0.6	53.4	3.73
871	1	470.37	0.7	53.3	4.47
872	1	470.37	0.8	53.8	6.29
873	1	470.37	0.9	53.7	6.79
874	1	498.77	0.1	57.6	1.42
875	1	498.77	0.2	56.2	2.70
876	1	498.77	0.3	54.3	1.19
877	1	498.77	0.4	53.1	0.51
878	1	498.77	0.5	52.5	0.70
879	1	498.77	0.6	53.6	4.14
880	1	498.77	0.7	52.4	2.63
881	1	498.77	0.8	54.3	7.31
882	1	498.77	0.9	53.3	5.98
883	1	527.16	0.1	58.1	2.58
884	1	527.16	0.2	55.6	1.36
885	1	527.16	0.3	54.5	1.62
886	1	527.16	0.4	53.4	1.14
887	1	527.16	0.5	53.8	3.42
888	1	527.16	0.6	53.5	3.93
889	1	527.16	0.7	53.2	4.27
890	1	527.16	0.8	53.8	6.29
891	1	527.16	0.9	54.3	7.99

892	1	555.56	0.1	57.6	1.42
893	1	555.56	0.2	55.7	1.59
894	1	555.56	0.3	54.8	2.27
895	1	555.56	0.4	53.9	2.21
896	1	555.56	0.5	54.1	4.04
897	1	555.56	0.6	53.5	3.93
898	1	555.56	0.7	53.6	5.08
899	1	555.56	0.8	54.2	7.10
900	1	555.56	0.9	54.5	8.40

S5. Initial Screening Optimisation Study 500 nm IONPs

The results of the initial optimisation design space screening for 500 nm IONPs computing 1,000 particle trajectories are shown in Table S2.

Table S2. Capture and separator efficiency for the 900 simulations (10 tubing radii, 9 wire-to-tube radius ratios, and 10 flowrates between 0.01 ml/min and 1.00 ml/min) performed for the initial screening of the design space optimisation.

	Flowrate	**Tubing radius**	**Wire-to-tubing rad.**	**Capture Efficiency**	**Separator Efficiency**
	[ml/min]	**[µm]**	**[-]**	**[%]**	**[%]**
1	0.01	300	0.1	60.8	8.86
2	0.01	300	0.2	65.8	24.02
3	0.01	300	0.3	71.4	38.16
4	0.01	300	0.4	84.3	66.69
5	0.01	300	0.5	97.1	93.94
6	0.01	300	0.6	100	100.00
7	0.01	300	0.7	100	100.00
8	0.01	300	0.8	100	100.00
9	0.01	300	0.9	100	100.00
10	0.01	328.40	0.1	61.2	9.79
11	0.01	328.40	0.2	63.6	19.14
12	0.01	328.40	0.3	70.8	36.86
13	0.01	328.40	0.4	87.4	73.27
14	0.01	328.40	0.5	99	97.91
15	0.01	328.40	0.6	100	100.00
16	0.01	328.40	0.7	100	100.00
17	0.01	328.40	0.8	100	100.00
18	0.01	328.40	0.9	100	100.00
19	0.01	356.79	0.1	60.7	8.63
20	0.01	356.79	0.2	63.5	18.91
21	0.01	356.79	0.3	71.6	38.59
22	0.01	356.79	0.4	89.2	77.09
23	0.01	356.79	0.5	98.6	97.07
24	0.01	356.79	0.6	100	100.00
25	0.01	356.79	0.7	100	100.00
26	0.01	356.79	0.8	100	100.00
27	0.01	356.79	0.9	100	100.00
28	0.01	385.19	0.1	61.5	10.49
29	0.01	385.19	0.2	65.5	23.36
30	0.01	385.19	0.3	74.1	44.00
31	0.01	385.19	0.4	92.4	83.88
32	0.01	385.19	0.5	99.5	98.95
33	0.01	385.19	0.6	100	100.00
34	0.01	385.19	0.7	100	100.00

35	0.01	385.19	0.8	100	100.00
36	0.01	385.19	0.9	100	100.00
37	0.01	413.58	0.1	59.6	6.07
38	0.01	413.58	0.2	64.8	21.80
39	0.01	413.58	0.3	77.1	50.49
40	0.01	413.58	0.4	93.5	86.21
41	0.01	413.58	0.5	100	100.00
42	0.01	413.58	0.6	100	100.00
43	0.01	413.58	0.7	100	100.00
44	0.01	413.58	0.8	100	100.00
45	0.01	413.58	0.9	100	100.00
46	0.01	441.98	0.1	60.1	7.23
47	0.01	441.98	0.2	64.1	20.25
48	0.01	441.98	0.3	77.8	52.00
49	0.01	441.98	0.4	95.3	90.03
50	0.01	441.98	0.5	100	100.00
51	0.01	441.98	0.6	100	100.00
52	0.01	441.98	0.7	100	100.00
53	0.01	441.98	0.8	100	100.00
54	0.01	441.98	0.9	100	100.00
55	0.01	470.37	0.1	61.9	11.42
56	0.01	470.37	0.2	65.6	23.58
57	0.01	470.37	0.3	79.9	56.54
58	0.01	470.37	0.4	94.8	88.97
59	0.01	470.37	0.5	100	100.00
60	0.01	470.37	0.6	100	100.00
61	0.01	470.37	0.7	100	100.00
62	0.01	470.37	0.8	100	100.00
63	0.01	470.37	0.9	100	100.00
64	0.01	498.77	0.1	61.4	10.26
65	0.01	498.77	0.2	65.8	24.02
66	0.01	498.77	0.3	81.2	59.35
67	0.01	498.77	0.4	96.8	93.21
68	0.01	498.77	0.5	100	100.00
69	0.01	498.77	0.6	100	100.00
70	0.01	498.77	0.7	100	100.00
71	0.01	498.77	0.8	100	100.00
72	0.01	498.77	0.9	100	100.00
73	0.01	527.16	0.1	60.7	8.63
74	0.01	527.16	0.2	65.8	24.02
75	0.01	527.16	0.3	82.4	61.95
76	0.01	527.16	0.4	99	97.88
77	0.01	527.16	0.5	100	100.00
78	0.01	527.16	0.6	100	100.00
79	0.01	527.16	0.7	100	100.00
80	0.01	527.16	0.8	100	100.00
81	0.01	527.16	0.9	100	100.00
82	0.01	555.56	0.1	61	9.33
83	0.01	555.56	0.2	65.9	24.25
84	0.01	555.56	0.3	82.8	62.81
85	0.01	555.56	0.4	99.9	99.79
86	0.01	555.56	0.5	100	100.00
87	0.01	555.56	0.6	100	100.00
88	0.01	555.56	0.7	100	100.00

89	0.01	555.56	0.8	100	100.00
90	0.01	555.56	0.9	100	100.00
91	0.12	300	0.1	57.6	1.42
92	0.12	300	0.2	56.6	3.59
93	0.12	300	0.3	56.2	5.30
94	0.12	300	0.4	56.4	7.51
95	0.12	300	0.5	57.8	11.78
96	0.12	300	0.6	63.3	24.18
97	0.12	300	0.7	66.3	31.06
98	0.12	300	0.8	80.3	60.04
99	0.12	300	0.9	93.1	86.11
100	0.12	328.40	0.1	58	2.35
101	0.12	328.40	0.2	56.5	3.36
102	0.12	328.40	0.3	56.6	6.16
103	0.12	328.40	0.4	57.1	8.99
104	0.12	328.40	0.5	58.7	13.66
105	0.12	328.40	0.6	62.7	22.94
106	0.12	328.40	0.7	72.1	42.93
107	0.12	328.40	0.8	88.6	76.88
108	0.12	328.40	0.9	98.2	96.38
109	0.12	356.79	0.1	58.3	3.05
110	0.12	356.79	0.2	57.1	4.70
111	0.12	356.79	0.3	56.6	6.16
112	0.12	356.79	0.4	58	10.90
113	0.12	356.79	0.5	60.9	18.26
114	0.12	356.79	0.6	65	27.69
115	0.12	356.79	0.7	79.5	58.07
116	0.12	356.79	0.8	93	85.80
117	0.12	356.79	0.9	98.4	96.78
118	0.12	385.19	0.1	58.6	3.75
119	0.12	385.19	0.2	56	2.25
120	0.12	385.19	0.3	56	4.86
121	0.12	385.19	0.4	59.2	13.45
122	0.12	385.19	0.5	60.1	16.59
123	0.12	385.19	0.6	71.3	40.71
124	0.12	385.19	0.7	84.2	67.68
125	0.12	385.19	0.8	96.9	93.71
126	0.12	385.19	0.9	100	100.00
127	0.12	413.58	0.1	57.7	1.65
128	0.12	413.58	0.2	56.8	4.03
129	0.12	413.58	0.3	56.2	5.30
130	0.12	413.58	0.4	58.5	11.96
131	0.12	413.58	0.5	61	18.47
132	0.12	413.58	0.6	74.5	47.32
133	0.12	413.58	0.7	87	73.41
134	0.12	413.58	0.8	98.8	97.57
135	0.12	413.58	0.9	100	100.00
136	0.12	441.98	0.1	57.6	1.42
137	0.12	441.98	0.2	56.4	3.14
138	0.12	441.98	0.3	56.1	5.08
139	0.12	441.98	0.4	58.5	11.96
140	0.12	441.98	0.5	65.3	27.46
141	0.12	441.98	0.6	78.9	56.41
142	0.12	441.98	0.7	92.2	84.04

143	0.12	441.98	0.8	99.8	99.59
144	0.12	441.98	0.9	100	100.00
145	0.12	470.37	0.1	58.4	3.28
146	0.12	470.37	0.2	56.7	3.81
147	0.12	470.37	0.3	56.6	6.16
148	0.12	470.37	0.4	59.2	13.45
149	0.12	470.37	0.5	68.3	33.73
150	0.12	470.37	0.6	80.5	59.71
151	0.12	470.37	0.7	94.4	88.54
152	0.12	470.37	0.8	100	100.00
153	0.12	470.37	0.9	100	100.00
154	0.12	498.77	0.1	57.8	1.89
155	0.12	498.77	0.2	56.4	3.14
156	0.12	498.77	0.3	57.8	8.76
157	0.12	498.77	0.4	59.7	14.51
158	0.12	498.77	0.5	70.9	39.17
159	0.12	498.77	0.6	82.9	64.67
160	0.12	498.77	0.7	98.3	96.52
161	0.12	498.77	0.8	100	100.00
162	0.12	498.77	0.9	100	100.00
163	0.12	527.16	0.1	58.6	3.75
164	0.12	527.16	0.2	56.6	3.59
165	0.12	527.16	0.3	56.8	6.59
166	0.12	527.16	0.4	61.3	17.90
167	0.12	527.16	0.5	73.2	43.97
168	0.12	527.16	0.6	84.5	67.98
169	0.12	527.16	0.7	99.9	99.80
170	0.12	527.16	0.8	100	100.00
171	0.12	527.16	0.9	100	100.00
172	0.12	555.56	0.1	58.2	2.82
173	0.12	555.56	0.2	56.8	4.03
174	0.12	555.56	0.3	58.5	10.27
175	0.12	555.56	0.4	62.5	20.45
176	0.12	555.56	0.5	74.9	47.53
177	0.12	555.56	0.6	88.5	76.24
178	0.12	555.56	0.7	100	100.00
179	0.12	555.56	0.8	100	100.00
180	0.12	555.56	0.9	100	100.00
181	0.23	300	0.1	57.4	0.96
182	0.23	300	0.2	55.2	0.48
183	0.23	300	0.3	54.8	2.27
184	0.23	300	0.4	54.5	3.48
185	0.23	300	0.5	55.3	6.55
186	0.23	300	0.6	57.7	12.61
187	0.23	300	0.7	58.3	14.70
188	0.23	300	0.8	67.7	34.49
189	0.23	300	0.9	74.8	49.27
190	0.23	328.40	0.1	57.4	0.96
191	0.23	328.40	0.2	55.3	0.70
192	0.23	328.40	0.3	54.9	2.48
193	0.23	328.40	0.4	54.8	4.12
194	0.23	328.40	0.5	56.9	9.90
195	0.23	328.40	0.6	58.2	13.64
196	0.23	328.40	0.7	63.3	24.93

197	0.23	328.40	0.8	71.2	41.59
198	0.23	328.40	0.9	78.8	57.32
199	0.23	356.79	0.1	57.4	0.96
200	0.23	356.79	0.2	56.2	2.70
201	0.23	356.79	0.3	55.9	4.65
202	0.23	356.79	0.4	55.3	5.18
203	0.23	356.79	0.5	56.2	8.44
204	0.23	356.79	0.6	59.7	16.74
205	0.23	356.79	0.7	68	34.54
206	0.23	356.79	0.8	75.5	50.31
207	0.23	356.79	0.9	81.8	63.36
208	0.23	385.19	0.1	57.8	1.89
209	0.23	385.19	0.2	56	2.25
210	0.23	385.19	0.3	55	2.70
211	0.23	385.19	0.4	55.7	6.02
212	0.23	385.19	0.5	57	10.11
213	0.23	385.19	0.6	62.8	23.15
214	0.23	385.19	0.7	69.7	38.02
215	0.23	385.19	0.8	78	55.38
216	0.23	385.19	0.9	88.9	77.65
217	0.23	413.58	0.1	57.5	1.19
218	0.23	413.58	0.2	55.8	1.81
219	0.23	413.58	0.3	55.5	3.78
220	0.23	413.58	0.4	56.2	7.08
221	0.23	413.58	0.5	56.9	9.90
222	0.23	413.58	0.6	64.9	27.49
223	0.23	413.58	0.7	71.9	42.52
224	0.23	413.58	0.8	80.6	60.65
225	0.23	413.58	0.9	94.8	89.53
226	0.23	441.98	0.1	57.5	1.19
227	0.23	441.98	0.2	56.2	2.70
228	0.23	441.98	0.3	55.9	4.65
229	0.23	441.98	0.4	55.9	6.45
230	0.23	441.98	0.5	59.3	14.92
231	0.23	441.98	0.6	67	31.82
232	0.23	441.98	0.7	73.6	46.00
233	0.23	441.98	0.8	86.5	72.62
234	0.23	441.98	0.9	97.8	95.57
235	0.23	470.37	0.1	57.7	1.65
236	0.23	470.37	0.2	56.2	2.70
237	0.23	470.37	0.3	55.3	3.35
238	0.23	470.37	0.4	56.7	8.15
239	0.23	470.37	0.5	62.3	21.19
240	0.23	470.37	0.6	69.5	36.99
241	0.23	470.37	0.7	76.6	52.13
242	0.23	470.37	0.8	91.4	82.56
243	0.23	470.37	0.9	99.5	98.99
244	0.23	498.77	0.1	57.7	1.65
245	0.23	498.77	0.2	56.4	3.14
246	0.23	498.77	0.3	55.9	4.65
247	0.23	498.77	0.4	56.1	6.87
248	0.23	498.77	0.5	63.2	23.07
249	0.23	498.77	0.6	70.3	38.64
250	0.23	498.77	0.7	79.6	58.27

251	0.23	498.77	0.8	94.9	89.66
252	0.23	498.77	0.9	99.5	98.99
253	0.23	527.16	0.1	57.5	1.19
254	0.23	527.16	0.2	56.2	2.70
255	0.23	527.16	0.3	56.5	5.94
256	0.23	527.16	0.4	57.5	9.84
257	0.23	527.16	0.5	65.2	27.25
258	0.23	527.16	0.6	71.9	41.95
259	0.23	527.16	0.7	84.2	67.68
260	0.23	527.16	0.8	97	93.92
261	0.23	527.16	0.9	99.9	99.80
262	0.23	555.56	0.1	57.5	1.19
263	0.23	555.56	0.2	56.6	3.59
264	0.23	555.56	0.3	56.4	5.73
265	0.23	555.56	0.4	58.9	12.81
266	0.23	555.56	0.5	66	28.92
267	0.23	555.56	0.6	73.8	45.87
268	0.23	555.56	0.7	87.1	73.61
269	0.23	555.56	0.8	99	97.97
270	0.23	555.56	0.9	99.8	99.60
271	0.34	300	0.1	57.3	0.72
272	0.34	300	0.2	55.5	1.14
273	0.34	300	0.3	54.6	1.84
274	0.34	300	0.4	54.8	4.12
275	0.34	300	0.5	55.1	6.14
276	0.34	300	0.6	55	7.03
277	0.34	300	0.7	57.3	12.65
278	0.34	300	0.8	63.2	25.36
279	0.34	300	0.9	67.6	34.77
280	0.34	328.40	0.1	57.1	0.26
281	0.34	328.40	0.2	56	2.25
282	0.34	328.40	0.3	55.1	2.92
283	0.34	328.40	0.4	54.6	3.69
284	0.34	328.40	0.5	54.9	5.72
285	0.34	328.40	0.6	55.7	8.48
286	0.34	328.40	0.7	59.6	17.36
287	0.34	328.40	0.8	65.8	30.63
288	0.34	328.40	0.9	70.1	39.80
289	0.34	356.79	0.1	57.9	2.12
290	0.34	356.79	0.2	55.8	1.81
291	0.34	356.79	0.3	54.4	1.40
292	0.34	356.79	0.4	54.8	4.12
293	0.34	356.79	0.5	55.4	6.76
294	0.34	356.79	0.6	57.6	12.40
295	0.34	356.79	0.7	62.6	23.49
296	0.34	356.79	0.8	68.2	35.50
297	0.34	356.79	0.9	72.1	43.83
298	0.34	385.19	0.1	57.8	1.89
299	0.34	385.19	0.2	55.8	1.81
300	0.34	385.19	0.3	54.4	1.40
301	0.34	385.19	0.4	54.8	4.12
302	0.34	385.19	0.5	55.5	6.97
303	0.34	385.19	0.6	59.2	15.71
304	0.34	385.19	0.7	64.5	27.38

305	0.34	385.19	0.8	70.5	40.17
306	0.34	385.19	0.9	77.2	54.10
307	0.34	413.58	0.1	57.8	1.89
308	0.34	413.58	0.2	55.7	1.59
309	0.34	413.58	0.3	55.2	3.13
310	0.34	413.58	0.4	55.1	4.75
311	0.34	413.58	0.5	56.4	8.85
312	0.34	413.58	0.6	61.5	20.46
313	0.34	413.58	0.7	66.9	32.29
314	0.34	413.58	0.8	72.7	44.63
315	0.34	413.58	0.9	81.4	62.55
316	0.34	441.98	0.1	57.8	1.89
317	0.34	441.98	0.2	56	2.25
318	0.34	441.98	0.3	54.7	2.05
319	0.34	441.98	0.4	55.7	6.02
320	0.34	441.98	0.5	56.1	8.23
321	0.34	441.98	0.6	63.2	23.97
322	0.34	441.98	0.7	66.8	32.09
323	0.34	441.98	0.8	76.1	51.52
324	0.34	441.98	0.9	85.6	71.01
325	0.34	470.37	0.1	58.1	2.58
326	0.34	470.37	0.2	56.7	3.81
327	0.34	470.37	0.3	55.6	4.00
328	0.34	470.37	0.4	55.1	4.75
329	0.34	470.37	0.5	59.3	14.92
330	0.34	470.37	0.6	64.7	27.07
331	0.34	470.37	0.7	69.8	38.22
332	0.34	470.37	0.8	79.8	59.03
333	0.34	470.37	0.9	88.7	77.25
334	0.34	498.77	0.1	57.5	1.19
335	0.34	498.77	0.2	56	2.25
336	0.34	498.77	0.3	55.1	2.92
337	0.34	498.77	0.4	55.5	5.60
338	0.34	498.77	0.5	60.3	17.01
339	0.34	498.77	0.6	65.9	29.55
340	0.34	498.77	0.7	71.9	42.52
341	0.34	498.77	0.8	81.5	62.48
342	0.34	498.77	0.9	91.8	83.49
343	0.34	527.16	0.1	57.9	2.12
344	0.34	527.16	0.2	55.9	2.03
345	0.34	527.16	0.3	55.6	4.00
346	0.34	527.16	0.4	56.7	8.15
347	0.34	527.16	0.5	61.4	19.31
348	0.34	527.16	0.6	66.6	31.00
349	0.34	527.16	0.7	74.7	48.25
350	0.34	527.16	0.8	83.9	67.34
351	0.34	527.16	0.9	93.2	86.31
352	0.34	555.56	0.1	58	2.35
353	0.34	555.56	0.2	55.6	1.36
354	0.34	555.56	0.3	55.7	4.21
355	0.34	555.56	0.4	56.5	7.72
356	0.34	555.56	0.5	61	18.47
357	0.34	555.56	0.6	67.9	33.68
358	0.34	555.56	0.7	76.7	52.34

359	0.34	555.56	0.8	85.5	70.59
360	0.34	555.56	0.9	94.7	89.33
361	0.45	300	0.1	58.3	3.05
362	0.45	300	0.2	55.1	0.25
363	0.45	300	0.3	54.6	1.84
364	0.45	300	0.4	54.1	2.63
365	0.45	300	0.5	53.7	3.21
366	0.45	300	0.6	53.9	4.76
367	0.45	300	0.7	54.1	6.11
368	0.45	300	0.8	58.9	16.64
369	0.45	300	0.9	63.1	25.71
370	0.45	328.40	0.1	57.6	1.42
371	0.45	328.40	0.2	55.7	1.59
372	0.45	328.40	0.3	54.4	1.40
373	0.45	328.40	0.4	54.3	3.05
374	0.45	328.40	0.5	54.7	5.30
375	0.45	328.40	0.6	54.9	6.83
376	0.45	328.40	0.7	57.6	13.27
377	0.45	328.40	0.8	61.1	21.10
378	0.45	328.40	0.9	64.5	28.53
379	0.45	356.79	0.1	58.3	3.05
380	0.45	356.79	0.2	55.3	0.70
381	0.45	356.79	0.3	54	0.54
382	0.45	356.79	0.4	54.4	3.27
383	0.45	356.79	0.5	54.5	4.88
384	0.45	356.79	0.6	55.1	7.24
385	0.45	356.79	0.7	59.8	17.77
386	0.45	356.79	0.8	63.6	26.17
387	0.45	356.79	0.9	66.7	32.96
388	0.45	385.19	0.1	57.7	1.65
389	0.45	385.19	0.2	55.1	0.25
390	0.45	385.19	0.3	54.3	1.19
391	0.45	385.19	0.4	54.8	4.12
392	0.45	385.19	0.5	55.2	6.34
393	0.45	385.19	0.6	57.4	11.99
394	0.45	385.19	0.7	62	22.27
395	0.45	385.19	0.8	66	31.04
396	0.45	385.19	0.9	71.3	42.22
397	0.45	413.58	0.1	57.5	1.19
398	0.45	413.58	0.2	55.6	1.36
399	0.45	413.58	0.3	55.5	3.78
400	0.45	413.58	0.4	54.5	3.48
401	0.45	413.58	0.5	55.3	6.55
402	0.45	413.58	0.6	59.3	15.92
403	0.45	413.58	0.7	62.6	23.49
404	0.45	413.58	0.8	67.4	33.88
405	0.45	413.58	0.9	74.2	48.06
406	0.45	441.98	0.1	57.6	1.42
407	0.45	441.98	0.2	55.7	1.59
408	0.45	441.98	0.3	55.3	3.35
409	0.45	441.98	0.4	55.1	4.75
410	0.45	441.98	0.5	55.8	7.60
411	0.45	441.98	0.6	60	17.36
412	0.45	441.98	0.7	64.4	27.18

413	0.45	441.98	0.8	70.5	40.17
414	0.45	441.98	0.9	77.6	54.90
415	0.45	470.37	0.1	57.7	1.65
416	0.45	470.37	0.2	55.6	1.36
417	0.45	470.37	0.3	55.3	3.35
418	0.45	470.37	0.4	55.3	5.18
419	0.45	470.37	0.5	57.3	10.73
420	0.45	470.37	0.6	60.8	19.01
421	0.45	470.37	0.7	65.6	29.63
422	0.45	470.37	0.8	73.4	46.05
423	0.45	470.37	0.9	80.2	60.14
424	0.45	498.77	0.1	58	2.35
425	0.45	498.77	0.2	55.4	0.92
426	0.45	498.77	0.3	55	2.70
427	0.45	498.77	0.4	54.9	4.33
428	0.45	498.77	0.5	58.5	13.24
429	0.45	498.77	0.6	61.9	21.29
430	0.45	498.77	0.7	68	34.54
431	0.45	498.77	0.8	75.6	50.51
432	0.45	498.77	0.9	81.4	62.55
433	0.45	527.16	0.1	57.5	1.19
434	0.45	527.16	0.2	56.2	2.70
435	0.45	527.16	0.3	55	2.70
436	0.45	527.16	0.4	55.6	5.81
437	0.45	527.16	0.5	59	14.29
438	0.45	527.16	0.6	63	23.56
439	0.45	527.16	0.7	70	38.63
440	0.45	527.16	0.8	76.8	52.94
441	0.45	527.16	0.9	83.1	65.98
442	0.45	555.56	0.1	57.5	1.19
443	0.45	555.56	0.2	56.2	2.70
444	0.45	555.56	0.3	55.3	3.35
445	0.45	555.56	0.4	55.8	6.24
446	0.45	555.56	0.5	59.6	15.54
447	0.45	555.56	0.6	64.7	27.07
448	0.45	555.56	0.7	71.4	41.50
449	0.45	555.56	0.8	77.9	55.17
450	0.45	555.56	0.9	85	69.80
451	0.56	300	0.1	57.6	1.42
452	0.56	300	0.2	55.5	1.14
453	0.56	300	0.3	54.6	1.84
454	0.56	300	0.4	54.2	2.84
455	0.56	300	0.5	53.8	3.42
456	0.56	300	0.6	54.7	6.41
457	0.56	300	0.7	54.4	6.72
458	0.56	300	0.8	58.1	15.02
459	0.56	300	0.9	60.5	20.48
460	0.56	328.40	0.1	57.5	1.19
461	0.56	328.40	0.2	55.8	1.81
462	0.56	328.40	0.3	54.6	1.84
463	0.56	328.40	0.4	53.7	1.78
464	0.56	328.40	0.5	53.7	3.21
465	0.56	328.40	0.6	54.1	5.17
466	0.56	328.40	0.7	56.1	10.20

467	0.56	328.40	0.8	58.9	16.64
468	0.56	328.40	0.9	61.2	21.89
469	0.56	356.79	0.1	58	2.35
470	0.56	356.79	0.2	55.7	1.59
471	0.56	356.79	0.3	54.3	1.19
472	0.56	356.79	0.4	54	2.42
473	0.56	356.79	0.5	54.8	5.51
474	0.56	356.79	0.6	55	7.03
475	0.56	356.79	0.7	58.1	14.29
476	0.56	356.79	0.8	60.9	20.69
477	0.56	356.79	0.9	63.8	27.12
478	0.56	385.19	0.1	57.7	1.65
479	0.56	385.19	0.2	55.9	2.03
480	0.56	385.19	0.3	55.2	3.13
481	0.56	385.19	0.4	54.5	3.48
482	0.56	385.19	0.5	54.8	5.51
483	0.56	385.19	0.6	56.3	9.72
484	0.56	385.19	0.7	58.8	15.72
485	0.56	385.19	0.8	62.3	23.53
486	0.56	385.19	0.9	67.2	33.97
487	0.56	413.58	0.1	57.2	0.49
488	0.56	413.58	0.2	55.6	1.36
489	0.56	413.58	0.3	55.1	2.92
490	0.56	413.58	0.4	54.4	3.27
491	0.56	413.58	0.5	55	5.93
492	0.56	413.58	0.6	58.3	13.85
493	0.56	413.58	0.7	60.4	18.99
494	0.56	413.58	0.8	64.5	28.00
495	0.56	413.58	0.9	69.5	38.60
496	0.56	441.98	0.1	57.4	0.96
497	0.56	441.98	0.2	56.2	2.70
498	0.56	441.98	0.3	54.9	2.48
499	0.56	441.98	0.4	54.9	4.33
500	0.56	441.98	0.5	55.6	7.18
501	0.56	441.98	0.6	57.8	12.82
502	0.56	441.98	0.7	61.4	21.04
503	0.56	441.98	0.8	67.2	33.47
504	0.56	441.98	0.9	73	45.64
505	0.56	470.37	0.1	57.6	1.42
506	0.56	470.37	0.2	55.7	1.59
507	0.56	470.37	0.3	55.4	3.57
508	0.56	470.37	0.4	54.7	3.90
509	0.56	470.37	0.5	56.1	8.23
510	0.56	470.37	0.6	59.2	15.71
511	0.56	470.37	0.7	63.1	24.52
512	0.56	470.37	0.8	69.9	38.95
513	0.56	470.37	0.9	74	47.66
514	0.56	498.77	0.1	57.9	2.12
515	0.56	498.77	0.2	56	2.25
516	0.56	498.77	0.3	54.9	2.48
517	0.56	498.77	0.4	54.1	2.63
518	0.56	498.77	0.5	57.3	10.73
519	0.56	498.77	0.6	60.7	18.81
520	0.56	498.77	0.7	65.3	29.02

521	0.56	498.77	0.8	71.2	41.59
522	0.56	498.77	0.9	75.5	50.68
523	0.56	527.16	0.1	57.7	1.65
524	0.56	527.16	0.2	55.9	2.03
525	0.56	527.16	0.3	55.7	4.21
526	0.56	527.16	0.4	55.2	4.96
527	0.56	527.16	0.5	58.8	13.87
528	0.56	527.16	0.6	61	19.43
529	0.56	527.16	0.7	67.1	32.70
530	0.56	527.16	0.8	72.8	44.83
531	0.56	527.16	0.9	78.1	55.91
532	0.56	555.56	0.1	57.5	1.19
533	0.56	555.56	0.2	55.4	0.92
534	0.56	555.56	0.3	54.4	1.40
535	0.56	555.56	0.4	55.4	5.39
536	0.56	555.56	0.5	57.8	11.78
537	0.56	555.56	0.6	61.7	20.87
538	0.56	555.56	0.7	69.1	36.79
539	0.56	555.56	0.8	73.2	45.64
540	0.56	555.56	0.9	77.6	54.90
541	0.67	300	0.1	57.6	1.42
542	0.67	300	0.2	55.9	2.03
543	0.67	300	0.3	54.1	0.76
544	0.67	300	0.4	53.7	1.78
545	0.67	300	0.5	53.3	2.37
546	0.67	300	0.6	53.2	3.31
547	0.67	300	0.7	54.1	6.11
548	0.67	300	0.8	56.7	12.18
549	0.67	300	0.9	58.9	17.26
550	0.67	328.40	0.1	57.4	0.96
551	0.67	328.40	0.2	55.2	0.48
552	0.67	328.40	0.3	54.6	1.84
553	0.67	328.40	0.4	53.9	2.21
554	0.67	328.40	0.5	54	3.84
555	0.67	328.40	0.6	53.7	4.35
556	0.67	328.40	0.7	54.8	7.54
557	0.67	328.40	0.8	58.1	15.02
558	0.67	328.40	0.9	59.7	18.87
559	0.67	356.79	0.1	57.9	2.12
560	0.67	356.79	0.2	56	2.25
561	0.67	356.79	0.3	54.4	1.40
562	0.67	356.79	0.4	54.6	3.69
563	0.67	356.79	0.5	53.6	3.00
564	0.67	356.79	0.6	54.3	5.59
565	0.67	356.79	0.7	57.1	12.24
566	0.67	356.79	0.8	59.3	17.45
567	0.67	356.79	0.9	61.9	23.30
568	0.67	385.19	0.1	57.8	1.89
569	0.67	385.19	0.2	55.3	0.70
570	0.67	385.19	0.3	55.2	3.13
571	0.67	385.19	0.4	54.6	3.69
572	0.67	385.19	0.5	54.1	4.04
573	0.67	385.19	0.6	55.4	7.86
574	0.67	385.19	0.7	57.5	13.06

575	0.67	385.19	0.8	60.5	19.88
576	0.67	385.19	0.9	64.2	27.93
577	0.67	413.58	0.1	57.4	0.96
578	0.67	413.58	0.2	56.2	2.70
579	0.67	413.58	0.3	54.9	2.48
580	0.67	413.58	0.4	54.8	4.12
581	0.67	413.58	0.5	54.7	5.30
582	0.67	413.58	0.6	56.5	10.13
583	0.67	413.58	0.7	59.2	16.54
584	0.67	413.58	0.8	61.8	22.52
585	0.67	413.58	0.9	67.2	33.97
586	0.67	441.98	0.1	58	2.35
587	0.67	441.98	0.2	55.9	2.03
588	0.67	441.98	0.3	54.9	2.48
589	0.67	441.98	0.4	54.6	3.69
590	0.67	441.98	0.5	54.8	5.51
591	0.67	441.98	0.6	56.9	10.96
592	0.67	441.98	0.7	59.6	17.36
593	0.67	441.98	0.8	65.1	29.21
594	0.67	441.98	0.9	68.8	37.19
595	0.67	470.37	0.1	58.2	2.82
596	0.67	470.37	0.2	56.1	2.48
597	0.67	470.37	0.3	55	2.70
598	0.67	470.37	0.4	54.6	3.69
599	0.67	470.37	0.5	55	5.93
600	0.67	470.37	0.6	58	13.23
601	0.67	470.37	0.7	61.4	21.04
602	0.67	470.37	0.8	66.7	32.46
603	0.67	470.37	0.9	71.7	43.03
604	0.67	498.77	0.1	57.6	1.42
605	0.67	498.77	0.2	55.9	2.03
606	0.67	498.77	0.3	54.7	2.05
607	0.67	498.77	0.4	54.3	3.05
608	0.67	498.77	0.5	56.5	9.06
609	0.67	498.77	0.6	59	15.30
610	0.67	498.77	0.7	63.3	24.93
611	0.67	498.77	0.8	68.1	35.30
612	0.67	498.77	0.9	71.3	42.22
613	0.67	527.16	0.1	58	2.35
614	0.67	527.16	0.2	55.8	1.81
615	0.67	527.16	0.3	54.6	1.84
616	0.67	527.16	0.4	55	4.54
617	0.67	527.16	0.5	57.1	10.32
618	0.67	527.16	0.6	59.7	16.74
619	0.67	527.16	0.7	63.9	26.15
620	0.67	527.16	0.8	69.5	38.14
621	0.67	527.16	0.9	72.3	44.23
622	0.67	555.56	0.1	57.2	0.49
623	0.67	555.56	0.2	55.4	0.92
624	0.67	555.56	0.3	54.9	2.48
625	0.67	555.56	0.4	55	4.54
626	0.67	555.56	0.5	57.5	11.15
627	0.67	555.56	0.6	60.8	19.01
628	0.67	555.56	0.7	66.2	30.86

629	0.67	555.56	0.8	70.5	40.17
630	0.67	555.56	0.9	73.5	46.65
631	0.78	300	0.1	57.7	1.65
632	0.78	300	0.2	55.6	1.37
633	0.78	300	0.3	54	0.54
634	0.78	300	0.4	54	2.42
635	0.78	300	0.5	53.2	2.16
636	0.78	300	0.6	53.1	3.11
637	0.78	300	0.7	52.9	3.65
638	0.78	300	0.8	54.8	8.32
639	0.78	300	0.9	57	13.43
640	0.78	328.40	0.1	57.9	2.12
641	0.78	328.40	0.2	56.3	2.92
642	0.78	328.40	0.3	54	0.54
643	0.78	328.40	0.4	53.7	1.78
644	0.78	328.40	0.5	53.8	3.42
645	0.78	328.40	0.6	53.6	4.14
646	0.78	328.40	0.7	54.5	6.93
647	0.78	328.40	0.8	56.8	12.38
648	0.78	328.40	0.9	57.4	14.24
649	0.78	356.79	0.1	57.7	1.65
650	0.78	356.79	0.2	55.8	1.81
651	0.78	356.79	0.3	53.8	0.11
652	0.78	356.79	0.4	54.1	2.63
653	0.78	356.79	0.5	53.3	2.37
654	0.78	356.79	0.6	53.7	4.35
655	0.78	356.79	0.7	56.3	10.61
656	0.78	356.79	0.8	58.1	15.02
657	0.78	356.79	0.9	59.1	17.66
658	0.78	385.19	0.1	58	2.35
659	0.78	385.19	0.2	55.6	1.36
660	0.78	385.19	0.3	54.9	2.48
661	0.78	385.19	0.4	54.5	3.48
662	0.78	385.19	0.5	53.8	3.42
663	0.78	385.19	0.6	55.4	7.86
664	0.78	385.19	0.7	57.3	12.65
665	0.78	385.19	0.8	59.7	18.26
666	0.78	385.19	0.9	62.2	23.90
667	0.78	413.58	0.1	57.9	2.12
668	0.78	413.58	0.2	55.6	1.36
669	0.78	413.58	0.3	54.9	2.48
670	0.78	413.58	0.4	54.5	3.48
671	0.78	413.58	0.5	53.9	3.63
672	0.78	413.58	0.6	55.5	8.07
673	0.78	413.58	0.7	58.2	14.49
674	0.78	413.58	0.8	60.5	19.88
675	0.78	413.58	0.9	64.5	28.53
676	0.78	441.98	0.1	58	2.35
677	0.78	441.98	0.2	56	2.25
678	0.78	441.98	0.3	54.6	1.84
679	0.78	441.98	0.4	54.7	3.90
680	0.78	441.98	0.5	54.2	4.25
681	0.78	441.98	0.6	56.8	10.75
682	0.78	441.98	0.7	59.1	16.34

683	0.78	441.98	0.8	62.5	23.94
684	0.78	441.98	0.9	67.4	34.37
685	0.78	470.37	0.1	57.8	1.89
686	0.78	470.37	0.2	55.6	1.36
687	0.78	470.37	0.3	55	2.70
688	0.78	470.37	0.4	54.6	3.69
689	0.78	470.37	0.5	55.4	6.76
690	0.78	470.37	0.6	56.8	10.75
691	0.78	470.37	0.7	59.3	16.74
692	0.78	470.37	0.8	63.7	26.37
693	0.78	470.37	0.9	68.9	37.39
694	0.78	498.77	0.1	57.9	2.12
695	0.78	498.77	0.2	55.7	1.59
696	0.78	498.77	0.3	55.4	3.57
697	0.78	498.77	0.4	54	2.42
698	0.78	498.77	0.5	55.9	7.81
699	0.78	498.77	0.6	57.6	12.40
700	0.78	498.77	0.7	61.1	20.43
701	0.78	498.77	0.8	66.3	31.65
702	0.78	498.77	0.9	69.9	39.40
703	0.78	527.16	0.1	57.9	2.12
704	0.78	527.16	0.2	56.3	2.92
705	0.78	527.16	0.3	55	2.70
706	0.78	527.16	0.4	55.1	4.75
707	0.78	527.16	0.5	56.2	8.43
708	0.78	527.16	0.6	58	13.23
709	0.78	527.16	0.7	62.5	23.29
710	0.78	527.16	0.8	67.2	33.47
711	0.78	527.16	0.9	69.2	37.99
712	0.78	555.56	0.1	57.6	1.42
713	0.78	555.56	0.2	55.9	2.03
714	0.78	555.56	0.3	54.5	1.62
715	0.78	555.56	0.4	54.8	4.11
716	0.78	555.56	0.5	57.2	10.53
717	0.78	555.56	0.6	59.4	16.12
718	0.78	555.56	0.7	64	26.36
719	0.78	555.56	0.8	67.7	34.49
720	0.78	555.56	0.9	71.2	42.02
721	0.89	300	0.1	57.6	1.42
722	0.89	300	0.2	55.6	1.37
723	0.89	300	0.3	54.3	1.19
724	0.89	300	0.4	53.9	2.21
725	0.89	300	0.5	53.6	3.00
726	0.89	300	0.6	53	2.90
727	0.89	300	0.7	53.2	4.27
728	0.89	300	0.8	54.8	8.32
729	0.89	300	0.9	55.7	10.81
730	0.89	328.40	0.1	58	2.35
731	0.89	328.40	0.2	55.4	0.92
732	0.89	328.40	0.3	54.3	1.19
733	0.89	328.40	0.4	53.8	1.99
734	0.89	328.40	0.5	53.1	1.95
735	0.89	328.40	0.6	52.9	2.69
736	0.89	328.40	0.7	53.3	4.47

737	0.89	328.40	0.8	56	10.76
738	0.89	328.40	0.9	57.2	13.83
739	0.89	356.79	0.1	56.9	-0.21
740	0.89	356.79	0.2	55.3	0.70
741	0.89	356.79	0.3	54.8	2.27
742	0.89	356.79	0.4	53.5	1.36
743	0.89	356.79	0.5	54.5	4.88
744	0.89	356.79	0.6	54.2	5.38
745	0.89	356.79	0.7	56	9.99
746	0.89	356.79	0.8	56.8	12.38
747	0.89	356.79	0.9	58.1	15.65
748	0.89	385.19	0.1	57.8	1.89
749	0.89	385.19	0.2	55.6	1.36
750	0.89	385.19	0.3	54.7	2.05
751	0.89	385.19	0.4	54	2.42
752	0.89	385.19	0.5	53.4	2.58
753	0.89	385.19	0.6	54.5	6.00
754	0.89	385.19	0.7	56.1	10.20
755	0.89	385.19	0.8	57.4	13.60
756	0.89	385.19	0.9	61.5	22.49
757	0.89	413.58	0.1	57.9	2.12
758	0.89	413.58	0.2	55.9	2.03
759	0.89	413.58	0.3	54.8	2.27
760	0.89	413.58	0.4	53.5	1.36
761	0.89	413.58	0.5	53	1.75
762	0.89	413.58	0.6	55.2	7.45
763	0.89	413.58	0.7	57.3	12.65
764	0.89	413.58	0.8	60	18.87
765	0.89	413.58	0.9	61.4	22.29
766	0.89	441.98	0.1	57.3	0.72
767	0.89	441.98	0.2	56.2	2.70
768	0.89	441.98	0.3	54.2	0.97
769	0.89	441.98	0.4	53.6	1.57
770	0.89	441.98	0.5	54.2	4.25
771	0.89	441.98	0.6	56.1	9.30
772	0.89	441.98	0.7	56.6	11.22
773	0.89	441.98	0.8	60.5	19.88
774	0.89	441.98	0.9	64.7	28.93
775	0.89	470.37	0.1	57.5	1.19
776	0.89	470.37	0.2	55.7	1.59
777	0.89	470.37	0.3	55	2.70
778	0.89	470.37	0.4	54.2	2.84
779	0.89	470.37	0.5	54.9	5.72
780	0.89	470.37	0.6	56.4	9.92
781	0.89	470.37	0.7	58.4	14.90
782	0.89	470.37	0.8	62.9	24.75
783	0.89	470.37	0.9	66.9	33.36
784	0.89	498.77	0.1	57.9	2.12
785	0.89	498.77	0.2	55.2	0.48
786	0.89	498.77	0.3	54.8	2.27
787	0.89	498.77	0.4	53.8	1.99
788	0.89	498.77	0.5	55	5.93
789	0.89	498.77	0.6	57.3	11.78
790	0.89	498.77	0.7	60.3	18.79

791	0.89	498.77	0.8	64.1	27.18
792	0.89	498.77	0.9	66.7	32.96
793	0.89	527.16	0.1	57.7	1.65
794	0.89	527.16	0.2	56.1	2.48
795	0.89	527.16	0.3	54.8	2.27
796	0.89	527.16	0.4	54.5	3.48
797	0.89	527.16	0.5	55.9	7.81
798	0.89	527.16	0.6	57.1	11.37
799	0.89	527.16	0.7	61.3	20.84
800	0.89	527.16	0.8	64.4	27.79
801	0.89	527.16	0.9	67.4	34.37
802	0.89	555.56	0.1	57.6	1.42
803	0.89	555.56	0.2	55.5	1.14
804	0.89	555.56	0.3	54.9	2.48
805	0.89	555.56	0.4	54.9	4.33
806	0.89	555.56	0.5	56	8.02
807	0.89	555.56	0.6	58.3	13.85
808	0.89	555.56	0.7	62.8	23.90
809	0.89	555.56	0.8	65.5	30.02
810	0.89	555.56	0.9	68.5	36.58
811	1	300	0.1	58	2.35
812	1	300	0.2	55.1	0.25
813	1	300	0.3	54.2	0.97
814	1	300	0.4	53.7	1.78
815	1	300	0.5	53.1	1.95
816	1	300	0.6	53	2.90
817	1	300	0.7	52.9	3.65
818	1	300	0.8	53.2	5.08
819	1	300	0.9	55.6	10.61
820	1	328.40	0.1	57.4	0.96
821	1	328.40	0.2	56	2.25
822	1	328.40	0.3	54.7	2.05
823	1	328.40	0.4	54	2.42
824	1	328.40	0.5	53.4	2.58
825	1	328.40	0.6	52.6	2.07
826	1	328.40	0.7	53.8	5.49
827	1	328.40	0.8	56.1	10.96
828	1	328.40	0.9	56.1	11.62
829	1	356.79	0.1	58.1	2.58
830	1	356.79	0.2	55.4	0.92
831	1	356.79	0.3	54.2	0.97
832	1	356.79	0.4	53.6	1.57
833	1	356.79	0.5	53.6	3.00
834	1	356.79	0.6	53.8	4.55
835	1	356.79	0.7	55.5	8.97
836	1	356.79	0.8	56.3	11.36
837	1	356.79	0.9	56.3	12.02
838	1	385.19	0.1	57.5	1.19
839	1	385.19	0.2	55.8	1.81
840	1	385.19	0.3	54.1	0.76
841	1	385.19	0.4	53.4	1.15
842	1	385.19	0.5	53.6	3.00
843	1	385.19	0.6	54.7	6.41
844	1	385.19	0.7	55.3	8.56

845	1	385.19	0.8	56.7	12.18
846	1	385.19	0.9	59.7	18.87
847	1	413.58	0.1	57.6	1.42
848	1	413.58	0.2	55.7	1.59
849	1	413.58	0.3	54.5	1.62
850	1	413.58	0.4	53.7	1.78
851	1	413.58	0.5	53.6	3.00
852	1	413.58	0.6	55.3	7.65
853	1	413.58	0.7	56.1	10.20
854	1	413.58	0.8	58.1	15.02
855	1	413.58	0.9	60.9	21.28
856	1	441.98	0.1	57.5	1.19
857	1	441.98	0.2	55.4	0.92
858	1	441.98	0.3	54.7	2.05
859	1	441.98	0.4	54.1	2.63
860	1	441.98	0.5	54.2	4.25
861	1	441.98	0.6	55.4	7.86
862	1	441.98	0.7	57.2	12.45
863	1	441.98	0.8	60.1	19.07
864	1	441.98	0.9	62.7	24.91
865	1	470.37	0.1	57.5	1.19
866	1	470.37	0.2	55.9	2.03
867	1	470.37	0.3	54.8	2.27
868	1	470.37	0.4	54	2.42
869	1	470.37	0.5	54.5	4.88
870	1	470.37	0.6	56	9.10
871	1	470.37	0.7	57.7	13.47
872	1	470.37	0.8	60.7	20.29
873	1	470.37	0.9	63.9	27.32
874	1	498.77	0.1	58	2.35
875	1	498.77	0.2	56.1	2.48
876	1	498.77	0.3	54.8	2.27
877	1	498.77	0.4	53.8	1.99
878	1	498.77	0.5	54.8	5.51
879	1	498.77	0.6	56.4	9.92
880	1	498.77	0.7	59.2	16.54
881	1	498.77	0.8	62.1	23.13
882	1	498.77	0.9	65.4	30.34
883	1	527.16	0.1	58.1	2.58
884	1	527.16	0.2	55.6	1.36
885	1	527.16	0.3	54.5	1.62
886	1	527.16	0.4	54.1	2.63
887	1	527.16	0.5	56.1	8.23
888	1	527.16	0.6	57.1	11.37
889	1	527.16	0.7	60.3	18.79
890	1	527.16	0.8	62.5	23.94
891	1	527.16	0.9	66.2	31.95
892	1	555.56	0.1	57.6	1.42
893	1	555.56	0.2	55.6	1.36
894	1	555.56	0.3	54.9	2.48
895	1	555.56	0.4	54.9	4.33
896	1	555.56	0.5	55.6	7.18
897	1	555.56	0.6	57.6	12.40
898	1	555.56	0.7	61.1	20.43

899	1	555.56	0.8	64.4	27.79
900	1	555.56	0.9	67.4	34.37