

APPENDIX B
COMPLETE EXPERIMENTAL RESULTS

TABLE I
TIME COMPARISON BETWEEN TYPICAL IC3, INCREMENTAL IC3, AND FUSEIC3 FOR 1,620 MODELS OF THE OF NASA NEXTGEN AIR TRAFFIC CONTROL SYSTEM AGAINST EACH PROPERTY (TIME IS IN MINUTES). PROPERTIES FOR WHICH TIME < 0.25 ARE NOT SHOWN.

Prop	Typical IC3			Incremental IC3				FuseIC3				
	Time			Time			Speedup	Time			Speedup	
	Overall	Propagate	Block	Overall	Propagate	Block	v/s Typical	Overall	Propagate	Block	v/s Typical	v/s Incremental
φ_1	0.65	0.27	0.36	0.72	0.20	0.27	0.89	0.27	0.00	0.00	2.36	2.64
φ_2	0.74	0.36	0.45	0.52	0.18	0.23	1.42	0.27	0.00	0.00	2.68	1.88
φ_3	0.68	0.31	0.40	0.50	0.16	0.21	1.36	0.27	0.00	0.00	2.53	1.86
φ_5	478.13	55.68	360.83	439.54	50.56	325.30	1.09	267.16	32.10	173.78	1.79	1.65
φ_6	294.33	41.08	205.50	248.52	34.40	166.03	1.18	184.78	27.26	109.85	1.59	1.34
φ_7	95.13	13.19	64.31	73.63	9.92	47.12	1.29	57.32	8.38	33.71	1.66	1.28
φ_8	4.28	0.48	2.55	2.88	0.28	1.52	1.48	1.70	0.13	0.80	2.52	1.70
φ_9	23.27	4.05	16.68	11.97	2.18	8.23	1.94	2.22	0.35	1.06	10.50	5.40
φ_{10}	9.34	1.79	6.52	6.60	1.12	4.21	1.41	0.29	0.00	0.01	31.89	22.54
φ_{11}	7.94	1.33	5.22	5.00	0.67	3.07	1.59	0.25	0.00	0.00	32.09	20.20
φ_{12}	496.33	50.69	372.33	424.66	42.09	312.77	1.17	318.20	32.16	208.10	1.56	1.33
φ_{13}	232.77	27.14	164.50	219.25	26.23	147.36	1.06	168.82	25.28	99.84	1.38	1.30
φ_{14}	90.22	12.45	63.15	67.63	7.82	44.35	1.33	54.99	7.98	32.03	1.64	1.23
φ_{15}	301.66	28.20	223.84	270.87	24.20	196.45	1.11	220.80	21.76	134.59	1.37	1.23
φ_{16}	70.04	8.08	50.56	59.64	6.59	41.98	1.17	47.83	5.68	29.93	1.46	1.25
φ_{17}	12.32	1.39	8.47	9.12	0.86	6.31	1.35	7.50	0.63	4.64	1.64	1.22
φ_{23}	8.25	0.66	5.49	4.70	0.36	2.86	1.76	0.59	0.01	0.05	14.08	8.02
φ_{24}	8.33	1.00	5.52	4.84	0.58	3.03	1.72	0.67	0.01	0.05	12.47	7.25
φ_{25}	8.57	0.64	5.66	5.05	0.41	3.07	1.70	0.66	0.01	0.10	13.02	7.67
φ_{26}	20.75	2.26	14.32	22.94	2.46	15.00	0.90	31.18	4.53	18.43	0.67	0.74
φ_{27}	9.85	1.31	6.58	11.97	1.53	7.50	0.82	16.84	3.42	9.76	0.58	0.71
φ_{28}	5.54	0.51	2.95	5.52	0.38	3.31	1.00	4.80	0.36	3.06	1.15	1.15
φ_{30}	68.95	10.39	50.16	59.22	7.86	41.21	1.16	58.23	8.62	33.40	1.18	1.02
φ_{31}	8.25	0.86	5.51	4.17	0.35	2.71	1.98	3.15	0.22	1.94	2.61	1.32
φ_{32}	194.27	20.98	140.69	173.75	18.97	123.63	1.12	189.15	23.92	94.30	1.03	0.92
φ_{33}	46.75	6.39	33.92	42.69	6.01	25.34	1.10	42.52	5.44	29.86	1.10	1.00
φ_{34}	5.37	0.62	3.58	4.66	0.45	3.00	1.15	3.07	0.24	1.71	1.75	1.52
	2502.70			2180.57			1.29	1683.53			1.75	1.34
	(total)			(total)			(median)	(total)			(median)	(median)

TABLE II
COMPARISON BETWEEN TYPICAL IC3, INCREMENTAL IC3, AND FUSEIC3 FOR AIR6110 WHEEL BRAKING SYSTEM (TIME IS IN MINUTES).

Model	Typical IC3			Incremental IC3				FuseIC3				
	Time			Time			Speedup	Time			Speedup	
	Overall	Propagate	Block	Overall	Propagate	Block	v/s Typical	Overall	Propagate	Block	v/s Typical	v/s Incremental
M_1	4.36	0.38	1.48	5.02	0.43	1.93	0.87	3.72	0.60	1.10	1.17	1.35
M_2	15.78	1.44	4.92	16.65	1.49	5.92	0.95	14.80	2.47	3.74	1.07	1.13
M_3	12.43	1.22	3.93	13.48	1.28	4.91	0.92	11.24	1.87	3.15	1.11	1.20
M_4	12.45	1.20	3.92	13.66	1.34	4.99	0.91	11.09	1.90	3.00	1.12	1.23
M_5	15.92	1.49	4.97	17.04	1.51	5.99	0.93	14.71	2.51	3.73	1.08	1.16
M_6	16.85	1.55	5.27	17.79	1.56	6.28	0.95	17.04	2.68	4.24	0.99	1.04
M_7	12.95	1.23	4.06	13.67	1.21	4.90	0.95	12.12	2.01	3.26	1.07	1.13
	90.73			97.31			0.95	84.72			1.11	1.20
	(total)			(total)			(median)	(total)			(median)	(median)

TABLE III: TIME COMPARISON BETWEEN TYPICAL IC3, INCREMENTAL IC3, AND FUSEIC3 FOR 110 MUTATED BENCHMARK MODEL-SETS FROM HWMCC 2015 (TIME IS IN MINUTES)

Model	Typical IC3			Incremental IC3				FuseIC3				
	Time			Time			Speedup	Time			Speedup	
	Overall	Propagate	Block	Overall	Propagate	Block	v/s Typical	Overall	Propagate	Block	v/s Typical	v/s Incremental
139442p0	1.36	0.29	0.87	0.72	0.14	0.45	1.89	0.03	0.00	0.00	46.20	24.43
139443p0	2.59	0.62	1.68	1.31	0.31	0.83	1.98	0.14	0.02	0.06	18.73	9.47
139444p0	3.92	0.95	2.56	2.15	0.51	1.35	1.82	0.44	0.04	0.23	8.93	4.91
139454p0	7.55	2.01	4.96	4.65	1.14	2.96	1.62	1.05	0.23	0.62	7.19	4.42
139463p0	8.09	2.11	5.38	4.38	1.06	2.81	1.85	2.04	0.44	1.24	3.96	2.15
6s120	0.34	0.02	0.19	0.33	0.02	0.19	1.01	0.31	0.01	0.17	1.08	1.07
beemcycschd3b1	0.33	0.02	0.18	0.35	0.02	0.19	0.96	0.28	0.02	0.15	1.18	1.23
beemelev1f1	7.69	0.47	4.60	8.54	0.56	5.16	0.90	0.82	0.13	0.49	9.42	10.46
beemelev2f1	11.41	0.47	6.38	11.17	0.47	6.21	1.02	11.79	0.43	6.37	0.97	0.95
beemfw3f3	TO	-	-	TO	-	-	-	TO	-	-	-	-
beemlann2f1	10.83	1.42	6.01	58.03	16.84	26.15	0.19	15.68	2.56	7.80	0.69	3.70
beemlmp1r8f1	1.74	0.20	1.09	1.10	0.13	0.68	1.58	0.77	0.08	0.45	2.28	1.44
beemlup1b1	0.14	0.01	0.08	0.15	0.01	0.08	0.95	0.11	0.01	0.06	1.20	1.27
beemmcs6f1	1.58	0.19	0.92	1.47	0.19	0.88	1.07	2.62	0.19	1.31	0.60	0.56
beemmsmie1f1	0.57	0.07	0.37	0.92	0.07	0.63	0.61	0.28	0.04	0.16	2.03	3.32
beemtlphn4f1	7.34	0.51	4.84	7.53	0.51	4.91	0.97	5.60	0.41	3.53	1.31	1.35
bj08amba2g3f3	0.82	0.06	0.55	0.83	0.06	0.56	0.99	0.51	0.03	0.32	1.63	1.64
bjrb07ambal andenv	1.38	0.12	0.88	0.91	0.08	0.58	1.51	0.69	0.05	0.43	1.99	1.31
bob2	0.80	0.06	0.53	0.77	0.05	0.51	1.04	0.38	0.03	0.23	2.09	2.02
bob3	36.54	3.61	22.62	34.77	3.44	21.18	1.05	16.38	1.63	9.82	2.23	2.12
bobcohdoptdcd4	8.91	0.38	5.80	8.99	0.37	5.86	0.99	5.61	0.19	3.23	1.59	1.60
boblivea	TO	-	-	TO	-	-	-	68.08	16.33	44.91	-	-
boblivear	TO	-	-	TO	-	-	-	93.35	29.91	54.16	-	-
bobmiterbm1and	0.02	0.00	0.00	0.02	0.00	0.00	1.00	0.02	0.00	0.00	1.00	1.00
bobsmdct	15.11	4.70	10.55	15.17	4.75	10.57	1.00	5.29	0.59	3.27	2.86	2.87
bobsynth09neg	TO	-	-	TO	-	-	-	TO	-	-	-	-
bobsynthetic2	6.93	0.83	4.87	7.05	0.70	4.66	0.98	2.17	0.23	1.04	3.19	3.25
bobtuint08neg	25.72	2.35	15.14	23.04	2.08	13.53	1.12	14.15	0.75	7.64	1.82	1.63
bobtuint09neg	TO	-	-	107.42	11.30	60.86	-	74.46	8.28	41.57	-	1.44
bobtuint12neg	19.57	1.16	11.32	21.98	1.16	11.43	0.89	19.86	0.90	10.86	0.99	1.11
bobtuint16neg	18.52	2.38	11.91	16.65	1.71	10.33	1.11	8.40	0.91	5.20	2.21	1.98
bobtuint17neg	73.76	6.94	40.37	57.08	5.73	32.66	1.29	18.25	2.18	10.40	4.04	3.13
bobtuint18neg	19.52	2.01	11.92	13.77	1.32	8.35	1.42	7.27	0.80	4.49	2.68	1.89
bobtuint19neg	94.98	7.53	46.68	85.19	6.41	41.26	1.11	35.11	4.57	19.19	2.71	2.43
bobtuint20neg	30.38	2.53	17.70	25.30	1.75	12.43	1.20	27.13	1.75	12.51	1.12	0.93
bobtuint21neg	31.90	4.71	19.89	25.90	3.73	15.78	1.23	21.57	2.91	12.54	1.48	1.20
bobtuint22neg	27.78	3.25	17.10	23.94	2.55	14.13	1.16	13.69	1.55	7.95	2.03	1.75
bobtuint26neg	38.09	3.74	22.86	35.29	2.71	20.63	1.08	17.94	2.19	10.65	2.12	1.97
bobtuintand	0.05	0.01	0.02	0.03	0.00	0.01	1.38	0.02	0.00	0.00	2.41	1.74
bobtuintorneg	0.05	0.01	0.02	0.03	0.00	0.01	1.39	0.02	0.00	0.00	2.39	1.72
bobuns2p10d100l	49.27	2.38	37.00	61.99	2.53	45.38	0.79	57.14	2.12	40.29	0.86	1.08
cmugigamax	0.16	0.02	0.11	0.18	0.03	0.12	0.90	0.10	0.01	0.06	1.67	1.87
eijks208c	6.38	3.50	5.10	6.52	3.52	5.21	0.98	2.66	1.42	2.12	2.40	2.46
eijks208o	13.49	6.73	10.85	13.64	6.77	10.95	0.99	11.68	6.36	9.49	1.16	1.17
eijks298	0.38	0.04	0.22	0.38	0.04	0.22	1.00	0.27	0.03	0.15	1.42	1.43
eijks510	0.42	0.01	0.21	0.42	0.01	0.21	1.00	0.35	0.01	0.17	1.18	1.18
eijks713	0.36	0.03	0.23	0.36	0.03	0.22	1.00	0.20	0.02	0.11	1.79	1.79
eijks820	0.74	0.00	0.42	0.75	0.00	0.43	0.98	0.56	0.00	0.25	1.32	1.35
eijks832	0.80	0.01	0.46	0.81	0.01	0.46	0.99	0.53	0.00	0.23	1.52	1.53
irstdme5	TO	-	-	TO	-	-	-	TO	-	-	-	-
kenflashp01	0.13	0.01	0.08	0.14	0.01	0.08	0.98	0.11	0.01	0.06	1.19	1.21
kenflashp04	0.05	0.00	0.02	0.04	0.00	0.02	1.09	0.03	0.00	0.01	1.34	1.23
kenflashp11	0.40	0.03	0.21	0.43	0.03	0.23	0.93	0.41	0.03	0.20	0.97	1.04
kenflashp13	0.01	0.00	0.00	0.01	0.00	0.00	1.00	0.01	0.00	0.00	1.00	1.00
kenoopp1	0.05	0.00	0.03	0.05	0.00	0.03	1.13	0.04	0.00	0.02	1.23	1.09
mentorbm1p01	TO	-	-	TO	-	-	-	TO	-	-	-	-
mentorbm1p09	TO	-	-	TO	-	-	-	TO	-	-	-	-
ndistal28	3.25	0.44	2.50	2.69	0.35	2.08	1.21	1.34	0.17	1.02	2.42	2.01
neclafp4001	1.51	0.26	0.94	1.70	0.31	1.07	0.89	0.67	0.11	0.36	2.26	2.55
nusmvguidancep6	1.38	0.14	1.06	1.07	0.08	0.80	1.28	0.22	0.02	0.13	6.33	4.93
nusmvguidancep8	1.04	0.12	0.76	0.94	0.12	0.68	1.10	0.50	0.05	0.32	2.08	1.89
nusmvreactorp1	0.01	0.00	0.00	0.01	0.00	0.00	1.01	0.01	0.00	0.00	1.01	1.00
nusmvreactorp4	1.44	0.12	1.03	3.27	0.38	2.22	0.44	0.74	0.06	0.49	1.95	4.44
nusmvreactorp5	0.81	0.08	0.59	0.84	0.06	0.58	0.96	1.55	0.36	1.12	0.52	0.54
nusmvsyncarb10p2	1.27	0.22	0.89	0.70	0.14	0.49	1.82	0.03	0.00	0.02	40.99	22.58
nusmvtcasp2	7.67	0.96	5.29	12.05	1.26	7.31	0.64	4.73	0.53	3.11	1.62	2.55
pdtpsblackjack	TO	-	-	TO	-	-	-	TO	-	-	-	-
pdtswsam6x8p1	41.02	4.75	27.26	39.46	4.56	26.05	1.04	9.94	1.34	6.40	4.13	3.97
pdtswvtma6x4p1	3.08	0.24	2.10	2.50	0.27	1.72	1.23	1.11	0.11	0.72	2.78	2.26
pdtvisblackjack1	TO	-	-	TO	-	-	-	TO	-	-	-	-
pdtvisblackjack2	TO	-	-	TO	-	-	-	TO	-	-	-	-
pdtviscoherence4	7.83	1.02	5.42	7.82	1.06	5.46	1.00	5.51	0.61	3.51	1.42	1.42
pdtvisgigamax3	0.30	0.03	0.19	0.32	0.03	0.21	0.94	0.19	0.02	0.11	1.53	1.64
pdtvisgoodbakery0	TO	-	-	TO	-	-	-	TO	-	-	-	-

pdvvisminmax0	0.18	0.00	0.11	0.18	0.00	0.11	1.00	0.19	0.00	0.11	0.95	0.95
pdvvisminmaxr1	0.29	0.01	0.20	0.29	0.01	0.20	1.00	0.17	0.00	0.10	1.75	1.75
pdvvisns3p02	TO	-	-	TO	-	-	-	TO	-	-	-	-
pdvvisretherrf1	3.06	0.49	2.01	3.31	0.42	2.16	0.92	2.32	0.31	1.50	1.32	1.42
pdvvissoap2	TO	-	-	TO	-	-	-	TO	-	-	-	-
pdvistwoall3	0.17	0.01	0.07	0.17	0.01	0.07	0.98	0.13	0.01	0.05	1.23	1.26
pdvvisvending07	17.73	2.22	12.15	16.22	1.61	11.32	1.09	11.75	1.31	7.22	1.51	1.38
pdvvisvending09	0.01	0.00	0.00	0.01	0.00	0.00	1.07	0.01	0.00	0.00	0.89	0.83
pdvvisvsa16a10	TO	-	-	TO	-	-	-	93.98	3.11	58.49	-	-
pdvvisvsa16a16	0.05	0.00	0.00	0.05	0.00	0.00	0.99	0.05	0.00	0.00	0.98	0.99
pdvvisvsa16a27	57.50	2.67	35.60	56.71	2.55	35.15	1.01	30.44	1.42	18.17	1.89	1.86
pdvvisvsa16a29	92.31	5.11	50.60	91.98	5.07	50.43	1.00	49.74	2.78	26.59	1.86	1.85
pdvvisvsar22	20.81	1.30	13.18	24.61	1.87	15.23	0.85	14.07	1.01	8.91	1.48	1.75
pdvvsar8multip13	TO	-	-	TO	-	-	-	TO	-	-	-	-
pdvvsar8multip16	0.04	0.00	0.00	0.04	0.00	0.00	1.00	0.04	0.00	0.00	1.01	1.01
pdvvsar8multip23	15.98	1.57	10.15	15.97	1.56	10.18	1.00	2.55	0.22	1.57	6.27	6.27
pdvvsarmultip08	7.47	0.49	5.04	7.65	0.49	5.17	0.98	4.85	0.27	3.18	1.54	1.58
pdvvsarmultip13	6.30	0.46	4.17	5.36	0.40	3.56	1.17	4.42	0.26	2.80	1.42	1.21
pdvvsarmultip29	TO	-	-	TO	-	-	-	103.99	10.68	53.58	-	-
pdvvsarmultip30	0.02	0.00	0.00	0.02	0.00	0.00	0.99	0.02	0.00	0.00	0.99	1.00
pj2002	21.61	2.68	11.23	24.17	2.64	12.68	0.89	11.11	1.44	5.63	1.94	2.18
pj2007	17.96	3.30	11.03	16.96	3.06	10.30	1.06	11.68	2.04	6.71	1.54	1.45
power2bit128	1.86	0.31	1.44	2.10	0.35	1.63	0.89	0.96	0.15	0.74	1.94	2.19
power2bit8	0.09	0.02	0.06	0.09	0.02	0.06	1.01	0.05	0.01	0.03	1.75	1.74
power2sum128	6.93	1.24	5.51	7.43	1.31	5.90	0.93	4.38	0.88	3.46	1.58	1.70
power2sum256	34.95	6.03	26.59	36.03	6.80	27.61	0.97	11.14	1.82	8.64	3.14	3.23
power2sum32	1.79	0.40	1.45	1.77	0.38	1.43	1.01	0.92	0.18	0.73	1.93	1.92
shift1add2048	TO	-	-	TO	-	-	-	TO	-	-	-	-
shift1add256	3.66	0.53	2.80	3.04	0.41	2.34	1.20	2.48	0.38	1.89	1.47	1.23
shift1add512	12.49	1.56	9.30	11.86	1.49	8.79	1.05	3.59	0.36	2.74	3.48	3.30
texaspimainp05	TO	-	-	107.05	7.82	50.52	-	TO	-	-	-	-
texaspimainp12	26.30	2.83	15.06	25.68	2.93	14.93	1.02	13.62	1.52	7.64	1.93	1.89
vis4arbitp1	1.43	0.22	0.98	1.50	0.22	1.02	0.95	0.93	0.14	0.62	1.53	1.61
viscoherencep2	5.80	0.56	4.07	4.96	0.46	3.49	1.17	3.01	0.26	1.98	1.93	1.65
viscoherencep3	7.41	1.15	5.19	8.54	1.38	5.89	0.87	3.05	0.23	2.01	2.43	2.80
vislevelatorp3	0.88	0.08	0.60	0.97	0.08	0.67	0.90	0.61	0.04	0.39	1.43	1.59

TABLE IV: TIME COMPARISON BETWEEN TYPICAL IC3, INCREMENTAL IC3, AND FUSEIC3 FOR VARYING LEVELS OF MUTATION PERCENTAGE OF THE BOBUI NT18NEG BENCHMARK FROM HWMCC 2015 (*' INDICATES TIMEOUT, TIME IS IN MINUTES)

%age	Typical IC3			Incremental IC3				FuseIC3				
	Solved	Time		Solved	Time		Adj. Speedup v/s Typical	Solved	Time		Adj. Speedup	
		Overall	Adj.		Overall	Adj.			Overall	Adj.	v/s Typical	v/s Incremental
0.5	100	9.25	9.25	100	11.19	11.19	0.83	100	3.81	3.81	2.43	2.94
1.0	100	6.97	6.97	100	6.09	6.09	1.15	100	2.58	2.58	2.70	2.36
1.5	100	11.70	11.70	100	9.97	9.97	1.17	100	6.85	6.85	1.71	1.46
2.0	100	31.43	31.43	100	39.40	39.40	0.80	100	14.95	14.95	2.10	2.64
2.5	100	32.47	32.47	100	45.34	45.34	0.72	100	14.37	14.37	2.26	3.15
3.0	100	32.14	32.14	100	30.11	30.11	1.07	100	21.73	21.73	1.48	1.39
3.5	100	43.78	43.78	100	53.40	53.40	0.82	100	20.09	20.09	2.18	2.66
4.0	100	49.72	49.72	100	37.52	37.52	1.33	100	26.75	26.75	1.86	1.40
4.5	64	59.35*	59.35	77	59.13*	51.60	1.15	81	54.59*	35.52	1.67	1.45
5.0	90	59.99*	59.99	92	59.99*	57.76	1.04	100	34.56	31.13	1.93	1.86
5.5	86	60.11*	39.49	69	56.73*	56.73	0.70	100	30.28	16.21	2.44	3.50
6.0	49	35.23*	35.23	49	31.62*	31.62	1.11	100	35.54	16.01	2.20	1.98
6.5	96	57.66*	28.66	62	32.10*	32.10	0.89	100	43.49	17.34	1.65	1.85
7.0	73	59.35*	49.68	64	59.72*	59.72	0.83	100	51.67	26.20	1.90	2.28
7.5	53	60.20*	33.24	20	36.46*	36.46	0.91	63	59.92*	21.66	1.53	1.68
8.0	76	53.49*	50.21	73	59.81*	59.81	0.84	80	60.10*	29.51	1.70	2.03
8.5	74	54.80*	52.26	72	59.41*	59.41	0.88	86	59.64*	39.95	1.31	1.49
9.0	76	60.28*	52.75	64	57.92*	57.92	0.91	100	41.73	24.70	2.14	2.34
9.5	57	51.51*	51.51	62	58.07*	53.98	0.95	94	59.80*	27.19	1.89	1.99
10.0	51	58.90*	53.44	46	59.84*	59.84	0.89	88	59.42*	34.43	1.55	1.74
10.5	57	54.60*	36.21	46	40.42*	40.42	0.90	92	54.97*	21.06	1.72	1.92
11.0	33	60.02*	60.02	42	59.86*	47.04	1.28	53	60.02*	39.26	1.53	1.20
11.5	42	59.04*	34.02	23	57.19*	57.19	0.59	54	59.57*	36.02	0.94	1.59
12.0	59	57.89*	49.06	54	57.82*	57.82	0.85	81	59.54*	31.10	1.58	1.86
12.5	74	59.85*	44.81	54	60.27*	60.27	0.74	84	57.00*	30.93	1.45	1.95
13.0	59	60.23*	58.00	55	56.70*	56.70	1.02	100	41.13	20.47	2.83	2.77
13.5	58	60.12*	54.77	50	57.41*	57.41	0.95	74	52.31*	30.04	1.82	1.91
14.0	44	56.31*	55.81	43	59.46*	59.46	0.94	47	59.01*	35.27	1.58	1.69
14.5	51	58.57*	53.35	42	59.41*	59.41	0.90	60	59.30*	49.77	1.07	1.19
15.0	35	43.49*	43.49	35	58.63*	58.63	0.74	67	59.82*	39.94	1.09	1.47
15.5	59	59.80*	35.36	44	51.94*	51.94	0.68	88	59.60*	21.42	1.65	2.42
16.0	37	58.15*	51.47	34	54.88*	54.88	0.94	80	59.62*	18.80	2.74	2.92
16.5	27	59.44*	58.34	23	59.89*	59.89	0.97	44	53.11*	45.20	1.29	1.33
17.0	37	55.16*	53.44	36	59.27*	59.27	0.90	59	51.55*	40.56	1.32	1.46
17.5	34	59.49*	49.40	30	57.07*	57.07	0.87	52	59.38*	31.73	1.56	1.80
18.0	15	60.40*	60.40	21	59.68*	50.90	1.19	16	57.92*	57.56	1.05	0.88
18.5	62	60.36*	40.41	41	48.81*	48.81	0.83	100	44.35	15.22	2.66	3.21
19.0	36	55.68*	31.76	36	50.92*	23.90	1.33	11	45.25*	45.25	0.70	0.53
19.5	31	60.28*	60.21	30	60.11*	60.11	1.00	34	40.42*	33.47	1.80	1.80
20.0	50	53.22*	53.22	50	59.05*	59.05	0.90	61	60.16*	33.54	1.59	1.76
20.5	31	49.64*	49.64	31	50.16*	50.16	0.99	50	34.40*	21.95	2.26	2.29
21.0	37	59.92*	57.54	33	59.49*	59.49	0.97	51	48.04*	41.87	1.37	1.42
21.5	45	53.61*	53.61	48	59.98*	48.37	1.11	84	58.51*	37.63	1.42	1.29
22.0	58	57.35*	50.97	49	59.30*	59.30	0.86	74	47.25*	28.58	1.78	2.07
22.5	41	59.76*	53.28	36	56.69*	56.69	0.94	78	55.79*	16.19	3.29	3.50
23.0	25	48.03*	48.03	25	49.23*	49.23	0.98	58	58.90*	29.31	1.64	1.68
23.5	40	49.79*	49.79	40	54.39*	54.39	0.92	40	34.42*	34.42	1.45	1.58
24.0	17	20.60*	20.60	26	54.42*	18.41	1.12	17	9.49*	9.49	2.17	1.94
24.5	47	59.60*	51.16	40	59.01*	59.01	0.87	83	59.85*	25.58	2.00	2.31
25.0	50	59.55*	51.66	48	59.42*	59.42	0.87	100	46.83	25.07	2.06	2.37
25.5	39	54.35*	51.63	35	59.18*	59.18	0.87	80	50.34*	27.70	1.86	2.14
26.0	42	59.46*	49.48	38	51.43*	51.43	0.96	63	59.10*	33.92	1.46	1.52
26.5	44	58.50*	58.50	44	58.96*	58.96	0.99	82	56.34*	31.36	1.87	1.88
27.0	59	57.38*	57.38	60	60.18*	54.34	1.06	86	59.34*	26.03	2.20	2.09
27.5	43	52.82*	52.82	43	58.05*	58.05	0.91	43	53.23*	53.23	0.99	1.09
28.0	32	59.33*	49.86	29	56.86*	56.86	0.88	100	59.44	17.42	2.86	3.26
28.5	57	58.36*	49.67	44	59.59*	59.59	0.83	82	55.41*	28.86	1.72	2.06
29.0	41	60.40*	60.40	43	59.56*	59.10	1.02	86	55.88*	30.53	1.98	1.94
29.5	23	54.41*	54.41	23	58.51*	58.51	0.93	24	59.43*	45.16	1.20	1.30
30.0	28	59.14*	59.14	28	58.48*	58.48	1.01	35	60.12*	36.99	1.60	1.58
30.5	47	59.17*	56.46	45	58.79*	58.79	0.96	82	58.80*	35.38	1.60	1.66
31.0	37	59.40*	49.26	27	49.74*	49.74	0.99	80	58.21*	11.45	4.30	4.34
31.5	44	59.88*	38.30	41	42.26*	42.26	0.91	93	58.98*	22.49	1.70	1.88
32.0	29	51.28*	51.28	29	57.31*	57.31	0.89	64	60.06*	35.68	1.44	1.61
32.5	42	59.98*	59.98	42	59.18*	59.18	1.01	96	56.90*	15.95	3.76	3.71
33.0	46	59.83*	58.77	44	59.02*	59.02	1.00	94	53.83*	22.22	2.64	2.66
33.5	11	45.91*	45.91	13	53.47*	46.18	0.99	52	60.27*	3.58	12.82	12.89
34.0	36	35.94*	35.94	36	41.99*	41.99	0.86	37	57.53*	20.55	1.75	2.04
34.5	35	57.43*	57.43	35	56.30*	56.30	1.02	54	58.80*	47.44	1.21	1.19
35.0	44	58.65*	58.65	44	59.03*	59.03	0.99	62	60.17*	33.91	1.73	1.74
35.5	49	58.94*	58.94	49	59.10*	59.10	1.00	65	56.98*	37.10	1.59	1.59
36.0	28	57.85*	48.34	23	57.86*	57.86	0.84	44	55.83*	41.70	1.16	1.39

36.5	18	37.03*	37.03	18	31.27*	31.27	1.18	64	59.70*	20.73	1.79	1.51
37.0	46	59.62*	56.68	45	59.15*	59.15	0.96	66	60.06*	26.84	2.11	2.20
37.5	21	55.48*	55.48	29	60.23*	52.50	1.06	45	56.97*	39.81	1.39	1.32
38.0	23	57.76*	3.51	8	25.14*	25.14	0.14	32	58.80*	1.97	1.78	12.74
38.5	37	59.98*	59.98	40	59.79*	54.22	1.11	60	59.62*	43.32	1.38	1.25
39.0	28	59.94*	36.86	15	55.40*	55.40	0.67	42	59.85*	29.85	1.23	1.86
39.5	25	59.57*	59.57	25	58.61*	58.61	1.02	60	27.37*	11.22	5.31	5.22
40.0	30	58.52*	56.65	29	59.76*	59.76	0.95	30	38.33*	38.21	1.48	1.56
40.5	41	60.10*	53.87	37	57.83*	57.83	0.93	65	58.80*	31.20	1.73	1.85
41.0	38	58.65*	52.73	36	58.69*	58.69	0.90	62	50.72*	31.13	1.69	1.89
41.5	40	58.17*	48.91	29	58.35*	58.35	0.84	52	59.94*	35.50	1.38	1.64
42.0	42	58.63*	58.63	42	58.65*	58.65	1.00	76	59.44*	14.68	3.99	4.00
42.5	18	59.52*	59.52	27	59.99*	51.09	1.17	78	58.98*	16.41	3.63	3.11
43.0	32	59.75*	52.18	29	55.16*	55.16	0.95	84	50.99*	27.25	1.92	2.02
43.5	30	54.85*	54.85	30	52.21*	52.21	1.05	46	59.81*	32.90	1.67	1.59
44.0	41	53.04*	53.04	41	53.62*	53.62	0.99	68	58.23*	39.06	1.36	1.37
44.5	44	58.90*	54.85	40	59.68*	59.68	0.92	72	56.30*	20.05	2.74	2.98
45.0	23	52.03*	44.67	22	54.81*	54.81	0.82	28	56.70*	43.89	1.02	1.25
45.5	35	59.65*	51.24	31	59.42*	59.42	0.86	52	56.92*	35.43	1.45	1.68
46.0	42	59.95*	55.69	37	59.86*	59.86	0.93	100	55.17	21.84	2.55	2.74
46.5	34	58.29*	58.29	34	57.94*	57.94	1.01	73	58.17*	18.31	3.18	3.16
47.0	39	59.00*	54.03	37	56.43*	56.43	0.96	88	55.65*	28.86	1.87	1.96
47.5	37	59.55*	58.86	36	59.93*	59.93	0.98	94	59.81*	25.89	2.27	2.32
48.0	28	59.17*	59.17	28	60.00*	60.00	0.99	86	59.53*	22.99	2.57	2.61
48.5	26	59.45*	49.07	20	53.83*	53.83	0.91	68	42.52*	6.43	7.63	8.37
49.0	36	54.48*	54.48	36	54.88*	54.88	0.99	49	59.94*	22.32	2.44	2.46
49.5	47	57.63*	53.08	41	59.86*	59.86	0.89	68	52.82*	32.65	1.63	1.83
50.0	28	51.48*	51.48	28	49.45*	49.45	1.04	46	59.13*	33.20	1.55	1.49