Supplementary File for Paper: Two-stage Robust Optimizer for Multi-product Multi-process Resource Allocation in Steel Production Systems

This supplementary presents a comprehensive experimental comparison, detailing the generation of instances and the performance of our algorithm across a spectrum of instances with different scales, under various uncertainty levels.

Table 5 shows the generated range of instance parameters. The nominal customer demand for each product type is randomly generated based on the total machine capacity of an SCC process. The tightness between them is adjusted by a factor τ. Furthermore, a minimum batch size criterion is established, stipulating that the batch size to initiate processing on any machine must be at least 20% of the machine's capacity. This rule ensures a balance between production efficiency and operational feasibility. The remaining parameters for each instance are stochastically determined within predefined intervals, as detailed in Table 5.

Table 5: Generation of Instances

Production process	$S = 3$
Machine capacity	$C_i \in [6000,\ 8000]$
Minimum batch size	$\check{L}_{ir} = 20\% C_i$
Initial inventory quantity	$I^0_{jp} \in [10,\ 20]$
Maximum inventory capacity	$\hat{I}_j \in [1000,\ 3000]$
Transportation cost	$c_{ijp} \in [1,\ 10]$
Fixed activation cost	$f_{ij} \in [100,\ 200]$
Shortage cost	$\delta_k \in [100,\ 200]$
Inventory cost	$\mu_k \in [1,\ 10]$
Tightness factor	$\tau = 1.0$
Normal customer demand	$\sum_{k=1}^{K} \bar{d}_k = \tau \sum_{i=1}^{\lvert\mathbb{M}^1\rvert} C_i$
Demand disturbance parameter	$\varepsilon = 10\%$
Normal production yield rate	$\bar{r}_p \in [0.95,\ 0.99]$
Maximum production yield rate deviation	$\hat{r}_p \in [0.01,\ 0.05]$

Table 6 provides a summary result comparison for a condition of $K = 20$, $|\mathbb{M}^s| = 3$, and $P = 39$. All of instances in the table can be optimally solved by CG and OA-CG. Therefore, $^{\#}$Ins is 20 for each demand disturbance parameter in a group. Tables 7-12 show experimental comparison results for small-scale instances with $K = 15$ and $K = 20$, under varying demand disturbance parameters and uncertainty levels, respectively. The instances can be optimally solved by using both CG and OA-CG. OA-CG demonstrates superior performance in terms of total computation time for the majority of instances. These results substantiate the high efficiency of our proposed algorithm in solving the problem at hand.

Table 6: SUMMARY RESULT COMPARISON WHEN $|\mathbb{M}^s| = 3$, $K = 20$, AND $P = 39$

Γ_D	Γ_R	ε	CG				OA-CG				$\bar{\mathcal{P}}_T$
			#Ins	Time (s)			#Ins	Time (s)			
				Min^C	Max^C	Avg^C		Min	Max	Avg	
4	10	5%	20	1.00	83.71	16.25	20	0.82	20.56	5.42	**55.44%**
		6%	20	0.92	94.41	15.74	20	1.08	35.25	6.38	**44.34%**
		7%	20	0.63	78.97	12.44	20	0.98	16.30	4.98	**34.64%**
		8%	20	0.67	46.51	10.45	20	0.86	30.27	5.80	**31.32%**
		9%	20	0.66	88.97	13.91	20	0.83	25.43	5.96	**35.75%**
		10%	20	0.61	103.45	12.97	20	0.95	29.14	5.86	**27.85%**
6	15	5%	20	3.23	58.39	17.80	20	1.52	15.65	5.70	**58.01%**
		6%	20	2.89	64.70	16.52	20	1.44	14.72	4.93	**59.43%**
		7%	20	1.50	60.10	16.53	20	1.45	14.83	5.35	**53.92%**
		8%	20	1.42	44.26	12.93	20	1.30	11.94	5.39	**41.77%**
		9%	20	1.83	40.12	11.73	20	1.39	20.91	5.30	**40.19%**
		10%	20	1.73	32.23	9.27	20	1.33	20.47	5.74	**24.50%**
8	20	5%	20	2.01	34.14	9.58	20	1.87	16.10	4.72	**40.45%**
		6%	20	1.30	27.72	8.95	20	1.44	15.36	4.94	**39.02%**
		7%	20	1.09	30.25	8.90	20	1.39	14.12	4.42	**40.59%**
		8%	20	1.28	25.88	7.56	20	1.29	19.98	4.69	**30.23%**
		9%	20	1.14	22.19	7.40	20	1.33	11.86	4.40	**28.77%**
		10%	20	1.02	23.69	7.30	20	1.20	12.72	4.38	**17.58%**

Table 13 gives a comparative analysis of the experimental results for large-scale instances with $|\mathbb{M}^s| = 4$ under different levels of uncertainty. CG yields suboptimal solutions for many instances, whereas OA-CG successfully identifies optimal solutions for most of them. The great improvement in solving efficiency, as evidenced by the reduced computational time, suggests OA-CG's high robustness and suitability for potential real-world industrial applications.

Table 7: Comparison Results When $|\mathbb{M}^s| = 3$, $K = 15$, $\Gamma_D = 4$, and $\Gamma_R = 10$

ε	Instance	CG					OA-CG					$\mathcal{P}_T$
		L^C	U^C	G^C	Time (s)		L	U	G	Time (s)		
					RP	Total				RP	Total	
5%	1	**496489.74**	**496489.74**	**0.00%**	20.75	30.89	**496489.74**	**496489.74**	**0.00%**	3.31	9.20	**70.22%**
	2	**549217.66**	**549217.66**	**0.00%**	24.56	29.56	**549217.66**	**549217.66**	**0.00%**	3.69	13.77	**53.43%**
	3	**588608.44**	**588608.44**	**0.00%**	36.07	67.82	**588608.44**	**588608.44**	**0.00%**	4.92	35.99	**46.94%**
	4	**560747.32**	**560747.32**	**0.00%**	253.27	408.36	**560747.32**	**560747.32**	**0.00%**	62.58	258.71	**36.65%**
	5	**842388.85**	**842388.85**	**0.00%**	28.05	29.98	**842388.85**	**842388.85**	**0.00%**	8.27	11.67	**61.06%**
	6	**546418.02**	**546418.02**	**0.00%**	4.59	5.09	**546418.02**	**546418.02**	**0.00%**	3.16	3.75	**26.33%**
	7	**566704.22**	**566704.22**	**0.00%**	11.47	18.08	**566704.22**	**566704.22**	**0.00%**	2.83	9.44	**47.80%**
	8	**960120.11**	**960120.11**	**0.00%**	6.14	7.83	**960120.11**	**960120.11**	**0.00%**	2.45	4.37	**44.15%**
	9	**501193.63**	**501193.63**	**0.00%**	12.44	18.61	**501193.63**	**501193.63**	**0.00%**	2.65	11.83	**36.42%**
	10	**501441.35**	**501441.35**	**0.00%**	24.07	44.05	**501441.35**	**501441.35**	**0.00%**	3.62	28.29	**35.77%**
	11	**779895.83**	**779895.83**	**0.00%**	15.31	17.38	**779895.83**	**779895.83**	**0.00%**	4.98	11.05	**36.43%**
	12	**710819.10**	**710819.92**	**0.00%**	6.66	8.16	**710819.12**	**710819.12**	**0.00%**	2.47	4.34	**46.76%**
	13	**615560.72**	**615560.72**	**0.00%**	5.63	6.50	**615560.72**	**615560.72**	**0.00%**	2.66	3.67	**43.48%**
	14	**557237.81**	**557237.81**	**0.00%**	9.44	10.74	**557237.81**	**557237.81**	**0.00%**	4.83	6.42	**40.21%**
	15	**1008934.05**	**1008934.05**	**0.00%**	1.52	1.78	**1008934.05**	**1008934.05**	**0.00%**	2.16	2.42	-35.78%
	16	**564437.04**	**564437.04**	**0.00%**	14.20	22.11	**564437.04**	**564437.04**	**0.00%**	3.86	13.66	**38.24%**
	17	**862551.02**	**862551.02**	**0.00%**	3.94	5.69	**862551.02**	**862551.02**	**0.00%**	2.58	4.77	**16.16%**
	18	**609537.72**	**609537.72**	**0.00%**	2.55	2.95	**609537.72**	**609537.72**	**0.00%**	2.12	3.19	-7.89%
	19	**634555.16**	**634555.16**	**0.00%**	9.16	11.28	**634555.16**	**634555.16**	**0.00%**	4.29	6.24	**44.70%**
	20	**715173.08**	**715173.08**	**0.00%**	11.33	20.36	**715173.08**	**715173.08**	**0.00%**	3.81	20.24	**0.60%**
6%	1	**513855.16**	**513855.16**	**0.00%**	18.21	22.55	**513855.16**	**513855.16**	**0.00%**	3.53	8.00	**64.52%**
	2	**568858.32**	**568858.32**	**0.00%**	23.87	28.66	**568858.32**	**568858.32**	**0.00%**	3.73	12.73	**55.57%**
	3	**605117.40**	**605117.40**	**0.00%**	39.67	68.91	**605117.40**	**605117.40**	**0.00%**	5.30	25.73	**62.65%**
	4	**572152.96**	**572152.96**	**0.00%**	189.59	241.11	**572152.96**	**572152.96**	**0.00%**	44.13	159.95	**33.66%**
	5	**871551.99**	**871551.99**	**0.00%**	18.08	20.63	**871551.99**	**871551.99**	**0.00%**	6.95	8.84	**57.17%**
	6	**568299.10**	**568299.10**	**0.00%**	5.59	6.27	**568299.10**	**568299.10**	**0.00%**	3.02	3.56	**43.14%**
	7	**588101.57**	**588101.57**	**0.00%**	12.16	19.63	**588101.57**	**588101.57**	**0.00%**	2.89	9.83	**49.93%**
	8	**988357.03**	**988357.03**	**0.00%**	10.28	14.11	**988357.03**	**988357.03**	**0.00%**	2.89	7.11	**49.62%**
	9	**515133.19**	**515133.19**	**0.00%**	13.73	21.22	**515133.19**	**515133.19**	**0.00%**	2.45	10.19	**52.00%**
	10	**525384.34**	**525384.34**	**0.00%**	21.66	43.81	**525384.34**	**525384.34**	**0.00%**	4.52	36.32	**17.11%**
	11	**813413.34**	**813413.34**	**0.00%**	15.88	18.27	**813413.34**	**813413.34**	**0.00%**	4.55	7.60	**58.41%**
	12	**732595.82**	**732595.82**	**0.00%**	5.28	6.21	**732595.82**	**732595.82**	**0.00%**	2.55	3.64	**41.34%**
	13	**636642.56**	**636642.56**	**0.00%**	6.61	7.38	**636642.56**	**636642.56**	**0.00%**	3.42	4.41	**40.27%**
	14	**577337.57**	**577337.57**	**0.00%**	10.83	12.77	**577337.57**	**577337.57**	**0.00%**	3.32	5.04	**60.56%**
	15	**1052815.65**	**1052815.65**	**0.00%**	1.48	1.70	**1052815.65**	**1052815.65**	**0.00%**	1.75	1.97	-15.62%
	16	**584090.29**	**584090.29**	**0.00%**	15.36	22.95	**584090.29**	**584090.29**	**0.00%**	5.78	15.86	**30.90%**
	17	**889975.66**	**889975.66**	**0.00%**	3.86	5.83	**889975.66**	**889975.66**	**0.00%**	3.19	5.78	**0.82%**
	18	**642794.60**	**642794.60**	**0.00%**	3.22	3.63	**642794.60**	**642794.60**	**0.00%**	2.30	2.81	**22.48%**
	19	**656528.10**	**656528.10**	**0.00%**	8.77	10.75	**656528.10**	**656528.10**	**0.00%**	4.78	8.37	**22.10%**
	20	**735368.78**	**735368.78**	**0.00%**	11.67	22.28	**735368.78**	**735368.78**	**0.00%**	4.10	16.57	**25.66%**
7%	1	**531226.37**	**531226.37**	**0.00%**	19.92	24.95	**531226.37**	**531226.37**	**0.00%**	3.77	13.53	**45.76%**
	2	**588498.98**	**588498.98**	**0.00%**	26.25	30.61	**588498.98**	**588498.98**	**0.00%**	3.36	11.44	**62.63%**
	3	**621670.75**	**621670.75**	**0.00%**	50.25	109.77	**621628.43**	**621670.75**	**0.00%**	6.41	56.76	**48.29%**
	4	**585424.03**	**585424.03**	**0.00%**	177.92	233.89	**585424.03**	**585424.03**	**0.00%**	141.33	219.50	**6.15%**
	5	**900715.14**	**900715.14**	**0.00%**	16.42	18.45	**900715.14**	**900715.14**	**0.00%**	11.12	14.06	**23.79%**
	6	**590180.18**	**590180.18**	**0.00%**	4.89	5.47	**590180.18**	**590180.18**	**0.00%**	3.56	4.33	**20.91%**
	7	**609498.92**	**609498.92**	**0.00%**	10.19	15.73	**609498.92**	**609498.92**	**0.00%**	2.79	9.99	**36.50%**
	8	**1016593.94**	**1016593.94**	**0.00%**	9.42	13.41	**1016593.94**	**1016593.94**	**0.00%**	2.71	6.46	**51.80%**
	9	**529129.73**	**529129.73**	**0.00%**	12.03	19.08	**529129.73**	**529129.73**	**0.00%**	2.30	10.28	**46.09%**
	10	**549754.64**	**549754.64**	**0.00%**	14.64	32.53	**549754.64**	**549754.64**	**0.00%**	3.57	23.03	**29.19%**
	11	**846078.82**	**846078.82**	**0.00%**	11.92	14.45	**846078.82**	**846078.82**	**0.00%**	5.53	8.36	**42.18%**
	12	**754372.52**	**754372.52**	**0.00%**	4.69	5.48	**754372.52**	**754372.52**	**0.00%**	2.45	3.20	**41.62%**
	13	**657724.41**	**657724.41**	**0.00%**	5.37	6.08	**657724.41**	**657724.41**	**0.00%**	2.54	3.24	**46.62%**

	14	**596829.81**	**596829.81**	**0.00%**	9.23	10.50	**596829.81**	**596829.81**	**0.00%**	3.16	4.39	**58.16%**
	15	**1097255.86**	**1097255.86**	**0.00%**	0.95	1.20	**1097255.86**	**1097255.86**	**0.00%**	1.39	1.66	-37.77%
	16	**603743.55**	**603743.55**	**0.00%**	12.70	19.49	**603743.55**	**603743.55**	**0.00%**	3.85	12.55	**35.58%**
	17	**917400.30**	**917400.30**	**0.00%**	3.59	5.27	**917400.30**	**917400.30**	**0.00%**	2.33	4.14	**21.39%**
	18	**676051.47**	**676051.47**	**0.00%**	2.14	2.52	**676051.47**	**676051.47**	**0.00%**	2.09	2.50	**0.72%**
	19	**678502.16**	**678502.16**	**0.00%**	7.39	9.26	**678502.16**	**678502.16**	**0.00%**	2.85	5.08	**45.14%**
	20	**761823.06**	**761823.06**	**0.00%**	9.56	15.50	**761823.06**	**761823.06**	**0.00%**	2.75	9.75	**37.07%**
8%	1	**548694.86**	**548694.86**	**0.00%**	23.80	31.22	**548694.86**	**548694.86**	**0.00%**	4.31	15.43	**50.59%**
	2	**608139.64**	**608139.64**	**0.00%**	26.14	31.52	**608139.64**	**608139.64**	**0.00%**	3.81	10.99	**65.14%**
	3	**642230.49**	**642230.49**	**0.00%**	47.36	85.43	**642230.49**	**642230.49**	**0.00%**	5.77	56.34	**34.04%**
	4	**611662.31**	**611662.31**	**0.00%**	85.28	163.47	**611662.31**	**611662.31**	**0.00%**	9.57	96.45	**41.00%**
	5	**930777.43**	**930777.43**	**0.00%**	11.64	12.50	**930777.43**	**930777.43**	**0.00%**	5.54	8.30	**33.60%**
	6	**612151.38**	**612151.38**	**0.00%**	8.47	9.91	**612151.38**	**612151.38**	**0.00%**	2.49	3.44	**65.28%**
	7	**630896.28**	**630896.28**	**0.00%**	9.28	14.33	**630896.28**	**630896.28**	**0.00%**	2.64	8.30	**42.09%**
	8	**1045108.49**	**1045108.49**	**0.00%**	8.77	12.27	**1045108.49**	**1045108.49**	**0.00%**	2.62	6.57	**46.46%**
	9	**543126.26**	**543126.26**	**0.00%**	12.02	19.12	**543126.26**	**543126.26**	**0.00%**	2.44	10.28	**46.25%**
	10	**576018.41**	**576018.41**	**0.00%**	14.28	35.29	**576018.41**	**576018.41**	**0.00%**	3.14	20.83	**40.97%**
	11	**880248.54**	**880248.54**	**0.00%**	9.45	11.80	**880248.54**	**880248.54**	**0.00%**	4.20	6.97	**40.90%**
	12	**776149.21**	**776149.21**	**0.00%**	3.92	4.63	**776149.21**	**776149.21**	**0.00%**	1.84	2.73	**40.97%**
	13	**678806.25**	**678806.25**	**0.00%**	5.09	5.69	**678806.25**	**678806.25**	**0.00%**	2.89	3.55	**37.63%**
	14	**615887.94**	**615887.94**	**0.00%**	7.63	8.83	**615887.94**	**615887.94**	**0.00%**	3.09	4.23	**52.09%**
	15	**1141696.07**	**1141696.07**	**0.00%**	3.41	4.20	**1141696.07**	**1141696.07**	**0.00%**	1.69	2.69	**36.11%**
	16	**623626.14**	**623626.14**	**0.00%**	10.02	14.31	**623626.14**	**623626.14**	**0.00%**	3.31	8.28	**42.11%**
	17	**944824.94**	**944824.94**	**0.00%**	3.33	4.64	**944824.94**	**944824.94**	**0.00%**	2.09	3.81	**17.94%**
	18	**709308.35**	**709308.35**	**0.00%**	4.59	5.55	**709308.35**	**709308.35**	**0.00%**	2.42	3.58	**35.49%**
	19	**700478.08**	**700478.08**	**0.00%**	7.19	8.84	**700478.08**	**700478.08**	**0.00%**	2.88	4.69	**46.97%**
	20	**789065.10**	**789065.10**	**0.00%**	8.86	14.54	**789065.10**	**789065.10**	**0.00%**	2.92	10.34	**28.89%**
9%	1	**566231.93**	**566231.93**	**0.00%**	21.56	25.89	**566231.93**	**566231.93**	**0.00%**	4.28	10.39	**59.88%**
	2	**627783.27**	**627783.27**	**0.00%**	18.58	22.47	**627783.27**	**627783.27**	**0.00%**	3.35	11.44	**49.08%**
	3	**662831.93**	**662831.93**	**0.00%**	32.22	70.00	**662831.93**	**662831.93**	**0.00%**	4.83	55.93	**20.10%**
	4	**638456.10**	**638456.10**	**0.00%**	73.05	138.03	**638456.10**	**638456.10**	**0.00%**	6.81	77.36	**43.96%**
	5	**960932.70**	**960932.70**	**0.00%**	10.05	11.05	**960932.70**	**960932.70**	**0.00%**	4.61	6.33	**42.70%**
	6	**634949.24**	**634949.24**	**0.00%**	11.31	14.28	**634949.24**	**634949.24**	**0.00%**	2.36	3.31	**76.80%**
	7	**652294.41**	**652294.41**	**0.00%**	6.97	10.33	**652294.41**	**652294.41**	**0.00%**	2.67	6.29	**39.08%**
	8	**1073741.66**	**1073741.66**	**0.00%**	8.39	11.58	**1073741.66**	**1073741.66**	**0.00%**	2.52	5.89	**49.11%**
	9	**557122.79**	**557122.79**	**0.00%**	10.97	17.55	**557122.79**	**557122.79**	**0.00%**	2.36	8.59	**51.03%**
	10	**602282.19**	**602282.19**	**0.00%**	18.01	47.53	**602282.19**	**602282.19**	**0.00%**	3.81	32.25	**32.15%**
	11	**914647.67**	**914647.67**	**0.00%**	8.73	10.80	**914647.67**	**914647.67**	**0.00%**	3.23	5.69	**47.32%**
	12	**797925.91**	**797925.91**	**0.00%**	4.28	5.06	**797925.91**	**797925.91**	**0.00%**	1.97	2.72	**46.30%**
	13	**699888.09**	**699888.09**	**0.00%**	4.77	5.39	**699888.09**	**699888.09**	**0.00%**	2.69	3.31	**38.58%**
	14	**634946.07**	**634946.07**	**0.00%**	7.92	9.02	**634946.07**	**634946.07**	**0.00%**	3.05	4.19	**53.50%**
	15	**1186370.90**	**1186370.90**	**0.00%**	2.95	3.73	**1186370.90**	**1186370.90**	**0.00%**	1.36	2.69	**27.90%**
	16	**643976.61**	**643976.61**	**0.00%**	13.28	21.37	**643976.61**	**643976.61**	**0.00%**	4.05	13.55	**36.63%**
	17	**975892.67**	**975892.67**	**0.00%**	3.13	4.47	**975892.67**	**975892.67**	**0.00%**	2.19	3.72	**16.70%**
	18	**742565.23**	**742565.23**	**0.00%**	3.66	4.67	**742565.23**	**742565.23**	**0.00%**	2.29	3.52	**24.67%**
	19	**722454.01**	**722454.01**	**0.00%**	6.73	8.73	**722454.01**	**722454.01**	**0.00%**	2.94	5.13	**41.28%**
	20	**816307.13**	**816307.13**	**0.00%**	9.37	14.28	**816307.13**	**816307.13**	**0.00%**	2.65	9.15	**35.91%**
10%	1	**583768.99**	**583768.99**	**0.00%**	23.36	33.47	**583768.99**	**583768.99**	**0.00%**	5.51	11.71	**65.00%**
	2	**647437.18**	**647437.18**	**0.00%**	12.50	15.14	**647437.18**	**647437.18**	**0.00%**	3.61	11.99	**20.84%**
	3	**683433.56**	**683433.56**	**0.00%**	37.14	93.27	**683433.56**	**683433.56**	**0.00%**	5.58	52.08	**44.16%**
	4	**665249.89**	**665249.89**	**0.00%**	64.91	164.33	**665249.89**	**665249.89**	**0.00%**	6.34	69.87	**57.48%**
	5	**991099.46**	**991099.46**	**0.00%**	11.44	12.34	**991099.46**	**991099.46**	**0.00%**	4.84	6.55	**46.96%**
	6	**657747.10**	**657747.10**	**0.00%**	10.36	11.86	**657747.10**	**657747.10**	**0.00%**	3.11	5.30	**55.35%**
	7	**675388.16**	**675388.16**	**0.00%**	9.53	13.75	**675388.16**	**675388.16**	**0.00%**	2.51	6.18	**55.03%**
	8	**1102374.82**	**1102374.82**	**0.00%**	10.09	14.11	**1102374.82**	**1102374.82**	**0.00%**	2.71	5.99	**57.53%**
	9	**571119.32**	**571119.32**	**0.00%**	19.91	29.72	**571119.32**	**571119.32**	**0.00%**	2.50	10.19	**65.72%**
	10	**628747.94**	**628747.94**	**0.00%**	23.03	62.47	**628747.94**	**628747.94**	**0.00%**	3.80	36.98	**40.81%**

11	**950826.68**	**950826.68**	**0.00%**	13.06	15.94	**950826.68**	**950826.68**	**0.00%**	3.72	6.33	**60.29%**
12	**819702.61**	**819702.61**	**0.00%**	6.50	7.48	**819702.61**	**819702.61**	**0.00%**	2.16	2.91	**61.17%**
13	**720985.56**	**720985.56**	**0.00%**	8.31	9.10	**720985.56**	**720985.56**	**0.00%**	2.78	3.44	**62.21%**
14	**654160.13**	**654160.13**	**0.00%**	12.83	14.41	**654160.13**	**654160.13**	**0.00%**	3.02	4.24	**70.59%**
15	**1233612.50**	**1233612.50**	**0.00%**	3.78	4.77	**1233612.50**	**1233612.50**	**0.00%**	1.39	2.14	**55.13%**
16	**664327.47**	**664327.47**	**0.00%**	18.86	31.31	**664327.47**	**664327.47**	**0.00%**	3.36	10.28	**67.16%**
17	**1007169.85**	**1007169.85**	**0.00%**	4.34	6.17	**1007169.85**	**1007169.85**	**0.00%**	2.02	3.39	**45.05%**
18	**775822.11**	**775822.11**	**0.00%**	5.78	7.23	**775822.11**	**775822.11**	**0.00%**	2.51	3.63	**49.79%**
19	**744429.93**	**744429.93**	**0.00%**	10.05	12.66	**744429.93**	**744429.93**	**0.00%**	2.76	5.77	**54.45%**
20	**843549.16**	**843549.16**	**0.00%**	9.86	15.64	**843549.16**	**843549.16**	**0.00%**	2.54	8.93	**42.91%**

Table 8: Comparison Results When $|\mathbb{M}^s| = 3$, $K = 15$, $\Gamma_D = 6$, and $\Gamma_R = 15$

ε	Instance	CG					OA-CG					$\mathcal{P}_T$
		L^C	U^C	G^C	Time (s)		L	U	G	Time (s)		
					RP	Total				RP	Total	
5%	1	**569796.21**	**569796.21**	**0.00%**	18.75	27.03	**569749.74**	**569796.21**	**0.00%**	4.56	12.10	**55.23%**
	2	**640935.42**	**640935.42**	**0.00%**	15.37	23.00	**640935.42**	**640935.42**	**0.00%**	3.64	11.67	**49.25%**
	3	**680538.28**	**680538.28**	**0.00%**	100.41	169.67	**680538.28**	**680538.28**	**0.00%**	15.41	67.55	**60.19%**
	4	**640067.75**	**640067.75**	**0.00%**	95.83	162.06	**640067.75**	**640067.75**	**0.00%**	6.94	45.61	**71.86%**
	5	**983568.94**	**983568.94**	**0.00%**	31.74	33.77	**983568.94**	**983568.94**	**0.00%**	8.03	10.06	**70.20%**
	6	**632262.78**	**632262.78**	**0.00%**	11.13	13.86	**632262.78**	**632262.78**	**0.00%**	3.23	5.79	**58.21%**
	7	**631590.58**	**631590.58**	**0.00%**	16.95	35.61	**631590.58**	**631590.58**	**0.00%**	3.59	28.32	**20.47%**
	8	**977102.64**	**977102.64**	**0.00%**	6.66	7.72	**977021.71**	**977102.64**	**0.00%**	3.30	5.38	**30.29%**
	9	**544647.95**	**544647.95**	**0.00%**	15.97	24.89	**544647.95**	**544647.95**	**0.00%**	2.66	13.55	**45.58%**
	10	**577578.78**	**577578.78**	**0.00%**	17.61	35.94	**577578.78**	**577578.78**	**0.00%**	4.38	30.60	**14.85%**
	11	**901788.00**	**901788.00**	**0.00%**	16.09	21.81	**901788.00**	**901788.00**	**0.00%**	3.94	9.62	**55.88%**
	12	**769445.65**	**769445.65**	**0.00%**	7.38	9.16	**769445.65**	**769445.65**	**0.00%**	2.57	5.73	**37.44%**
	13	**682168.98**	**682168.98**	**0.00%**	13.56	14.75	**682168.98**	**682168.98**	**0.00%**	5.41	8.41	**43.02%**
	14	**620968.66**	**620968.66**	**0.00%**	14.86	16.99	**620968.66**	**620968.66**	**0.00%**	3.42	5.98	**64.80%**
	15	**1128381.57**	**1128381.57**	**0.00%**	5.91	6.89	**1128381.57**	**1128381.57**	**0.00%**	2.49	3.61	**47.58%**
	16	**661698.19**	**661698.19**	**0.00%**	24.27	45.06	**661698.19**	**661698.19**	**0.00%**	4.08	21.13	**53.12%**
	17	**961359.29**	**961359.29**	**0.00%**	6.61	10.81	**961359.29**	**961359.29**	**0.00%**	2.95	11.39	-5.33%
	18	**685161.07**	**685161.07**	**0.00%**	6.46	7.96	**685161.07**	**685161.07**	**0.00%**	2.99	4.63	**41.80%**
	19	**718632.07**	**718632.07**	**0.00%**	9.13	11.23	**718632.07**	**718632.07**	**0.00%**	3.19	5.59	**50.20%**
	20	**817913.78**	**817913.78**	**0.00%**	11.51	25.84	**817913.78**	**817913.78**	**0.00%**	3.30	19.79	**23.42%**
6%	1	**594862.07**	**594862.07**	**0.00%**	24.78	35.14	**594812.45**	**594862.07**	**0.00%**	4.52	14.47	**58.82%**
	2	**668122.95**	**668122.95**	**0.00%**	22.70	31.78	**668122.95**	**668122.95**	**0.00%**	3.61	12.25	**61.46%**
	3	**711583.31**	**711583.31**	**0.00%**	78.13	153.47	**711583.31**	**711583.31**	**0.00%**	12.03	94.86	**38.19%**
	4	**676886.48**	**676886.48**	**0.00%**	68.96	129.59	**676886.48**	**676886.48**	**0.00%**	8.11	104.23	**19.57%**
	5	**1027003.85**	**1027084.95**	**0.00%**	28.92	30.32	**1027084.95**	**1027084.95**	**0.00%**	16.16	19.40	**36.02%**
	6	**663347.55**	**663347.55**	**0.00%**	14.09	17.69	**663347.55**	**663347.55**	**0.00%**	3.57	7.28	**58.81%**
	7	**659426.47**	**659426.47**	**0.00%**	18.50	36.95	**659426.47**	**659426.47**	**0.00%**	3.70	30.48	**17.52%**
	8	**1007548.18**	**1007548.18**	**0.00%**	6.81	7.92	**1007548.18**	**1007548.18**	**0.00%**	3.25	4.33	**45.36%**
	9	**562230.30**	**562230.30**	**0.00%**	34.89	47.14	**562230.30**	**562230.30**	**0.00%**	2.88	11.76	**75.06%**
	10	**609117.53**	**609117.53**	**0.00%**	18.56	40.21	**609117.53**	**609117.53**	**0.00%**	4.19	37.19	**7.50%**
	11	**945303.25**	**945303.25**	**0.00%**	15.52	20.78	**945303.25**	**945303.25**	**0.00%**	5.11	11.28	**45.71%**
	12	**798322.15**	**798322.15**	**0.00%**	7.42	9.13	**798322.15**	**798322.15**	**0.00%**	2.43	4.37	**52.17%**
	13	**710503.38**	**710503.38**	**0.00%**	10.98	12.11	**710503.38**	**710503.38**	**0.00%**	4.41	5.70	**52.90%**
	14	**645806.07**	**645806.07**	**0.00%**	15.89	18.56	**645806.07**	**645806.07**	**0.00%**	3.77	6.59	**64.48%**
	15	**1182885.71**	**1182885.71**	**0.00%**	2.86	3.39	**1182858.47**	**1182885.71**	**0.00%**	1.83	2.81	**17.08%**
	16	**691011.11**	**691011.11**	**0.00%**	29.88	60.38	**691011.11**	**691011.11**	**0.00%**	4.27	32.41	**46.32%**
	17	**1002209.10**	**1002209.10**	**0.00%**	6.06	9.64	**1002209.10**	**1002209.10**	**0.00%**	2.70	7.36	**23.67%**
	18	**725910.90**	**725910.90**	**0.00%**	4.83	6.06	**725910.90**	**725910.90**	**0.00%**	3.01	4.54	**25.09%**
	19	**749249.27**	**749249.27**	**0.00%**	8.16	10.16	**749249.27**	**749249.27**	**0.00%**	2.97	6.72	**33.84%**
	20	**853657.06**	**853657.06**	**0.00%**	10.85	22.91	**853657.06**	**853657.06**	**0.00%**	3.09	16.76	**26.83%**
7%	1	**619933.05**	**619933.05**	**0.00%**	23.31	32.47	**619875.16**	**619933.05**	**0.00%**	4.41	10.55	**67.50%**
	2	**695310.48**	**695310.48**	**0.00%**	22.63	33.31	**695310.48**	**695310.48**	**0.00%**	3.75	10.73	**67.78%**
	3	**742773.94**	**742773.94**	**0.00%**	76.53	168.35	**742768.37**	**742773.94**	**0.00%**	9.30	106.41	**36.79%**
	4	**714789.17**	**714789.17**	**0.00%**	52.08	100.03	**714789.17**	**714789.17**	**0.00%**	6.11	46.11	**53.90%**
	5	**1070532.37**	**1070634.37**	**0.00%**	24.11	26.28	**1070634.37**	**1070634.37**	**0.00%**	10.50	12.18	**53.64%**
	6	**694432.32**	**694432.32**	**0.00%**	14.72	19.49	**694432.32**	**694432.32**	**0.00%**	3.62	7.62	**60.88%**
	7	**690024.48**	**690024.48**	**0.00%**	24.45	62.59	**690024.48**	**690024.48**	**0.00%**	3.75	39.79	**36.42%**
	8	**1038152.80**	**1038152.80**	**0.00%**	6.83	7.81	**1038152.80**	**1038152.80**	**0.00%**	2.58	3.43	**56.04%**
	9	**579901.84**	**579901.84**	**0.00%**	26.44	35.23	**579901.84**	**579901.84**	**0.00%**	2.44	10.09	**71.36%**
	10	**640656.28**	**640656.28**	**0.00%**	23.50	72.50	**640656.28**	**640656.28**	**0.00%**	3.34	41.22	**43.15%**
	11	**988649.24**	**988649.24**	**0.00%**	15.52	20.12	**988649.24**	**988649.24**	**0.00%**	3.69	7.51	**62.67%**
	12	**827287.49**	**827287.49**	**0.00%**	5.14	6.05	**827287.49**	**827287.49**	**0.00%**	2.02	2.80	**53.70%**
	13	**739088.86**	**739088.86**	**0.00%**	7.88	8.81	**739088.86**	**739088.86**	**0.00%**	3.80	4.66	**47.11%**

	14	**670643.47**	**670643.47**	**0.00%**	12.70	14.86	**670643.47**	**670643.47**	**0.00%**	3.45	5.41	**63.62%**
	15	**1238509.64**	**1238509.64**	**0.00%**	2.25	2.75	**1238443.52**	**1238509.64**	**0.00%**	1.26	2.01	**26.94%**
	16	**720434.37**	**720434.37**	**0.00%**	20.94	39.01	**720434.37**	**720434.37**	**0.00%**	3.03	11.75	**69.89%**
	17	**1043762.48**	**1043762.48**	**0.00%**	4.69	8.83	**1043762.48**	**1043762.48**	**0.00%**	1.97	6.09	**30.97%**
	18	**766676.68**	**766676.68**	**0.00%**	3.34	4.20	**766676.68**	**766676.68**	**0.00%**	1.84	2.31	**44.97%**
	19	**779971.38**	**779971.38**	**0.00%**	7.78	9.66	**779971.38**	**779971.38**	**0.00%**	2.65	5.58	**42.17%**
	20	**889538.73**	**889538.73**	**0.00%**	9.36	20.36	**889538.73**	**889538.73**	**0.00%**	4.04	28.22	-38.62%
8%	1	**646571.06**	**646571.06**	**0.00%**	24.72	35.86	**646571.06**	**646571.06**	**0.00%**	4.64	11.89	**66.85%**
	2	**722498.01**	**722498.01**	**0.00%**	17.84	26.35	**722498.01**	**722498.01**	**0.00%**	3.31	9.78	**62.87%**
	3	**772941.93**	**772941.93**	**0.00%**	63.80	200.29	**772941.93**	**772941.93**	**0.00%**	9.05	83.36	**58.38%**
	4	**752967.21**	**752967.21**	**0.00%**	45.75	100.00	**752967.21**	**752967.21**	**0.00%**	5.81	59.19	**40.81%**
	5	**1114189.46**	**1114250.80**	**0.00%**	20.39	22.66	**1114250.80**	**1114250.80**	**0.00%**	10.75	13.41	**40.83%**
	6	**725517.08**	**725517.08**	**0.00%**	18.01	23.47	**725517.08**	**725517.08**	**0.00%**	3.72	8.38	**64.30%**
	7	**718196.92**	**718196.92**	**0.00%**	17.60	40.82	**718196.92**	**718196.92**	**0.00%**	4.11	24.19	**40.73%**
	8	**1068994.83**	**1068994.83**	**0.00%**	7.17	8.01	**1068994.83**	**1068994.83**	**0.00%**	2.58	3.52	**56.09%**
	9	**597573.37**	**597573.37**	**0.00%**	30.19	41.66	**597573.37**	**597573.37**	**0.00%**	2.84	12.85	**69.15%**
	10	**672195.03**	**672195.03**	**0.00%**	21.59	64.56	**672195.03**	**672195.03**	**0.00%**	3.74	37.08	**42.56%**
	11	**1032071.91**	**1032071.91**	**0.00%**	12.59	15.42	**1032071.91**	**1032071.91**	**0.00%**	3.53	6.08	**60.58%**
	12	**856252.82**	**856252.82**	**0.00%**	4.25	5.30	**856252.82**	**856252.82**	**0.00%**	2.04	2.92	**44.95%**
	13	**767976.12**	**767976.12**	**0.00%**	7.95	8.91	**767976.12**	**767976.12**	**0.00%**	3.28	4.08	**54.21%**
	14	**702582.32**	**702582.32**	**0.00%**	10.91	12.62	**702582.32**	**702582.32**	**0.00%**	3.50	5.55	**56.04%**
	15	**1294831.55**	**1294831.55**	**0.00%**	1.88	2.30	**1294831.55**	**1294831.55**	**0.00%**	1.01	1.47	**36.13%**
	16	**748302.27**	**748302.27**	**0.00%**	15.50	28.78	**748302.27**	**748302.27**	**0.00%**	3.11	16.08	**44.12%**
	17	**1085315.86**	**1085315.86**	**0.00%**	3.98	7.16	**1085315.86**	**1085315.86**	**0.00%**	2.39	6.50	**9.19%**
	18	**807511.13**	**807511.13**	**0.00%**	3.20	3.98	**807511.13**	**807511.13**	**0.00%**	2.41	3.62	**9.04%**
	19	**810693.48**	**810693.48**	**0.00%**	3.09	3.69	**810693.48**	**810693.48**	**0.00%**	2.06	3.56	**3.39%**
	20	**925420.40**	**925420.40**	**0.00%**	8.41	17.14	**925420.40**	**925420.40**	**0.00%**	2.85	12.40	**27.67%**
9%	1	**675275.91**	**675275.91**	**0.00%**	15.27	19.61	**675275.91**	**675275.91**	**0.00%**	3.55	6.25	**68.13%**
	2	**749685.54**	**749685.54**	**0.00%**	11.66	16.45	**749685.54**	**749685.54**	**0.00%**	3.80	8.56	**47.98%**
	3	**802967.97**	**802967.97**	**0.00%**	38.14	111.58	**802967.97**	**802967.97**	**0.00%**	7.97	80.80	**27.59%**
	4	**791145.24**	**791145.24**	**0.00%**	49.62	102.06	**791145.24**	**791145.24**	**0.00%**	5.98	46.46	**54.48%**
	5	**1157937.93**	**1157990.50**	**0.00%**	18.08	20.08	**1157990.50**	**1157990.50**	**0.00%**	5.86	8.47	**57.84%**
	6	**763981.56**	**763981.56**	**0.00%**	10.20	12.38	**763981.56**	**763981.56**	**0.00%**	2.90	4.53	**63.40%**
	7	**747966.81**	**747966.81**	**0.00%**	12.89	23.88	**747966.81**	**747966.81**	**0.00%**	3.95	12.20	**48.91%**
	8	**1099836.85**	**1099836.85**	**0.00%**	5.39	5.86	**1099836.85**	**1099836.85**	**0.00%**	2.55	2.97	**49.30%**
	9	**615244.91**	**615244.91**	**0.00%**	24.92	38.33	**615244.91**	**615244.91**	**0.00%**	2.80	9.73	**74.60%**
	10	**705715.08**	**705715.08**	**0.00%**	27.47	84.36	**705715.08**	**705715.08**	**0.00%**	3.94	48.96	**41.97%**
	11	**1075494.57**	**1075494.57**	**0.00%**	11.78	14.13	**1075494.57**	**1075494.57**	**0.00%**	4.46	6.42	**54.53%**
	12	**885578.04**	**885578.04**	**0.00%**	4.48	5.28	**885578.04**	**885578.04**	**0.00%**	2.11	3.69	**30.13%**
	13	**796892.83**	**796892.83**	**0.00%**	9.16	10.08	**796892.83**	**796892.83**	**0.00%**	3.73	4.73	**53.04%**
	14	**737231.88**	**737231.88**	**0.00%**	15.03	18.42	**737205.23**	**737231.88**	**0.00%**	3.92	7.22	**60.83%**
	15	**1351524.21**	**1351524.21**	**0.00%**	1.81	2.72	**1351524.21**	**1351524.21**	**0.00%**	0.97	1.89	**30.40%**
	16	**779567.46**	**779567.46**	**0.00%**	22.70	41.77	**779567.46**	**779567.46**	**0.00%**	6.41	28.96	**30.67%**
	17	**1126869.24**	**1126869.24**	**0.00%**	6.22	9.13	**1126869.24**	**1126869.24**	**0.00%**	2.09	6.56	**28.11%**
	18	**848345.57**	**848345.57**	**0.00%**	4.61	5.47	**848345.57**	**848345.57**	**0.00%**	1.92	2.42	**55.68%**
	19	**842806.52**	**842806.52**	**0.00%**	5.20	6.03	**842806.52**	**842806.52**	**0.00%**	2.88	3.72	**38.32%**
	20	**961151.07**	**961151.07**	**0.00%**	11.59	26.14	**961151.07**	**961151.07**	**0.00%**	2.72	19.84	**24.09%**
10%	1	**703980.76**	**703980.76**	**0.00%**	17.66	21.51	**703980.76**	**703980.76**	**0.00%**	3.92	7.99	**62.88%**
	2	**776950.21**	**776950.21**	**0.00%**	13.19	16.81	**776950.21**	**776950.21**	**0.00%**	3.29	7.60	**54.82%**
	3	**833493.72**	**833493.72**	**0.00%**	39.68	110.00	**833493.72**	**833493.72**	**0.00%**	7.37	59.30	**46.10%**
	4	**829323.27**	**829323.27**	**0.00%**	44.56	93.33	**829323.27**	**829323.27**	**0.00%**	6.34	58.18	**37.66%**
	5	**1201686.40**	**1201738.89**	**0.00%**	13.33	15.47	**1201738.89**	**1201738.89**	**0.00%**	5.23	7.48	**51.64%**
	6	**808530.46**	**808530.46**	**0.00%**	9.10	11.02	**808530.46**	**808530.46**	**0.00%**	2.23	3.62	**67.16%**
	7	**779246.50**	**779246.50**	**0.00%**	10.08	21.11	**779246.50**	**779246.50**	**0.00%**	3.48	11.56	**45.23%**
	8	**1132996.87**	**1132996.87**	**0.00%**	3.83	4.25	**1132996.87**	**1132996.87**	**0.00%**	4.05	5.13	-20.62%
	9	**632916.45**	**632916.45**	**0.00%**	25.19	36.42	**632916.45**	**632916.45**	**0.00%**	2.75	10.19	**72.03%**
	10	**740250.45**	**740250.45**	**0.00%**	16.14	32.50	**740250.45**	**740250.45**	**0.00%**	3.92	22.88	**29.60%**

11	**1118921.31**	**1118921.31**	**0.00%**	11.11	12.94	**1118921.31**	**1118921.31**	**0.00%**	3.55	5.00	**61.36%**
12	**914999.18**	**914999.18**	**0.00%**	3.24	4.00	**914999.18**	**914999.18**	**0.00%**	1.81	2.22	**44.58%**
13	**825875.13**	**825875.13**	**0.00%**	7.88	8.63	**825875.13**	**825875.13**	**0.00%**	3.13	3.72	**56.87%**
14	**772556.56**	**772556.56**	**0.00%**	9.16	11.04	**772556.56**	**772556.56**	**0.00%**	3.04	4.73	**57.13%**
15	**1410771.70**	**1410771.70**	**0.00%**	1.74	2.75	**1410771.70**	**1410771.70**	**0.00%**	1.50	2.61	**5.34%**
16	**811068.14**	**811068.14**	**0.00%**	26.67	65.50	**811068.14**	**811068.14**	**0.00%**	4.63	31.66	**51.66%**
17	**1168422.61**	**1168422.61**	**0.00%**	4.05	5.77	**1168422.61**	**1168422.61**	**0.00%**	1.75	2.88	**50.06%**
18	**889180.02**	**889180.02**	**0.00%**	3.24	3.80	**889180.02**	**889180.02**	**0.00%**	1.90	2.61	**31.35%**
19	**875356.36**	**875356.36**	**0.00%**	6.27	7.88	**875356.36**	**875356.36**	**0.00%**	2.49	3.74	**52.57%**
20	**997032.74**	**997032.74**	**0.00%**	15.11	38.80	**997032.74**	**997032.74**	**0.00%**	3.38	21.27	**45.17%**

Table 9: Comparison Results When $|\mathbb{M}^s| = 3$, $K = 15$, $\Gamma_D = 8$, and $\Gamma_R = 20$

ε	Instance	CG					OA-CG					$\mathcal{P}_T$
		L^C	U^C	G^C	Time (s)		L	U	G	Time (s)		
					RP	Total				RP	Total	
5%	1	**632093.35**	**632093.35**	**0.00%**	22.17	39.39	**632093.35**	**632093.35**	**0.00%**	3.88	16.44	**58.27%**
	2	**703307.42**	**703307.42**	**0.00%**	10.38	13.48	**703307.42**	**703307.42**	**0.00%**	2.90	4.96	**63.18%**
	3	**766607.07**	**766607.07**	**0.00%**	47.03	205.16	**766607.07**	**766607.07**	**0.00%**	9.45	202.64	**1.23%**
	4	**730402.91**	**730402.91**	**0.00%**	18.89	45.51	**730402.91**	**730402.91**	**0.00%**	4.39	31.89	**29.92%**
	5	**1087521.25**	**1087521.25**	**0.00%**	9.11	10.31	**1087521.25**	**1087521.25**	**0.00%**	5.45	6.69	**35.18%**
	6	**691261.51**	**691261.51**	**0.00%**	11.51	15.55	**691261.51**	**691261.51**	**0.00%**	3.19	6.70	**56.87%**
	7	**675992.48**	**675992.48**	**0.00%**	8.25	15.63	**675992.48**	**675992.48**	**0.00%**	2.22	9.59	**38.61%**
	8	**993994.06**	**993994.06**	**0.00%**	3.11	3.50	**993994.06**	**993994.06**	**0.00%**	2.56	2.99	**14.68%**
	9	**574246.39**	**574246.39**	**0.00%**	11.69	18.52	**574246.39**	**574246.39**	**0.00%**	2.36	12.75	**31.13%**
	10	**627110.16**	**627110.16**	**0.00%**	10.84	35.89	**627110.16**	**627110.16**	**0.00%**	1.55	11.83	**67.03%**
	11	**983791.69**	**983791.69**	**0.00%**	9.52	17.96	**983791.69**	**983791.69**	**0.00%**	3.89	13.67	**23.87%**
	12	**805465.50**	**805465.50**	**0.00%**	3.14	4.77	**805465.50**	**805465.50**	**0.00%**	1.57	3.49	**26.81%**
	13	**742056.57**	**742056.57**	**0.00%**	14.13	16.39	**742056.57**	**742056.57**	**0.00%**	4.02	7.85	**52.14%**
	14	**662581.21**	**662581.21**	**0.00%**	13.08	14.61	**662581.21**	**662581.21**	**0.00%**	3.53	5.30	**63.72%**
	15	**1206078.44**	**1206078.44**	**0.00%**	0.87	1.39	**1206078.44**	**1206078.44**	**0.00%**	0.86	1.35	**3.10%**
	16	**715396.45**	**715396.45**	**0.00%**	13.86	30.28	**715396.45**	**715396.45**	**0.00%**	3.35	21.88	**27.75%**
	17	**1024215.41**	**1024215.41**	**0.00%**	2.20	5.81	**1024215.41**	**1024215.41**	**0.00%**	1.30	5.25	**9.74%**
	18	**733132.48**	**733132.48**	**0.00%**	1.14	1.59	**733132.48**	**733132.48**	**0.00%**	1.10	1.97	-23.73%
	19	**762999.21**	**762999.21**	**0.00%**	4.59	5.86	**762999.21**	**762999.21**	**0.00%**	2.03	3.33	**43.18%**
	20	**891891.36**	**891891.36**	**0.00%**	6.48	38.03	**891891.36**	**891891.36**	**0.00%**	2.83	36.22	**4.76%**
6%	1	**664693.04**	**664706.54**	**0.00%**	20.33	40.16	**664706.54**	**664706.54**	**0.00%**	4.33	23.92	**40.44%**
	2	**737251.31**	**737277.84**	**0.00%**	10.49	15.47	**737277.84**	**737277.84**	**0.00%**	3.33	12.24	**20.91%**
	3	**803304.28**	**803304.28**	**0.00%**	48.17	246.05	**803304.28**	**803304.28**	**0.00%**	9.80	174.14	**29.22%**
	4	**777411.22**	**777411.22**	**0.00%**	16.34	42.16	**777411.22**	**777411.22**	**0.00%**	3.95	20.56	**51.24%**
	5	**1137855.77**	**1137855.77**	**0.00%**	7.33	8.47	**1137855.77**	**1137855.77**	**0.00%**	3.67	5.25	**38.00%**
	6	**727028.47**	**727028.47**	**0.00%**	15.16	21.00	**727028.47**	**727028.47**	**0.00%**	3.11	6.61	**68.53%**
	7	**708830.31**	**708830.31**	**0.00%**	9.47	26.39	**708830.31**	**708830.31**	**0.00%**	2.90	15.61	**40.87%**
	8	**1030626.00**	**1030626.00**	**0.00%**	2.63	3.05	**1030626.00**	**1030626.00**	**0.00%**	1.89	2.26	**25.80%**
	9	**595618.95**	**595618.95**	**0.00%**	11.44	18.69	**595618.95**	**595618.95**	**0.00%**	2.51	7.90	**57.71%**
	10	**665308.72**	**665308.72**	**0.00%**	6.85	18.57	**665308.72**	**665308.72**	**0.00%**	2.26	11.13	**40.06%**
	11	**1034795.77**	**1034795.77**	**0.00%**	10.28	19.50	**1034795.77**	**1034795.77**	**0.00%**	3.70	9.35	**52.08%**
	12	**838120.98**	**838120.98**	**0.00%**	4.09	5.63	**838120.98**	**838120.98**	**0.00%**	1.81	3.87	**31.16%**
	13	**777329.04**	**777329.04**	**0.00%**	9.50	10.88	**777288.25**	**777329.04**	**0.00%**	3.32	4.55	**58.16%**
	14	**695246.75**	**695246.75**	**0.00%**	13.36	14.80	**695246.75**	**695246.75**	**0.00%**	2.83	3.94	**73.37%**
	15	**1270479.65**	**1270479.65**	**0.00%**	0.73	1.16	**1270479.65**	**1270479.65**	**0.00%**	0.87	1.30	-12.72%
	16	**749089.08**	**749089.08**	**0.00%**	16.02	35.38	**749089.08**	**749089.08**	**0.00%**	3.99	18.17	**48.63%**
	17	**1072530.73**	**1072530.73**	**0.00%**	2.53	6.88	**1072530.73**	**1072530.73**	**0.00%**	1.68	5.27	**23.40%**
	18	**779702.39**	**779702.39**	**0.00%**	2.47	3.80	**779702.39**	**779702.39**	**0.00%**	1.66	2.69	**29.16%**
	19	**799058.07**	**799058.07**	**0.00%**	5.72	7.05	**799058.07**	**799058.07**	**0.00%**	1.98	3.06	**56.56%**
	20	**933653.08**	**933653.08**	**0.00%**	7.16	42.66	**933653.08**	**933653.08**	**0.00%**	3.00	27.42	**35.73%**
7%	1	**699880.47**	**699880.47**	**0.00%**	19.25	33.85	**699880.47**	**699880.47**	**0.00%**	3.88	19.23	**43.17%**
	2	**771510.18**	**771543.81**	**0.00%**	9.56	14.47	**771543.81**	**771543.81**	**0.00%**	2.54	9.86	**31.84%**
	3	**840035.23**	**840035.23**	**0.00%**	53.11	261.25	**840035.23**	**840035.23**	**0.00%**	8.24	99.03	**62.09%**
	4	**824835.22**	**824835.22**	**0.00%**	15.98	48.37	**824835.22**	**824835.22**	**0.00%**	4.41	41.91	**13.36%**
	5	**1189989.05**	**1190021.68**	**0.00%**	7.50	9.28	**1190021.68**	**1190021.68**	**0.00%**	5.31	8.85	**4.69%**
	6	**762795.43**	**762795.43**	**0.00%**	10.91	15.39	**762795.43**	**762795.43**	**0.00%**	3.79	8.15	**47.03%**
	7	**741788.50**	**741788.50**	**0.00%**	8.52	24.25	**741788.50**	**741788.50**	**0.00%**	2.58	21.53	**11.22%**
	8	**1067316.09**	**1067316.09**	**0.00%**	2.91	3.39	**1067316.09**	**1067316.09**	**0.00%**	2.21	2.64	**22.24%**
	9	**617095.33**	**617095.33**	**0.00%**	12.13	20.41	**617095.33**	**617095.33**	**0.00%**	2.46	13.55	**33.61%**
	10	**703527.85**	**703578.82**	**0.00%**	6.39	20.32	**703527.85**	**703527.85**	**0.00%**	1.89	13.96	**31.26%**
	11	**1088555.47**	**1088555.47**	**0.00%**	8.69	15.95	**1088555.47**	**1088555.47**	**0.00%**	3.96	11.06	**30.66%**
	12	**870776.45**	**870776.45**	**0.00%**	2.02	2.55	**870767.31**	**870776.45**	**0.00%**	2.31	3.01	-18.31%
	13	**812855.07**	**812855.07**	**0.00%**	8.37	9.95	**812855.07**	**812855.07**	**0.00%**	3.66	5.41	**45.64%**

	14	**736652.39**	**736652.39**	**0.00%**	5.66	6.11	**736652.39**	**736652.39**	**0.00%**	2.91	3.41	**44.21%**
	15	**1334952.40**	**1334952.40**	**0.00%**	0.70	1.22	**1334952.40**	**1334952.40**	**0.00%**	0.74	1.25	-2.54%
	16	**784547.63**	**784547.63**	**0.00%**	15.88	39.94	**784547.63**	**784547.63**	**0.00%**	4.41	32.13	**19.55%**
	17	**1121191.44**	**1121191.44**	**0.00%**	2.05	3.78	**1121191.44**	**1121191.44**	**0.00%**	1.24	3.19	**15.60%**
	18	**828234.81**	**828234.81**	**0.00%**	2.14	2.91	**828234.81**	**828234.81**	**0.00%**	1.27	2.23	**23.15%**
	19	**835116.94**	**835116.94**	**0.00%**	6.05	8.20	**835116.94**	**835116.94**	**0.00%**	3.08	3.87	**52.78%**
	20	**975414.81**	**975414.81**	**0.00%**	5.86	30.69	**975414.81**	**975414.81**	**0.00%**	2.29	30.95	-0.85%
8%	1	**735156.39**	**735156.39**	**0.00%**	21.91	41.38	**735156.39**	**735156.39**	**0.00%**	5.43	29.31	**29.17%**
	2	**805844.56**	**805888.82**	**0.00%**	8.55	12.98	**805888.82**	**805888.82**	**0.00%**	2.11	9.54	**26.48%**
	3	**878610.82**	**878610.82**	**0.00%**	49.64	299.41	**878610.82**	**878610.82**	**0.00%**	7.22	170.75	**42.97%**
	4	**872889.43**	**872889.43**	**0.00%**	15.19	57.67	**872889.43**	**872889.43**	**0.00%**	4.28	51.93	**9.95%**
	5	**1243068.06**	**1243168.06**	**0.00%**	7.88	9.60	**1243168.06**	**1243168.06**	**0.00%**	4.63	7.90	**17.68%**
	6	**804764.55**	**804764.55**	**0.00%**	12.89	18.69	**804764.55**	**804764.55**	**0.00%**	3.64	7.72	**58.67%**
	7	**775907.48**	**775907.48**	**0.00%**	10.75	27.47	**775907.48**	**775907.48**	**0.00%**	4.09	23.43	**14.70%**
	8	**1104222.12**	**1104222.12**	**0.00%**	2.63	2.97	**1104222.12**	**1104222.12**	**0.00%**	2.33	2.81	**5.39%**
	9	**638571.72**	**638571.72**	**0.00%**	11.46	20.41	**638571.72**	**638571.72**	**0.00%**	2.89	16.91	**17.13%**
	10	**745273.11**	**745273.11**	**0.00%**	5.76	14.47	**745273.11**	**745273.11**	**0.00%**	1.75	13.37	**7.56%**
	11	**1144330.91**	**1144330.91**	**0.00%**	5.72	10.33	**1144330.91**	**1144330.91**	**0.00%**	3.85	9.66	**6.48%**
	12	**903944.69**	**903944.69**	**0.00%**	1.44	2.00	**903944.69**	**903944.69**	**0.00%**	1.61	2.31	-15.62%
	13	**848421.88**	**848421.88**	**0.00%**	7.53	8.89	**848421.88**	**848421.88**	**0.00%**	3.70	5.63	**36.72%**
	14	**777624.00**	**777624.00**	**0.00%**	7.77	8.58	**777624.00**	**777624.00**	**0.00%**	10.92	12.55	-46.30%
	15	**1399499.53**	**1399499.53**	**0.00%**	1.77	2.95	**1399499.53**	**1399499.53**	**0.00%**	0.99	2.47	**16.42%**
	16	**823963.72**	**823963.72**	**0.00%**	14.75	42.99	**823963.72**	**823963.72**	**0.00%**	4.34	41.87	**2.59%**
	17	**1169852.15**	**1169852.15**	**0.00%**	1.45	3.00	**1169852.15**	**1169852.15**	**0.00%**	1.11	2.94	**2.17%**
	18	**876771.66**	**876771.66**	**0.00%**	1.12	1.56	**876771.66**	**876771.66**	**0.00%**	0.94	1.59	-1.92%
	19	**871970.87**	**871970.87**	**0.00%**	3.81	4.52	**871970.87**	**871970.87**	**0.00%**	2.36	3.22	**28.66%**
	20	**1019301.78**	**1019301.78**	**0.00%**	4.20	35.39	**1019301.78**	**1019301.78**	**0.00%**	3.09	32.71	**7.57%**
9%	1	**769863.04**	**769863.04**	**0.00%**	18.28	42.75	**769863.04**	**769863.04**	**0.00%**	4.59	22.31	**47.82%**
	2	**840178.94**	**840233.83**	**0.00%**	9.30	13.34	**840233.83**	**840233.83**	**0.00%**	2.39	6.52	**51.14%**
	3	**917530.89**	**917530.89**	**0.00%**	37.85	157.03	**917530.89**	**917530.89**	**0.00%**	7.89	107.88	**31.30%**
	4	**921131.81**	**921131.81**	**0.00%**	15.95	65.94	**921131.81**	**921131.81**	**0.00%**	3.75	38.17	**42.11%**
	5	**1296342.50**	**1296342.50**	**0.00%**	13.96	18.45	**1296342.50**	**1296342.50**	**0.00%**	3.91	7.16	**61.22%**
	6	**854249.58**	**854249.58**	**0.00%**	12.19	18.09	**854249.58**	**854249.58**	**0.00%**	2.97	6.36	**64.86%**
	7	**810381.64**	**810381.64**	**0.00%**	14.06	41.36	**810381.64**	**810381.64**	**0.00%**	4.45	25.81	**37.60%**
	8	**1141128.15**	**1141128.15**	**0.00%**	3.22	3.61	**1141128.15**	**1141128.15**	**0.00%**	1.96	2.34	**35.22%**
	9	**660048.10**	**660048.10**	**0.00%**	11.67	19.08	**660048.10**	**660048.10**	**0.00%**	3.52	17.23	**9.70%**
	10	**793424.60**	**793424.60**	**0.00%**	7.41	25.17	**793424.60**	**793424.60**	**0.00%**	3.77	38.91	-54.54%
	11	**1200106.35**	**1200106.35**	**0.00%**	8.59	15.03	**1200106.35**	**1200106.35**	**0.00%**	3.47	8.56	**43.03%**
	12	**937122.07**	**937122.07**	**0.00%**	1.56	2.05	**937122.07**	**937122.07**	**0.00%**	1.33	1.81	**11.49%**
	13	**883988.70**	**883988.70**	**0.00%**	8.27	9.74	**883988.70**	**883988.70**	**0.00%**	3.16	4.51	**53.70%**
	14	**818501.96**	**818501.96**	**0.00%**	9.59	11.15	**818501.96**	**818501.96**	**0.00%**	4.94	6.18	**44.59%**
	15	**1459621.85**	**1459621.85**	**0.00%**	1.56	2.74	**1459558.75**	**1459621.85**	**0.00%**	1.25	2.33	**14.88%**
	16	**859882.30**	**859882.30**	**0.00%**	15.75	59.42	**859882.30**	**859882.30**	**0.00%**	4.16	40.23	**32.29%**
	17	**1218512.86**	**1218512.86**	**0.00%**	1.50	2.73	**1218512.86**	**1218512.86**	**0.00%**	1.44	2.67	**2.23%**
	18	**925331.04**	**925331.04**	**0.00%**	1.17	1.60	**925331.04**	**925331.04**	**0.00%**	0.92	1.30	**18.62%**
	19	**909759.10**	**909759.10**	**0.00%**	4.98	7.22	**909683.27**	**909759.10**	**0.00%**	2.57	3.79	**47.53%**
	20	**1063401.89**	**1063401.89**	**0.00%**	4.83	40.22	**1063401.89**	**1063401.89**	**0.00%**	3.27	43.24	-7.49%
10%	1	**807256.35**	**807256.35**	**0.00%**	16.81	38.22	**807256.35**	**807256.35**	**0.00%**	4.38	17.86	**53.26%**
	2	**874578.84**	**874578.84**	**0.00%**	10.22	14.94	**874578.84**	**874578.84**	**0.00%**	2.27	5.53	**62.99%**
	3	**956722.40**	**956730.99**	**0.00%**	34.69	195.61	**956730.99**	**956730.99**	**0.00%**	7.70	100.59	**48.58%**
	4	**969378.66**	**969378.66**	**0.00%**	12.59	62.97	**969378.66**	**969378.66**	**0.00%**	3.79	40.49	**35.69%**
	5	**1349536.40**	**1349536.40**	**0.00%**	10.50	14.95	**1349536.40**	**1349536.40**	**0.00%**	3.80	7.35	**50.86%**
	6	**904138.73**	**904138.73**	**0.00%**	7.58	10.48	**904138.73**	**904138.73**	**0.00%**	2.56	3.97	**62.18%**
	7	**843822.85**	**843822.85**	**0.00%**	11.25	32.11	**843814.06**	**843822.85**	**0.00%**	2.85	15.74	**50.98%**
	8	**1178034.17**	**1178034.17**	**0.00%**	2.53	2.94	**1178034.17**	**1178034.17**	**0.00%**	1.85	2.19	**25.33%**
	9	**681524.49**	**681524.49**	**0.00%**	13.92	23.11	**681524.49**	**681524.49**	**0.00%**	3.17	14.66	**36.57%**
	10	**836571.96**	**836571.96**	**0.00%**	10.19	51.30	**836571.96**	**836571.96**	**0.00%**	2.65	21.86	**57.40%**

11	**1256749.75**	**1256749.75**	**0.00%**	9.16	17.75	**1256749.75**	**1256749.75**	**0.00%**	3.59	11.03	**37.86%**
12	**970299.44**	**970299.44**	**0.00%**	1.63	2.05	**970299.44**	**970299.44**	**0.00%**	1.15	1.51	**26.09%**
13	**919555.51**	**919555.51**	**0.00%**	7.47	8.91	**919555.51**	**919555.51**	**0.00%**	3.08	4.37	**50.90%**
14	**859454.79**	**859454.79**	**0.00%**	6.47	7.83	**859454.79**	**859454.79**	**0.00%**	3.64	5.01	**36.09%**
15	**1515207.78**	**1515207.78**	**0.00%**	1.58	3.44	**1515061.26**	**1515207.78**	**0.00%**	1.32	2.96	**13.94%**
16	**894929.13**	**894929.13**	**0.00%**	7.92	21.42	**894929.13**	**894929.13**	**0.00%**	3.00	15.22	**28.93%**
17	**1268329.71**	**1268329.71**	**0.00%**	1.38	3.88	**1268329.71**	**1268329.71**	**0.00%**	1.45	3.59	**7.28%**
18	**973890.41**	**973890.41**	**0.00%**	1.42	1.89	**973890.41**	**973890.41**	**0.00%**	0.95	1.37	**27.53%**
19	**948167.11**	**948187.49**	**0.00%**	4.72	5.88	**948187.49**	**948187.49**	**0.00%**	2.15	4.43	**24.54%**
20	**1107444.42**	**1107502.01**	**0.00%**	4.40	37.77	**1107502.01**	**1107502.01**	**0.00%**	3.17	46.54	-23.25%

Table 10: Comparison Results When $|\mathbb{M}^s| = 3$, $K = 20$, $\Gamma_D = 4$, and $\Gamma_R = 10$

ε	Instance	CG					OA-CG					$\mathcal{P}_T$
		L^C	U^C	G^C	Time (s)		L	U	G	Time (s)		
					RP	Total				RP	Total	
5%	1	**721274.47**	**721274.47**	**0.00%**	14.95	17.64	**721274.47**	**721274.47**	**0.00%**	3.42	5.52	**68.72%**
	2	**777358.67**	**777358.67**	**0.00%**	14.58	17.50	**777358.67**	**777358.67**	**0.00%**	2.91	4.93	**71.86%**
	3	**660255.03**	**660255.03**	**0.00%**	38.75	41.39	**660255.03**	**660255.03**	**0.00%**	6.55	9.31	**77.50%**
	4	**717360.88**	**717360.88**	**0.00%**	10.95	15.83	**717360.88**	**717360.88**	**0.00%**	4.99	15.14	**4.32%**
	5	**1044880.25**	**1044880.25**	**0.00%**	0.77	1.00	**1044880.25**	**1044880.25**	**0.00%**	0.64	0.82	**17.60%**
	6	**750712.28**	**750712.28**	**0.00%**	5.28	5.74	**750712.28**	**750712.28**	**0.00%**	2.58	2.93	**49.01%**
	7	**690410.87**	**690410.87**	**0.00%**	5.59	8.03	**690410.87**	**690410.87**	**0.00%**	1.77	3.29	**59.10%**
	8	**1188675.26**	**1188675.26**	**0.00%**	2.69	2.84	**1188675.26**	**1188675.26**	**0.00%**	2.22	2.34	**17.65%**
	9	**1066771.30**	**1066771.30**	**0.00%**	16.23	27.37	**1066771.30**	**1066771.30**	**0.00%**	3.66	10.52	**61.57%**
	10	**526429.28**	**526429.28**	**0.00%**	7.19	7.98	**526426.28**	**526429.28**	**0.00%**	2.85	3.31	**58.49%**
	11	**784067.97**	**784067.97**	**0.00%**	81.89	83.71	**784067.97**	**784067.97**	**0.00%**	18.65	20.56	**75.44%**
	12	**607588.62**	**607588.62**	**0.00%**	11.02	14.17	**607575.43**	**607588.62**	**0.00%**	2.58	4.56	**67.83%**
	13	**640452.44**	**640452.44**	**0.00%**	28.85	30.16	**640452.44**	**640452.44**	**0.00%**	2.30	3.10	**89.72%**
	14	**748577.11**	**748577.11**	**0.00%**	7.31	8.30	**748577.11**	**748577.11**	**0.00%**	2.30	2.99	**63.98%**
	15	**771370.64**	**771370.64**	**0.00%**	6.74	8.92	**771370.64**	**771370.64**	**0.00%**	2.11	3.63	**59.35%**
	16	**989095.35**	**989095.35**	**0.00%**	4.97	7.33	**989095.35**	**989095.35**	**0.00%**	1.30	2.83	**61.42%**
	17	**653028.31**	**653028.31**	**0.00%**	6.94	7.95	**653028.31**	**653028.31**	**0.00%**	2.35	3.07	**61.45%**
	18	**1321736.50**	**1321736.50**	**0.00%**	6.99	8.96	**1321736.50**	**1321736.50**	**0.00%**	1.97	3.44	**61.61%**
	19	**1019891.47**	**1019891.47**	**0.00%**	3.86	6.78	**1019891.47**	**1019891.47**	**0.00%**	1.95	4.15	**38.77%**
	20	**689273.46**	**689280.86**	**0.00%**	2.80	3.34	**689273.46**	**689273.46**	**0.00%**	1.35	1.89	**43.42%**
6%	1	**741296.40**	**741296.40**	**0.00%**	17.39	20.23	**741296.40**	**741296.40**	**0.00%**	3.55	5.73	**71.67%**
	2	**802776.72**	**802776.72**	**0.00%**	15.88	19.89	**802776.72**	**802776.72**	**0.00%**	3.44	6.36	**68.02%**
	3	**686570.21**	**686570.21**	**0.00%**	48.80	51.70	**686570.21**	**686570.21**	**0.00%**	7.31	11.64	**77.48%**
	4	**740005.36**	**740005.36**	**0.00%**	10.50	15.35	**740005.36**	**740005.36**	**0.00%**	5.14	14.13	**7.92%**
	5	**1076894.70**	**1076894.70**	**0.00%**	0.70	0.92	**1076894.70**	**1076894.70**	**0.00%**	0.87	1.08	-16.59%
	6	**784314.38**	**784314.38**	**0.00%**	4.35	4.75	**784314.38**	**784314.38**	**0.00%**	2.31	2.62	**44.79%**
	7	**721570.68**	**721570.68**	**0.00%**	4.59	6.03	**721570.68**	**721570.68**	**0.00%**	1.69	3.39	**43.71%**
	8	**1220614.33**	**1220614.33**	**0.00%**	3.52	3.69	**1220614.33**	**1220614.33**	**0.00%**	2.38	2.50	**32.14%**
	9	**1107380.11**	**1107413.91**	**0.00%**	11.16	15.70	**1107413.91**	**1107413.91**	**0.00%**	3.50	8.66	**44.86%**
	10	**550086.85**	**550086.85**	**0.00%**	11.92	14.17	**550086.85**	**550086.85**	**0.00%**	2.66	3.28	**76.84%**
	11	**804452.72**	**804452.72**	**0.00%**	92.97	94.41	**804452.72**	**804452.72**	**0.00%**	33.31	35.25	**62.66%**
	12	**624702.15**	**624702.15**	**0.00%**	9.53	12.01	**624702.15**	**624702.15**	**0.00%**	2.55	6.13	**49.01%**
	13	**656505.34**	**656505.34**	**0.00%**	15.52	16.48	**656505.34**	**656505.34**	**0.00%**	2.64	3.59	**78.22%**
	14	**772995.84**	**772995.84**	**0.00%**	5.00	5.81	**772995.84**	**772995.84**	**0.00%**	2.27	3.08	**47.08%**
	15	**799310.12**	**799310.12**	**0.00%**	5.89	8.58	**799310.12**	**799310.12**	**0.00%**	1.88	3.50	**59.19%**
	16	**1023843.91**	**1023843.91**	**0.00%**	3.67	5.26	**1023843.91**	**1023843.91**	**0.00%**	1.10	2.72	**48.29%**
	17	**681679.66**	**681679.66**	**0.00%**	5.58	6.35	**681679.66**	**681679.66**	**0.00%**	2.38	4.19	**33.90%**
	18	**1356660.49**	**1356660.49**	**0.00%**	5.25	6.77	**1356660.49**	**1356660.49**	**0.00%**	2.27	4.06	**39.93%**
	19	**1053407.75**	**1053407.75**	**0.00%**	2.81	5.05	**1053407.75**	**1053407.75**	**0.00%**	1.80	4.10	**18.79%**
	20	**709716.97**	**709716.97**	**0.00%**	1.38	1.59	**709716.97**	**709716.97**	**0.00%**	1.39	1.61	-1.07%
7%	1	**761391.76**	**761391.76**	**0.00%**	14.81	17.25	**761391.76**	**761391.76**	**0.00%**	4.81	7.00	**59.43%**
	2	**828194.77**	**828194.77**	**0.00%**	13.27	17.14	**828194.77**	**828194.77**	**0.00%**	3.28	6.92	**59.65%**
	3	**712885.39**	**712885.39**	**0.00%**	31.34	34.48	**712885.39**	**712885.39**	**0.00%**	7.52	10.27	**70.23%**
	4	**762649.83**	**762649.83**	**0.00%**	7.17	10.75	**762649.83**	**762649.83**	**0.00%**	4.16	9.89	**7.99%**
	5	**1108909.15**	**1108909.15**	**0.00%**	0.44	0.63	**1108909.15**	**1108909.15**	**0.00%**	0.78	0.98	-56.39%
	6	**817916.49**	**817916.49**	**0.00%**	3.56	3.86	**817916.49**	**817916.49**	**0.00%**	2.04	2.36	**38.92%**
	7	**749718.58**	**749718.58**	**0.00%**	3.06	4.05	**749718.58**	**749718.58**	**0.00%**	1.48	2.42	**40.19%**
	8	**1252553.40**	**1252553.40**	**0.00%**	2.47	2.59	**1252553.40**	**1252553.40**	**0.00%**	2.50	2.77	-6.71%
	9	**1148056.52**	**1148056.52**	**0.00%**	7.00	10.63	**1148056.52**	**1148056.52**	**0.00%**	2.05	5.65	**46.87%**
	10	**575711.56**	**575711.56**	**0.00%**	7.75	9.47	**575711.56**	**575711.56**	**0.00%**	2.41	3.36	**64.51%**
	11	**824837.47**	**824837.47**	**0.00%**	77.28	78.97	**824837.47**	**824837.47**	**0.00%**	14.33	16.30	**79.36%**
	12	**642328.91**	**642328.91**	**0.00%**	6.69	8.99	**642328.91**	**642328.91**	**0.00%**	2.57	5.73	**36.26%**
	13	**672558.25**	**672558.25**	**0.00%**	13.20	14.12	**672558.25**	**672558.25**	**0.00%**	2.36	3.26	**76.91%**

	14	**797588.09**	**797588.09**	**0.00%**	4.80	5.44	**797588.09**	**797588.09**	**0.00%**	2.20	2.86	**47.44%**
	15	**828117.69**	**828117.69**	**0.00%**	6.39	9.86	**828117.69**	**828117.69**	**0.00%**	2.22	4.53	**54.02%**
	16	**1057723.40**	**1057723.40**	**0.00%**	2.20	3.73	**1057723.40**	**1057723.40**	**0.00%**	1.38	2.92	**21.69%**
	17	**710331.01**	**710331.01**	**0.00%**	4.78	5.53	**710331.01**	**710331.01**	**0.00%**	2.53	3.17	**42.72%**
	18	**1391584.48**	**1391584.48**	**0.00%**	5.00	6.59	**1391584.48**	**1391584.48**	**0.00%**	2.23	3.62	**45.03%**
	19	**1085771.50**	**1085771.50**	**0.00%**	1.89	3.37	**1085771.50**	**1085771.50**	**0.00%**	1.67	3.94	-16.66%
	20	**731167.98**	**731167.98**	**0.00%**	1.11	1.35	**731167.98**	**731167.98**	**0.00%**	1.36	1.60	-18.66%
8%	1	**781490.26**	**781490.26**	**0.00%**	16.88	19.39	**781490.26**	**781490.26**	**0.00%**	5.16	7.25	**62.60%**
	2	**853612.81**	**853612.81**	**0.00%**	12.56	16.25	**853612.81**	**853612.81**	**0.00%**	3.67	7.24	**55.48%**
	3	**739200.57**	**739200.57**	**0.00%**	28.19	31.30	**739200.57**	**739200.57**	**0.00%**	5.59	8.45	**72.99%**
	4	**785294.30**	**785294.30**	**0.00%**	7.47	10.67	**785294.30**	**785294.30**	**0.00%**	4.56	11.14	-4.36%
	5	**1140923.60**	**1140923.60**	**0.00%**	0.45	0.67	**1140923.60**	**1140923.60**	**0.00%**	0.66	0.86	-28.27%
	6	**851844.16**	**851844.16**	**0.00%**	3.05	3.34	**851844.16**	**851844.16**	**0.00%**	2.20	2.48	**25.81%**
	7	**781111.47**	**781111.47**	**0.00%**	2.61	3.69	**781111.47**	**781111.47**	**0.00%**	1.59	2.62	**28.86%**
	8	**1285100.44**	**1285100.44**	**0.00%**	2.44	2.59	**1285100.44**	**1285100.44**	**0.00%**	2.53	2.69	-3.70%
	9	**1188707.85**	**1188707.85**	**0.00%**	6.67	10.23	**1188707.85**	**1188707.85**	**0.00%**	1.92	5.34	**47.79%**
	10	**601336.28**	**601336.28**	**0.00%**	7.84	9.56	**601336.28**	**601336.28**	**0.00%**	2.14	3.20	**66.51%**
	11	**845246.35**	**845246.35**	**0.00%**	44.59	46.51	**845246.35**	**845246.35**	**0.00%**	28.97	30.27	**34.93%**
	12	**660159.66**	**660159.66**	**0.00%**	7.70	9.95	**660159.58**	**660169.96**	**0.00%**	2.42	5.94	**40.38%**
	13	**688611.15**	**688611.15**	**0.00%**	9.33	10.33	**688611.15**	**688611.15**	**0.00%**	2.67	3.70	**64.17%**
	14	**823307.66**	**823307.66**	**0.00%**	4.56	5.30	**823307.66**	**823307.66**	**0.00%**	2.11	2.90	**45.19%**
	15	**856368.30**	**856368.30**	**0.00%**	4.33	6.62	**856368.30**	**856368.30**	**0.00%**	1.92	5.53	**16.47%**
	16	**1089368.81**	**1089368.81**	**0.00%**	2.25	4.05	**1089368.81**	**1089368.81**	**0.00%**	1.22	3.06	**24.35%**
	17	**738982.35**	**738982.35**	**0.00%**	4.74	5.41	**738982.35**	**738982.35**	**0.00%**	2.26	3.62	**33.10%**
	18	**1426508.47**	**1426508.47**	**0.00%**	5.28	6.89	**1426508.47**	**1426508.47**	**0.00%**	2.19	3.95	**42.63%**
	19	**1115058.65**	**1115058.65**	**0.00%**	2.31	4.84	**1115058.65**	**1115058.65**	**0.00%**	1.57	4.23	**12.74%**
	20	**752618.98**	**752618.98**	**0.00%**	1.13	1.36	**752618.98**	**752618.98**	**0.00%**	1.26	1.51	-11.32%
9%	1	**801588.77**	**801588.77**	**0.00%**	29.23	32.08	**801588.77**	**801588.77**	**0.00%**	10.76	12.73	**60.31%**
	2	**880681.63**	**880681.63**	**0.00%**	7.27	8.55	**880681.63**	**880681.63**	**0.00%**	3.52	9.80	-14.62%
	3	**765515.75**	**765515.75**	**0.00%**	29.72	33.11	**765515.75**	**765515.75**	**0.00%**	7.37	9.43	**71.51%**
	4	**807938.77**	**807938.77**	**0.00%**	8.83	12.78	**807938.77**	**807938.77**	**0.00%**	4.09	10.70	**16.27%**
	5	**1172938.05**	**1172938.05**	**0.00%**	0.50	0.66	**1172938.05**	**1172938.05**	**0.00%**	0.66	0.83	-26.41%
	6	**886505.61**	**886505.61**	**0.00%**	3.84	4.20	**886505.61**	**886505.61**	**0.00%**	2.17	2.50	**40.56%**
	7	**812504.36**	**812504.36**	**0.00%**	3.23	4.48	**812504.36**	**812504.36**	**0.00%**	1.48	3.17	**29.24%**
	8	**1319412.48**	**1319412.48**	**0.00%**	2.24	2.36	**1319412.48**	**1319412.48**	**0.00%**	2.14	2.30	**2.63%**
	9	**1229373.97**	**1229373.97**	**0.00%**	10.89	15.10	**1229373.97**	**1229373.97**	**0.00%**	1.81	5.57	**63.08%**
	10	**627808.43**	**627808.43**	**0.00%**	11.06	13.11	**627808.43**	**627808.43**	**0.00%**	2.63	5.55	**57.67%**
	11	**865660.42**	**865660.42**	**0.00%**	86.81	88.97	**865660.42**	**865660.42**	**0.00%**	24.05	25.43	**71.41%**
	12	**677990.41**	**677990.41**	**0.00%**	10.92	14.27	**677990.41**	**677990.41**	**0.00%**	2.47	5.61	**60.65%**
	13	**704664.06**	**704664.06**	**0.00%**	12.35	13.33	**704664.06**	**704664.06**	**0.00%**	2.77	3.66	**72.57%**
	14	**849252.06**	**849252.06**	**0.00%**	5.25	6.08	**849252.06**	**849252.06**	**0.00%**	2.16	3.00	**50.63%**
	15	**879133.87**	**879134.59**	**0.00%**	4.87	6.39	**879134.59**	**879134.59**	**0.00%**	2.03	4.55	**28.82%**
	16	**1121014.22**	**1121014.22**	**0.00%**	2.30	3.98	**1121014.22**	**1121014.22**	**0.00%**	1.05	2.75	**31.01%**
	17	**767636.36**	**767636.36**	**0.00%**	5.39	6.13	**767636.36**	**767636.36**	**0.00%**	2.07	2.96	**51.76%**
	18	**1461432.46**	**1461432.46**	**0.00%**	5.88	7.66	**1461432.46**	**1461432.46**	**0.00%**	2.26	4.10	**46.42%**
	19	**1144345.80**	**1144345.80**	**0.00%**	1.95	3.53	**1144345.80**	**1144345.80**	**0.00%**	1.25	2.85	**19.41%**
	20	**774069.99**	**774069.99**	**0.00%**	1.20	1.49	**774069.99**	**774069.99**	**0.00%**	1.49	1.75	-17.98%
10%	1	**821687.27**	**821687.27**	**0.00%**	15.69	17.90	**821687.27**	**821687.27**	**0.00%**	4.34	6.60	**63.11%**
	2	**908468.27**	**908468.27**	**0.00%**	9.45	11.20	**908468.27**	**908468.27**	**0.00%**	3.33	6.94	**38.06%**
	3	**791830.93**	**791830.93**	**0.00%**	23.50	26.58	**791830.93**	**791830.93**	**0.00%**	8.50	11.58	**56.44%**
	4	**830586.72**	**830586.72**	**0.00%**	7.28	10.50	**830586.72**	**830586.72**	**0.00%**	2.87	7.51	**28.45%**
	5	**1204952.50**	**1204952.50**	**0.00%**	0.42	0.61	**1204952.50**	**1204952.50**	**0.00%**	0.73	0.95	-56.32%
	6	**921167.06**	**921167.06**	**0.00%**	3.33	3.69	**921167.06**	**921167.06**	**0.00%**	2.00	2.37	**35.61%**
	7	**843897.25**	**843897.25**	**0.00%**	2.81	3.97	**843897.25**	**843897.25**	**0.00%**	1.41	3.03	**23.56%**
	8	**1353727.56**	**1353727.56**	**0.00%**	1.67	1.84	**1353724.53**	**1353727.56**	**0.00%**	2.19	2.36	-27.96%
	9	**1270047.24**	**1270047.24**	**0.00%**	7.72	12.38	**1270047.24**	**1270047.24**	**0.00%**	1.85	6.46	**47.82%**
	10	**657468.47**	**657468.47**	**0.00%**	8.37	10.11	**657468.47**	**657468.47**	**0.00%**	2.86	5.70	**43.56%**

11	**886150.82**	**886150.82**	**0.00%**	102.10	103.45	**886150.82**	**886150.82**	**0.00%**	27.84	29.14	**71.83%**
12	**695821.15**	**695821.15**	**0.00%**	9.99	13.89	**695821.15**	**695821.15**	**0.00%**	3.83	8.60	**38.13%**
13	**720716.96**	**720716.96**	**0.00%**	11.90	13.50	**720716.96**	**720716.96**	**0.00%**	3.10	4.60	**65.95%**
14	**875196.46**	**875196.46**	**0.00%**	4.88	5.59	**875196.46**	**875196.46**	**0.00%**	2.17	2.95	**47.20%**
15	**899369.84**	**899427.65**	**0.00%**	5.30	8.72	**899369.84**	**899369.84**	**0.00%**	2.03	5.67	**34.94%**
16	**1152723.02**	**1152723.02**	**0.00%**	1.28	2.13	**1152723.02**	**1152723.02**	**0.00%**	0.81	1.75	**17.65%**
17	**796674.62**	**796674.62**	**0.00%**	3.12	3.48	**796674.62**	**796674.62**	**0.00%**	2.05	2.52	**27.79%**
18	**1496356.45**	**1496356.45**	**0.00%**	4.16	5.70	**1496356.45**	**1496356.45**	**0.00%**	2.27	3.85	**32.55%**
19	**1173632.96**	**1173632.96**	**0.00%**	1.70	2.91	**1173632.96**	**1173632.96**	**0.00%**	1.54	2.83	**2.48%**
20	**795521.00**	**795521.00**	**0.00%**	1.06	1.31	**795521.00**	**795521.00**	**0.00%**	1.50	1.75	-33.74%

Table 11: Comparison Results When $|\mathbb{M}^s| = 3$, $K = 20$, $\Gamma_D = 6$, and $\Gamma_R = 15$

ε	Instance	CG					OA-CG					$\mathcal{P}_T$
		L^C	U^C	G^C	Time (s)		L	U	G	Time (s)		
					RP	Total				RP	Total	
5%	1	**828271.98**	**828271.98**	**0.00%**	19.36	21.58	**828271.98**	**828271.98**	**0.00%**	4.03	6.34	**70.62%**
	2	**905310.00**	**905356.87**	**0.00%**	8.49	10.02	**905356.87**	**905356.87**	**0.00%**	3.18	6.43	**35.86%**
	3	**755504.35**	**755504.35**	**0.00%**	42.85	47.24	**755451.09**	**755504.35**	**0.00%**	10.82	15.65	**66.86%**
	4	**804142.21**	**804142.21**	**0.00%**	35.08	53.36	**804142.21**	**804142.21**	**0.00%**	6.14	13.45	**74.80%**
	5	**1084732.32**	**1084732.32**	**0.00%**	3.61	3.80	**1084732.32**	**1084732.32**	**0.00%**	1.36	1.52	**60.06%**
	6	**897614.36**	**897614.36**	**0.00%**	6.78	7.70	**897614.36**	**897614.36**	**0.00%**	2.55	3.69	**52.14%**
	7	**768832.54**	**768832.54**	**0.00%**	4.06	6.33	**768821.90**	**768832.54**	**0.00%**	1.88	3.49	**44.85%**
	8	**1256227.05**	**1256227.05**	**0.00%**	3.92	4.09	**1256227.05**	**1256227.05**	**0.00%**	2.66	2.81	**31.27%**
	9	**1169648.39**	**1169648.39**	**0.00%**	9.81	14.38	**1169648.39**	**1169648.39**	**0.00%**	2.15	5.34	**62.85%**
	10	**624512.09**	**624512.09**	**0.00%**	14.19	18.05	**624512.09**	**624512.09**	**0.00%**	3.56	6.28	**65.19%**
	11	**897153.78**	**897153.78**	**0.00%**	27.98	29.64	**897153.78**	**897153.78**	**0.00%**	10.11	11.28	**61.94%**
	12	**667484.63**	**667484.63**	**0.00%**	11.50	14.91	**667484.63**	**667484.63**	**0.00%**	2.32	5.70	**61.76%**
	13	**713458.10**	**713458.10**	**0.00%**	57.27	58.39	**713458.10**	**713458.10**	**0.00%**	3.06	3.84	**93.42%**
	14	**839974.11**	**839974.11**	**0.00%**	6.44	7.55	**839974.11**	**839974.11**	**0.00%**	2.50	3.81	**49.47%**
	15	**841962.05**	**841962.05**	**0.00%**	9.78	14.40	**841962.05**	**841962.05**	**0.00%**	2.31	4.43	**69.22%**
	16	**1072967.89**	**1072967.89**	**0.00%**	1.78	3.23	**1072967.89**	**1072967.89**	**0.00%**	1.11	2.16	**33.24%**
	17	**759207.83**	**759207.83**	**0.00%**	10.48	12.24	**759207.83**	**759207.83**	**0.00%**	2.76	4.80	**60.81%**
	18	**1365198.50**	**1365198.50**	**0.00%**	10.61	13.44	**1365198.50**	**1365198.50**	**0.00%**	2.54	5.18	**61.47%**
	19	**1099896.47**	**1099896.47**	**0.00%**	4.83	9.91	**1099836.80**	**1099896.47**	**0.00%**	1.52	5.41	**45.44%**
	20	**754275.45**	**754275.45**	**0.00%**	4.87	5.70	**754275.45**	**754275.45**	**0.00%**	1.70	2.34	**58.93%**
6%	1	**858600.66**	**858600.66**	**0.00%**	14.19	15.91	**858600.66**	**858600.66**	**0.00%**	3.71	5.18	**67.46%**
	2	**943491.47**	**943491.47**	**0.00%**	13.80	16.22	**943491.47**	**943491.47**	**0.00%**	3.30	6.18	**61.92%**
	3	**789950.65**	**789950.65**	**0.00%**	52.17	56.78	**789950.65**	**789950.65**	**0.00%**	11.44	14.72	**74.07%**
	4	**836122.03**	**836140.73**	**0.00%**	17.56	22.03	**836140.73**	**836140.73**	**0.00%**	5.65	10.06	**54.35%**
	5	**1122990.11**	**1122990.11**	**0.00%**	2.69	2.89	**1122990.11**	**1122990.11**	**0.00%**	1.27	1.44	**50.16%**
	6	**940786.17**	**940786.17**	**0.00%**	6.42	7.30	**940770.13**	**940786.17**	**0.00%**	2.19	2.78	**61.85%**
	7	**807239.76**	**807239.76**	**0.00%**	3.17	4.64	**807239.76**	**807239.76**	**0.00%**	1.34	2.30	**50.54%**
	8	**1297038.93**	**1297038.93**	**0.00%**	3.62	3.80	**1297038.93**	**1297038.93**	**0.00%**	2.59	2.73	**28.01%**
	9	**1217281.30**	**1217281.30**	**0.00%**	10.13	15.67	**1217281.30**	**1217281.30**	**0.00%**	2.00	5.69	**63.70%**
	10	**662036.23**	**662050.45**	**0.00%**	10.58	13.06	**662050.45**	**662050.45**	**0.00%**	2.50	5.00	**61.73%**
	11	**926559.66**	**926559.66**	**0.00%**	19.60	21.23	**926559.66**	**926559.66**	**0.00%**	3.64	4.70	**77.85%**
	12	**690502.39**	**690502.39**	**0.00%**	14.83	19.84	**690502.39**	**690502.39**	**0.00%**	2.64	5.44	**72.60%**
	13	**736150.88**	**736150.88**	**0.00%**	63.59	64.70	**736150.88**	**736150.88**	**0.00%**	2.98	3.60	**94.43%**
	14	**871404.98**	**871404.98**	**0.00%**	6.94	8.01	**871404.98**	**871404.98**	**0.00%**	1.99	2.68	**66.62%**
	15	**882227.00**	**882227.00**	**0.00%**	8.86	13.39	**882227.00**	**882227.00**	**0.00%**	2.13	5.44	**59.34%**
	16	**1113010.55**	**1113010.55**	**0.00%**	1.50	3.08	**1113010.55**	**1113010.55**	**0.00%**	1.13	2.19	**28.95%**
	17	**794734.65**	**794734.65**	**0.00%**	10.60	12.64	**794734.65**	**794734.65**	**0.00%**	2.95	4.17	**67.00%**
	18	**1405423.57**	**1405423.57**	**0.00%**	11.50	14.80	**1405423.57**	**1405423.57**	**0.00%**	2.58	4.94	**66.64%**
	19	**1137330.30**	**1137330.30**	**0.00%**	4.19	9.46	**1137330.30**	**1137330.30**	**0.00%**	1.91	7.22	**23.65%**
	20	**782707.46**	**782707.46**	**0.00%**	4.39	5.05	**782707.46**	**782707.46**	**0.00%**	1.59	2.14	**57.67%**
7%	1	**890353.60**	**890353.60**	**0.00%**	19.99	22.05	**890353.60**	**890353.60**	**0.00%**	3.93	5.53	**74.90%**
	2	**982203.98**	**982203.98**	**0.00%**	7.59	8.89	**982203.98**	**982203.98**	**0.00%**	3.13	6.29	**29.31%**
	3	**824396.95**	**824396.95**	**0.00%**	54.70	60.10	**824396.95**	**824396.95**	**0.00%**	6.25	9.80	**83.69%**
	4	**868788.44**	**868788.44**	**0.00%**	21.53	30.14	**868788.44**	**868788.44**	**0.00%**	5.73	12.10	**59.85%**
	5	**1161423.47**	**1161423.47**	**0.00%**	2.36	2.59	**1161423.47**	**1161423.47**	**0.00%**	1.18	1.57	**39.32%**
	6	**984072.40**	**984072.40**	**0.00%**	5.92	6.87	**984072.40**	**984072.40**	**0.00%**	2.28	2.92	**57.56%**
	7	**845657.62**	**845657.62**	**0.00%**	3.33	4.82	**845657.62**	**845657.62**	**0.00%**	1.09	2.17	**54.91%**
	8	**1337940.27**	**1337940.27**	**0.00%**	3.77	3.95	**1337940.27**	**1337940.27**	**0.00%**	2.80	2.94	**25.68%**
	9	**1264914.20**	**1264914.20**	**0.00%**	9.67	14.72	**1264914.20**	**1264914.20**	**0.00%**	1.83	5.61	**61.90%**
	10	**690320.29**	**690320.29**	**0.00%**	12.26	16.22	**690320.29**	**690320.29**	**0.00%**	2.99	5.97	**63.20%**
	11	**955979.81**	**955979.81**	**0.00%**	21.61	23.38	**955979.81**	**955979.81**	**0.00%**	4.56	5.89	**74.80%**
	12	**713520.16**	**713520.16**	**0.00%**	16.16	20.53	**713520.16**	**713520.16**	**0.00%**	2.39	5.23	**74.52%**
	13	**758843.66**	**758843.66**	**0.00%**	50.35	51.25	**758843.66**	**758843.66**	**0.00%**	2.52	3.33	**93.50%**

	14	**905354.12**	**905354.12**	**0.00%**	6.58	7.61	**905354.12**	**905354.12**	**0.00%**	2.44	3.88	**49.07%**
	15	**919788.26**	**919788.26**	**0.00%**	11.85	21.13	**919788.26**	**919788.26**	**0.00%**	3.72	14.83	**29.81%**
	16	**1153055.98**	**1153055.98**	**0.00%**	0.72	1.50	**1153055.98**	**1153055.98**	**0.00%**	0.82	1.45	**3.47%**
	17	**830261.47**	**830261.47**	**0.00%**	7.55	8.89	**830261.47**	**830261.47**	**0.00%**	2.87	4.31	**51.52%**
	18	**1445308.23**	**1445308.23**	**0.00%**	7.70	10.25	**1445308.23**	**1445308.23**	**0.00%**	2.55	5.29	**48.44%**
	19	**1174764.14**	**1174764.14**	**0.00%**	4.25	10.92	**1174760.64**	**1174764.14**	**0.00%**	1.28	5.61	**48.64%**
	20	**811139.47**	**811139.47**	**0.00%**	4.19	4.89	**811139.47**	**811139.47**	**0.00%**	1.65	2.24	**54.23%**
8%	1	**922260.81**	**922260.81**	**0.00%**	10.88	12.42	**922260.81**	**922260.81**	**0.00%**	3.63	5.22	**57.95%**
	2	**1020922.38**	**1020922.38**	**0.00%**	6.25	7.19	**1020922.38**	**1020922.38**	**0.00%**	3.58	6.99	**2.81%**
	3	**859114.23**	**859114.23**	**0.00%**	36.55	44.26	**859114.23**	**859114.23**	**0.00%**	6.53	11.94	**73.03%**
	4	**901436.14**	**901436.14**	**0.00%**	20.12	33.76	**901436.14**	**901436.14**	**0.00%**	5.44	9.66	**71.40%**
	5	**1199856.83**	**1199856.83**	**0.00%**	2.22	2.41	**1199856.83**	**1199856.83**	**0.00%**	1.11	1.30	**46.16%**
	6	**1027465.31**	**1027465.31**	**0.00%**	3.66	4.03	**1027465.31**	**1027465.31**	**0.00%**	2.11	2.45	**39.22%**
	7	**884075.47**	**884075.47**	**0.00%**	2.11	3.55	**884075.47**	**884075.47**	**0.00%**	1.08	2.19	**38.45%**
	8	**1378841.60**	**1378841.60**	**0.00%**	3.47	3.63	**1378841.60**	**1378841.60**	**0.00%**	2.53	2.66	**26.80%**
	9	**1312547.11**	**1312547.11**	**0.00%**	6.42	9.97	**1312547.11**	**1312547.11**	**0.00%**	1.59	3.87	**61.15%**
	10	**715094.90**	**715094.90**	**0.00%**	10.09	12.89	**715094.90**	**715094.90**	**0.00%**	2.53	5.04	**60.88%**
	11	**985399.96**	**985399.96**	**0.00%**	26.23	27.66	**985399.96**	**985399.96**	**0.00%**	6.73	8.05	**70.90%**
	12	**735862.45**	**735862.45**	**0.00%**	10.75	14.13	**735862.45**	**735862.45**	**0.00%**	4.14	8.20	**41.93%**
	13	**781616.92**	**781616.92**	**0.00%**	33.88	34.74	**781616.92**	**781616.92**	**0.00%**	2.77	4.17	**87.99%**
	14	**940574.54**	**940574.54**	**0.00%**	4.64	5.47	**940574.54**	**940574.54**	**0.00%**	2.23	3.49	**36.12%**
	15	**947928.26**	**947928.26**	**0.00%**	6.59	10.06	**947928.26**	**947928.26**	**0.00%**	3.04	9.62	**4.41%**
	16	**1193549.95**	**1193549.95**	**0.00%**	0.80	1.42	**1193549.95**	**1193549.95**	**0.00%**	0.86	1.54	-8.44%
	17	**865788.29**	**865788.29**	**0.00%**	7.61	9.13	**865788.29**	**865788.29**	**0.00%**	2.94	4.45	**51.22%**
	18	**1488899.82**	**1488899.82**	**0.00%**	7.11	9.67	**1488899.82**	**1488899.82**	**0.00%**	2.52	6.33	**34.57%**
	19	**1212197.97**	**1212197.97**	**0.00%**	4.14	7.09	**1212197.97**	**1212197.97**	**0.00%**	1.46	8.27	-16.62%
	20	**839571.48**	**839571.48**	**0.00%**	4.47	5.16	**839571.48**	**839571.48**	**0.00%**	1.75	2.30	**55.50%**
9%	1	**954168.02**	**954168.02**	**0.00%**	14.05	15.89	**954168.02**	**954168.02**	**0.00%**	3.64	5.26	**66.87%**
	2	**1059640.78**	**1059640.78**	**0.00%**	7.45	8.53	**1059640.78**	**1059640.78**	**0.00%**	2.95	3.98	**53.32%**
	3	**893859.49**	**893859.49**	**0.00%**	31.58	40.12	**893859.49**	**893859.49**	**0.00%**	6.27	11.30	**71.84%**
	4	**934083.84**	**934083.84**	**0.00%**	22.64	33.95	**934083.84**	**934083.84**	**0.00%**	6.02	20.91	**38.41%**
	5	**1238290.18**	**1238290.18**	**0.00%**	2.30	2.49	**1238290.18**	**1238290.18**	**0.00%**	1.19	1.39	**44.05%**
	6	**1071816.05**	**1071816.05**	**0.00%**	3.67	4.02	**1071816.05**	**1071816.05**	**0.00%**	2.00	2.33	**41.99%**
	7	**922554.25**	**922554.25**	**0.00%**	1.69	2.72	**922493.33**	**922554.25**	**0.00%**	0.97	2.05	**24.66%**
	8	**1419746.68**	**1419746.68**	**0.00%**	2.42	2.55	**1419746.68**	**1419746.68**	**0.00%**	2.73	2.89	-13.47%
	9	**1360180.01**	**1360180.01**	**0.00%**	5.38	8.11	**1360180.01**	**1360180.01**	**0.00%**	1.58	4.25	**47.54%**
	10	**739869.50**	**739869.50**	**0.00%**	6.83	8.53	**739869.50**	**739869.50**	**0.00%**	2.67	4.33	**49.27%**
	11	**1015607.91**	**1015607.91**	**0.00%**	14.38	15.64	**1015607.91**	**1015607.91**	**0.00%**	4.94	6.12	**60.86%**
	12	**757944.96**	**757944.96**	**0.00%**	9.59	11.97	**757944.96**	**757944.96**	**0.00%**	3.92	8.12	**32.11%**
	13	**804431.51**	**804431.51**	**0.00%**	36.80	37.66	**804431.51**	**804431.51**	**0.00%**	2.79	4.20	**88.85%**
	14	**976064.45**	**976064.45**	**0.00%**	5.00	5.78	**976064.45**	**976064.45**	**0.00%**	2.21	3.49	**39.62%**
	15	**976068.27**	**976068.27**	**0.00%**	6.05	8.81	**976068.27**	**976068.27**	**0.00%**	1.85	4.94	**43.94%**
	16	**1234451.74**	**1234451.74**	**0.00%**	0.77	1.83	**1234451.74**	**1234451.74**	**0.00%**	0.89	1.96	-7.00%
	17	**901391.84**	**901391.84**	**0.00%**	6.39	7.27	**901391.84**	**901391.84**	**0.00%**	2.47	3.37	**53.61%**
	18	**1533087.10**	**1533087.10**	**0.00%**	6.03	8.28	**1533087.10**	**1533087.10**	**0.00%**	2.91	6.97	**15.82%**
	19	**1249631.80**	**1249631.80**	**0.00%**	3.30	5.87	**1249631.80**	**1249631.80**	**0.00%**	1.24	5.55	**5.57%**
	20	**869288.89**	**869288.89**	**0.00%**	4.02	4.63	**869288.89**	**869288.89**	**0.00%**	1.99	2.50	**45.88%**
10%	1	**986075.23**	**986075.23**	**0.00%**	12.00	13.52	**986075.23**	**986075.23**	**0.00%**	3.26	4.86	**64.07%**
	2	**1098368.11**	**1098368.11**	**0.00%**	6.09	7.03	**1098368.11**	**1098368.11**	**0.00%**	2.99	3.94	**44.00%**
	3	**928604.75**	**928604.75**	**0.00%**	23.52	32.23	**928604.75**	**928604.75**	**0.00%**	5.55	13.02	**59.62%**
	4	**966713.03**	**966731.54**	**0.00%**	14.38	22.63	**966731.54**	**966731.54**	**0.00%**	6.11	20.47	**9.52%**
	5	**1276723.54**	**1276723.54**	**0.00%**	1.58	1.80	**1276723.54**	**1276723.54**	**0.00%**	1.13	1.33	**26.00%**
	6	**1116395.39**	**1116395.39**	**0.00%**	3.11	3.42	**1116395.39**	**1116395.39**	**0.00%**	2.06	2.36	**31.01%**
	7	**961122.49**	**961122.49**	**0.00%**	1.31	2.42	**961122.49**	**961122.49**	**0.00%**	1.07	2.83	-16.89%
	8	**1460670.33**	**1460670.33**	**0.00%**	2.47	2.63	**1460670.33**	**1460670.33**	**0.00%**	2.67	2.80	-6.55%
	9	**1407812.92**	**1407812.92**	**0.00%**	5.19	7.31	**1407812.92**	**1407812.92**	**0.00%**	2.29	7.76	-6.17%
	10	**762778.66**	**762778.66**	**0.00%**	6.05	7.66	**762756.79**	**762778.66**	**0.00%**	2.74	4.46	**41.80%**

11	**1046981.75**	**1046981.75**	**0.00%**	12.92	14.16	**1046981.75**	**1046981.75**	**0.00%**	4.28	5.57	**60.68%**
12	**783172.26**	**783172.26**	**0.00%**	6.92	9.14	**783172.26**	**783172.26**	**0.00%**	4.22	8.86	**3.02%**
13	**827360.59**	**827360.59**	**0.00%**	20.70	22.03	**827360.59**	**827360.59**	**0.00%**	2.78	5.16	**76.60%**
14	**1011579.30**	**1011579.30**	**0.00%**	5.97	7.23	**1011579.30**	**1011579.30**	**0.00%**	2.37	3.70	**48.82%**
15	**1004208.28**	**1004208.28**	**0.00%**	4.83	8.21	**1004208.28**	**1004208.28**	**0.00%**	1.92	5.14	**37.34%**
16	**1275747.10**	**1275747.10**	**0.00%**	0.70	1.73	**1275747.10**	**1275747.10**	**0.00%**	0.85	1.93	-11.14%
17	**937565.32**	**937565.32**	**0.00%**	3.35	3.81	**937565.32**	**937565.32**	**0.00%**	2.56	4.38	-14.74%
18	**1578906.78**	**1578906.78**	**0.00%**	5.84	8.16	**1578906.78**	**1578906.78**	**0.00%**	4.06	7.87	**3.45%**
19	**1287065.64**	**1287065.64**	**0.00%**	3.19	5.53	**1287065.64**	**1287065.64**	**0.00%**	1.08	5.51	**0.33%**
20	**903069.24**	**903069.24**	**0.00%**	4.16	4.70	**903069.24**	**903069.24**	**0.00%**	1.90	2.86	**39.23%**

Table 12: Comparison Results When $|\mathbb{M}^s| = 3$, $K = 20$, $\Gamma_D = 8$, and $\Gamma_R = 20$

ε	Instance	CG					OA-CG					$\mathcal{P}_T$
		L^C	U^C	G^C	Time (s)		L	U	G	Time (s)		
					RP	Total				RP	Total	
5%	1	**918170.76**	**918170.76**	**0.00%**	6.31	7.25	**918170.76**	**918170.76**	**0.00%**	3.31	4.17	**42.48%**
	2	**1001517.29**	**1001517.29**	**0.00%**	3.81	5.37	**1001517.29**	**1001517.29**	**0.00%**	2.11	3.59	**33.11%**
	3	**834593.06**	**834593.06**	**0.00%**	29.22	34.14	**834593.06**	**834593.06**	**0.00%**	13.66	16.10	**52.85%**
	4	**878113.72**	**878113.72**	**0.00%**	13.33	22.79	**878113.72**	**878113.72**	**0.00%**	4.14	11.55	**49.34%**
	5	**1107092.99**	**1107092.99**	**0.00%**	2.14	2.53	**1107092.99**	**1107092.99**	**0.00%**	1.72	1.87	**25.96%**
	6	**988638.46**	**988638.46**	**0.00%**	2.50	3.25	**988638.46**	**988638.46**	**0.00%**	1.45	2.09	**35.63%**
	7	**814054.85**	**814054.85**	**0.00%**	0.92	2.01	**814054.85**	**814054.85**	**0.00%**	1.00	2.00	**0.65%**
	8	**1309291.80**	**1309291.80**	**0.00%**	4.75	4.92	**1309291.80**	**1309291.80**	**0.00%**	3.61	3.75	**23.85%**
	9	**1224233.60**	**1224233.60**	**0.00%**	2.97	4.66	**1224233.60**	**1224233.60**	**0.00%**	1.28	3.31	**28.95%**
	10	**694099.72**	**694099.72**	**0.00%**	5.64	7.80	**694099.72**	**694099.72**	**0.00%**	2.00	3.63	**53.51%**
	11	**985283.45**	**985283.45**	**0.00%**	10.38	11.16	**985283.45**	**985283.45**	**0.00%**	3.55	4.66	**58.25%**
	12	**711473.20**	**711473.20**	**0.00%**	10.81	14.58	**711473.20**	**711473.20**	**0.00%**	2.86	7.33	**49.73%**
	13	**767561.17**	**767561.17**	**0.00%**	26.63	28.05	**767561.17**	**767561.17**	**0.00%**	3.20	4.89	**82.56%**
	14	**903624.52**	**903624.52**	**0.00%**	3.08	3.50	**903624.52**	**903624.52**	**0.00%**	1.72	2.17	**38.00%**
	15	**900626.81**	**900626.81**	**0.00%**	5.45	12.56	**900626.81**	**900626.81**	**0.00%**	2.83	8.20	**34.72%**
	16	**1106317.80**	**1106317.80**	**0.00%**	1.03	3.42	**1106317.80**	**1106317.80**	**0.00%**	1.25	3.18	**6.95%**
	17	**842196.94**	**842196.94**	**0.00%**	6.77	7.92	**842196.94**	**842196.94**	**0.00%**	2.50	3.25	**58.97%**
	18	**1388622.34**	**1388622.34**	**0.00%**	4.70	6.39	**1388622.34**	**1388622.34**	**0.00%**	2.47	3.88	**39.33%**
	19	**1135168.76**	**1135168.76**	**0.00%**	2.11	4.10	**1135149.96**	**1135168.76**	**0.00%**	1.27	2.73	**33.24%**
	20	**795710.67**	**795710.67**	**0.00%**	4.56	5.24	**795710.67**	**795710.67**	**0.00%**	1.59	2.05	**60.92%**
6%	1	**956916.11**	**956916.11**	**0.00%**	5.31	5.87	**956916.11**	**956916.11**	**0.00%**	3.04	3.58	**39.02%**
	2	**1049312.55**	**1049312.55**	**0.00%**	3.55	5.50	**1049312.55**	**1049312.55**	**0.00%**	1.58	3.37	**38.70%**
	3	**875530.17**	**875530.17**	**0.00%**	24.74	27.72	**875530.17**	**875530.17**	**0.00%**	12.96	15.36	**44.58%**
	4	**917799.86**	**917799.86**	**0.00%**	14.87	26.14	**917799.86**	**917799.86**	**0.00%**	3.69	15.25	**41.65%**
	5	**1148986.29**	**1148986.29**	**0.00%**	2.78	3.16	**1148986.29**	**1148986.29**	**0.00%**	1.61	1.77	**44.01%**
	6	**1039430.17**	**1039430.17**	**0.00%**	2.00	2.92	**1039430.17**	**1039430.17**	**0.00%**	1.30	1.98	**32.08%**
	7	**856632.89**	**856632.89**	**0.00%**	1.31	2.91	**856632.89**	**856632.89**	**0.00%**	0.98	2.08	**28.50%**
	8	**1355292.46**	**1355292.46**	**0.00%**	5.23	5.41	**1355292.46**	**1355292.46**	**0.00%**	3.41	3.55	**34.41%**
	9	**1278137.56**	**1278137.56**	**0.00%**	2.73	4.81	**1278137.56**	**1278137.56**	**0.00%**	1.17	3.51	**27.06%**
	10	**725242.88**	**725242.88**	**0.00%**	5.22	6.66	**725242.88**	**725242.88**	**0.00%**	1.86	3.03	**54.49%**
	11	**1021129.69**	**1021129.69**	**0.00%**	9.56	10.53	**1021129.69**	**1021129.69**	**0.00%**	3.36	4.64	**55.92%**
	12	**736411.53**	**736411.53**	**0.00%**	11.98	16.28	**736411.53**	**736411.53**	**0.00%**	4.34	10.09	**38.00%**
	13	**796010.93**	**796010.93**	**0.00%**	16.84	18.56	**796010.93**	**796010.93**	**0.00%**	2.99	5.14	**72.29%**
	14	**943823.64**	**943823.64**	**0.00%**	2.45	3.00	**943823.64**	**943823.64**	**0.00%**	2.25	2.74	**8.77%**
	15	**932780.13**	**932781.12**	**0.00%**	4.73	12.22	**932781.12**	**932781.12**	**0.00%**	2.27	8.44	**30.92%**
	16	**1149885.46**	**1149885.46**	**0.00%**	0.56	1.30	**1149885.46**	**1149885.46**	**0.00%**	0.81	1.44	-10.72%
	17	**883509.43**	**883509.43**	**0.00%**	6.56	7.75	**883509.43**	**883509.43**	**0.00%**	2.64	3.65	**52.88%**
	18	**1437089.18**	**1437089.18**	**0.00%**	6.42	9.19	**1437089.18**	**1437089.18**	**0.00%**	2.42	4.61	**49.85%**
	19	**1177926.69**	**1177926.69**	**0.00%**	2.56	4.28	**1177907.88**	**1177926.69**	**0.00%**	1.13	2.71	**36.81%**
	20	**829025.22**	**829025.22**	**0.00%**	4.25	4.81	**829025.22**	**829025.22**	**0.00%**	1.30	1.87	**61.22%**
7%	1	**996427.22**	**996427.22**	**0.00%**	7.48	8.23	**996427.22**	**996427.22**	**0.00%**	3.06	3.60	**56.34%**
	2	**1097203.72**	**1097203.72**	**0.00%**	6.97	12.17	**1097203.72**	**1097203.72**	**0.00%**	1.72	4.09	**66.36%**
	3	**916467.29**	**916467.29**	**0.00%**	26.44	30.25	**916467.29**	**916467.29**	**0.00%**	10.39	14.12	**53.31%**
	4	**957486.01**	**957486.01**	**0.00%**	15.34	29.09	**957486.01**	**957486.01**	**0.00%**	3.99	13.52	**53.54%**
	5	**1190879.59**	**1190879.59**	**0.00%**	3.02	3.47	**1190879.59**	**1190879.59**	**0.00%**	1.69	1.83	**47.25%**
	6	**1091033.04**	**1091033.04**	**0.00%**	1.88	2.34	**1091033.04**	**1091033.04**	**0.00%**	1.06	1.39	**40.83%**
	7	**899210.93**	**899210.93**	**0.00%**	1.70	3.30	**899210.93**	**899210.93**	**0.00%**	1.08	2.24	**32.10%**
	8	**1401922.09**	**1401922.09**	**0.00%**	3.64	3.78	**1401922.09**	**1401922.09**	**0.00%**	2.76	3.02	**20.26%**
	9	**1332041.52**	**1332041.52**	**0.00%**	2.72	4.64	**1332041.52**	**1332041.52**	**0.00%**	1.27	3.45	**25.57%**
	10	**755636.96**	**755636.96**	**0.00%**	5.72	7.65	**755636.96**	**755636.96**	**0.00%**	2.19	3.72	**51.37%**
	11	**1060801.58**	**1060801.58**	**0.00%**	7.94	8.91	**1060801.58**	**1060801.58**	**0.00%**	2.71	3.89	**56.38%**
	12	**760887.96**	**760887.96**	**0.00%**	9.58	12.00	**760887.96**	**760887.96**	**0.00%**	4.22	6.89	**42.59%**
	13	**824714.30**	**824714.30**	**0.00%**	14.42	15.81	**824714.30**	**824714.30**	**0.00%**	3.17	4.30	**72.82%**

	14	**984022.76**	**984022.76**	**0.00%**	2.80	3.28	**984022.76**	**984022.76**	**0.00%**	1.89	2.32	**29.39%**
	15	**965395.40**	**965395.40**	**0.00%**	2.91	6.75	**965395.40**	**965395.40**	**0.00%**	1.86	5.42	**19.69%**
	16	**1193595.52**	**1193595.52**	**0.00%**	0.45	1.09	**1193595.52**	**1193595.52**	**0.00%**	0.89	1.50	-37.29%
	17	**925266.62**	**925266.62**	**0.00%**	8.34	9.89	**925266.62**	**925266.62**	**0.00%**	2.41	4.53	**54.16%**
	18	**1490581.51**	**1490581.51**	**0.00%**	5.78	8.45	**1490581.51**	**1490581.51**	**0.00%**	2.28	4.25	**49.75%**
	19	**1220684.61**	**1220684.61**	**0.00%**	2.02	3.55	**1220665.80**	**1220684.61**	**0.00%**	1.20	2.74	**22.86%**
	20	**862933.34**	**862933.34**	**0.00%**	2.84	3.40	**862933.34**	**862933.34**	**0.00%**	1.08	1.55	**54.61%**
8%	1	**1035938.33**	**1035938.33**	**0.00%**	6.80	7.50	**1035938.33**	**1035938.33**	**0.00%**	3.34	4.75	**36.67%**
	2	**1145146.20**	**1145146.20**	**0.00%**	5.99	9.75	**1145146.20**	**1145146.20**	**0.00%**	2.17	4.88	**49.98%**
	3	**957407.92**	**957407.92**	**0.00%**	22.71	25.88	**957407.92**	**957407.92**	**0.00%**	9.88	12.80	**50.54%**
	4	**997172.15**	**997172.15**	**0.00%**	10.48	19.86	**997172.15**	**997172.15**	**0.00%**	4.10	19.98	-0.60%
	5	**1232772.89**	**1232772.89**	**0.00%**	2.38	2.75	**1232772.89**	**1232772.89**	**0.00%**	1.78	1.94	**29.56%**
	6	**1143590.28**	**1143590.28**	**0.00%**	1.13	1.55	**1143590.28**	**1143590.28**	**0.00%**	0.91	1.29	**16.88%**
	7	**941788.97**	**941788.97**	**0.00%**	1.05	2.24	**941788.97**	**941788.97**	**0.00%**	1.10	2.10	**6.22%**
	8	**1448612.97**	**1448612.97**	**0.00%**	3.19	3.35	**1448612.97**	**1448612.97**	**0.00%**	3.10	3.38	-0.99%
	9	**1385945.48**	**1385945.48**	**0.00%**	2.30	3.89	**1385945.48**	**1385945.48**	**0.00%**	1.27	3.55	**8.79%**
	10	**787382.99**	**787382.99**	**0.00%**	4.80	6.53	**787382.99**	**787382.99**	**0.00%**	2.17	3.69	**43.51%**
	11	**1100475.59**	**1100475.59**	**0.00%**	6.59	7.47	**1100475.59**	**1100475.59**	**0.00%**	2.50	3.57	**52.28%**
	12	**786890.16**	**786890.16**	**0.00%**	7.59	9.31	**786890.16**	**786890.16**	**0.00%**	4.30	7.27	**21.93%**
	13	**854147.54**	**854147.54**	**0.00%**	12.88	14.42	**854147.54**	**854147.54**	**0.00%**	3.40	4.39	**69.57%**
	14	**1027046.04**	**1027046.04**	**0.00%**	2.44	2.95	**1027046.04**	**1027046.04**	**0.00%**	1.92	2.32	**21.57%**
	15	**1004554.19**	**1004554.19**	**0.00%**	3.02	9.14	**1004554.19**	**1004554.19**	**0.00%**	1.48	3.67	**59.82%**
	16	**1238025.96**	**1238025.96**	**0.00%**	0.51	1.28	**1238025.96**	**1238025.96**	**0.00%**	0.97	1.52	-18.36%
	17	**968475.42**	**968475.42**	**0.00%**	6.45	7.59	**968475.42**	**968475.42**	**0.00%**	2.54	4.70	**38.14%**
	18	**1545838.50**	**1545838.50**	**0.00%**	6.27	9.25	**1545769.49**	**1545838.50**	**0.00%**	2.04	4.28	**53.72%**
	19	**1263442.54**	**1263442.54**	**0.00%**	0.89	1.81	**1263423.73**	**1263442.54**	**0.00%**	0.88	1.63	**10.21%**
	20	**900341.83**	**900341.83**	**0.00%**	3.56	4.59	**900341.83**	**900341.83**	**0.00%**	1.27	2.06	**55.16%**
9%	1	**1075449.43**	**1075449.43**	**0.00%**	6.06	6.67	**1075449.43**	**1075449.43**	**0.00%**	2.80	3.69	**44.76%**
	2	**1193089.64**	**1193089.64**	**0.00%**	6.00	10.42	**1193089.64**	**1193089.64**	**0.00%**	2.03	4.86	**53.37%**
	3	**998362.17**	**998362.17**	**0.00%**	15.73	19.00	**998362.17**	**998362.17**	**0.00%**	7.87	11.86	**37.58%**
	4	**1036858.30**	**1036858.30**	**0.00%**	11.86	22.19	**1036858.30**	**1036858.30**	**0.00%**	3.62	11.45	**48.38%**
	5	**1282010.10**	**1282010.10**	**0.00%**	2.13	2.31	**1282010.10**	**1282010.10**	**0.00%**	2.75	3.09	-33.74%
	6	**1196392.58**	**1196392.58**	**0.00%**	1.39	1.83	**1196392.58**	**1196392.58**	**0.00%**	0.97	1.33	**27.34%**
	7	**984367.00**	**984367.00**	**0.00%**	1.55	3.63	**984367.00**	**984367.00**	**0.00%**	1.28	3.08	**15.09%**
	8	**1495744.01**	**1495744.01**	**0.00%**	2.56	2.74	**1495744.01**	**1495744.01**	**0.00%**	2.47	2.63	**4.06%**
	9	**1439849.45**	**1439849.45**	**0.00%**	1.97	3.64	**1439849.45**	**1439849.45**	**0.00%**	1.16	2.71	**25.65%**
	10	**819252.55**	**819252.55**	**0.00%**	4.11	6.11	**819252.55**	**819252.55**	**0.00%**	2.05	3.42	**44.03%**
	11	**1140150.98**	**1140150.98**	**0.00%**	6.69	7.57	**1140150.98**	**1140150.98**	**0.00%**	2.26	3.53	**53.38%**
	12	**814568.19**	**814568.19**	**0.00%**	8.75	10.34	**814568.19**	**814568.19**	**0.00%**	4.33	7.49	**27.61%**
	13	**883858.92**	**883858.92**	**0.00%**	13.98	15.50	**883858.92**	**883858.92**	**0.00%**	3.13	4.39	**71.65%**
	14	**1070674.05**	**1070674.05**	**0.00%**	2.61	3.09	**1070674.05**	**1070674.05**	**0.00%**	1.79	2.18	**29.67%**
	15	**1046219.72**	**1046219.72**	**0.00%**	2.05	4.61	**1046219.72**	**1046219.72**	**0.00%**	1.31	3.46	**25.02%**
	16	**1282709.38**	**1282709.38**	**0.00%**	0.50	1.14	**1282709.38**	**1282709.38**	**0.00%**	0.88	1.42	-24.63%
	17	**1011985.04**	**1011985.04**	**0.00%**	5.94	6.92	**1011985.04**	**1011985.04**	**0.00%**	2.50	3.37	**51.29%**
	18	**1605219.95**	**1605219.95**	**0.00%**	5.63	8.86	**1605219.95**	**1605219.95**	**0.00%**	1.89	5.23	**40.98%**
	19	**1306228.35**	**1306228.35**	**0.00%**	1.06	1.92	**1306181.65**	**1306228.35**	**0.00%**	1.02	1.77	**8.01%**
	20	**940807.73**	**940807.73**	**0.00%**	4.84	9.48	**940807.73**	**940807.73**	**0.00%**	2.42	7.03	**25.83%**
10%	1	**1115071.29**	**1115071.29**	**0.00%**	8.19	8.87	**1115071.29**	**1115071.29**	**0.00%**	3.16	4.14	**53.35%**
	2	**1241044.71**	**1241044.71**	**0.00%**	4.95	8.76	**1241044.71**	**1241044.71**	**0.00%**	1.87	4.82	**44.96%**
	3	**1039317.25**	**1039317.25**	**0.00%**	14.23	17.34	**1039317.25**	**1039317.25**	**0.00%**	7.57	9.95	**42.65%**
	4	**1076544.44**	**1076544.44**	**0.00%**	12.51	23.69	**1076544.44**	**1076544.44**	**0.00%**	3.72	12.72	**46.29%**
	5	**1334938.27**	**1334938.27**	**0.00%**	0.81	1.02	**1334938.27**	**1335070.27**	**0.00%**	1.72	2.11	-107.68%
	6	**1249204.59**	**1249204.59**	**0.00%**	1.16	1.53	**1249204.59**	**1249204.59**	**0.00%**	0.87	1.20	**21.62%**
	7	**1027179.50**	**1027179.50**	**0.00%**	1.55	3.70	**1027179.50**	**1027179.50**	**0.00%**	1.18	2.78	**24.98%**
	8	**1543069.51**	**1543069.51**	**0.00%**	3.25	3.42	**1543069.51**	**1543069.51**	**0.00%**	2.56	2.74	**20.05%**
	9	**1493753.41**	**1493753.41**	**0.00%**	2.06	3.73	**1493753.41**	**1493753.41**	**0.00%**	1.27	3.53	**5.33%**
	10	**851391.60**	**851391.60**	**0.00%**	2.84	3.84	**851391.60**	**851391.60**	**0.00%**	1.64	2.55	**33.63%**

11	**1179887.56**	**1179887.56**	**0.00%**	6.06	6.86	**1179887.56**	**1179887.56**	**0.00%**	2.50	3.46	**49.61%**
12	**845141.53**	**845141.53**	**0.00%**	7.23	8.84	**845141.53**	**845141.53**	**0.00%**	2.97	5.14	**41.84%**
13	**913577.83**	**913577.83**	**0.00%**	13.05	15.36	**913577.83**	**913577.83**	**0.00%**	3.19	4.82	**68.63%**
14	**1114827.55**	**1114827.55**	**0.00%**	2.09	2.45	**1114827.55**	**1114827.55**	**0.00%**	1.64	1.99	**19.00%**
15	**1091033.78**	**1091137.78**	**0.00%**	1.83	4.75	**1091137.78**	**1091137.78**	**0.00%**	1.28	3.58	**24.68%**
16	**1328917.55**	**1329010.60**	**0.00%**	0.47	1.11	**1329010.29**	**1329010.60**	**0.00%**	1.25	2.24	-101.62%
17	**1055710.84**	**1055710.84**	**0.00%**	5.45	6.47	**1055710.84**	**1055710.84**	**0.00%**	2.12	2.95	**54.44%**
18	**1662748.10**	**1662748.10**	**0.00%**	8.89	15.80	**1662748.10**	**1662748.10**	**0.00%**	2.81	9.23	**41.55%**
19	**1349171.59**	**1349171.59**	**0.00%**	1.27	2.08	**1349171.59**	**1349171.59**	**0.00%**	1.08	3.44	-65.32%
20	**974691.01**	**974691.01**	**0.00%**	3.70	6.41	**974691.01**	**974691.01**	**0.00%**	1.90	4.26	**33.56%**

Table 13: Comparison Results When $|\mathbb{M}^s| = 4$

Γ_D	Γ_R	Instance	CG					OA-CG					$\mathcal{P}_T$	$\mathcal{P}_G$	$\mathcal{P}_F$
			L^C	U^C	G^C	Time (s)		L	U	G	Time (s)				
						RP	Total				RP	Total			
4	10	1	**595310.61**	**595310.61**	**0.00%**	2260.77	2356.74	**595310.61**	**595310.61**	**0.00%**	270.53	315.47	**86.61%**	-	0.00%
		2	**746287.18**	**746287.18**	**0.00%**	1315.90	1435.75	**746287.18**	**746287.18**	**0.00%**	98.64	191.53	**86.66%**	-	0.00%
		3	**621274.01**	**621274.01**	**0.00%**	1814.16	2075.95	**621274.01**	**621274.01**	**0.00%**	129.40	524.37	**74.74%**	-	0.00%
		4	**826032.85**	**826032.85**	**0.00%**	547.30	696.49	**826032.85**	**826032.85**	**0.00%**	337.26	506.20	**27.32%**	-	0.00%
		5	**720894.59**	**720923.32**	**0.00%**	160.89	184.17	**720923.32**	**720923.32**	**0.00%**	74.84	114.74	**37.70%**	-	0.00%
		6	**1081879.72**	**1081879.72**	**0.00%**	437.64	487.03	**1081879.72**	**1081879.72**	**0.00%**	79.75	126.02	**74.13%**	-	0.00%
		7	**696092.17**	**696092.17**	**0.00%**	2294.31	2333.31	**696092.17**	**696092.17**	**0.00%**	907.58	926.72	**60.28%**	-	0.00%
		8	**689664.55**	**689664.55**	**0.00%**	1112.39	1170.58	**689664.55**	**689664.55**	**0.00%**	104.64	179.21	**84.69%**	-	0.00%
		9	**857046.18**	**857090.61**	**0.00%**	245.72	356.46	**857046.18**	**857090.61**	**0.00%**	24.05	132.24	**62.90%**	-	0.00%
		10	**866085.65**	**866085.65**	**0.00%**	152.53	187.20	**866085.65**	**866085.65**	**0.00%**	31.38	63.97	**65.83%**	-	0.00%
		11	**588378.35**	**588378.35**	**0.00%**	985.52	1310.25	**588358.17**	**588378.35**	**0.00%**	78.20	273.38	**79.14%**	-	0.00%
		12	**800504.08**	**800504.08**	**0.00%**	1508.72	1529.89	**800504.08**	**800504.08**	**0.00%**	642.98	742.23	**51.48%**	-	0.00%
		13	**844454.43**	**844454.43**	**0.00%**	419.06	534.73	**844454.43**	**844454.43**	**0.00%**	94.04	387.19	**27.59%**	-	0.00%
		14	**715190.98**	**715190.98**	**0.00%**	480.67	639.03	**715190.98**	**715190.98**	**0.00%**	66.18	329.46	**48.44%**	-	0.00%
		15	**772098.18**	**772098.18**	**0.00%**	262.36	416.20	**772098.18**	**772098.18**	**0.00%**	56.80	279.49	**32.85%**	-	0.00%
		16	**667069.80**	**667069.80**	**0.00%**	526.13	1114.81	**667069.80**	**667069.80**	**0.00%**	52.76	766.84	**31.21%**	-	0.00%
		17	**769166.54**	**769166.54**	**0.00%**	1081.95	1157.77	**769166.54**	**769166.54**	**0.00%**	60.91	138.42	**88.04%**	-	0.00%
		18	**764927.80**	**764927.80**	**0.00%**	62.22	78.03	**764927.80**	**764927.80**	**0.00%**	14.62	29.53	**62.16%**	-	0.00%
		19	**582048.05**	**582048.05**	**0.00%**	2431.33	5040.56	**582048.05**	**582048.05**	**0.00%**	264.06	1342.00	**73.38%**	-	0.00%
		20	**1102896.15**	**1102896.15**	**0.00%**	48.20	69.16	**1102896.15**	**1102896.15**	**0.00%**	12.60	35.05	**49.31%**	-	0.00%
4	15	1	615489.64	654901.29	6.02%	7173.62	7200.00	**643090.99**	**643090.99**	**0.00%**	536.85	753.58	**89.53%**	**100.00%**	**1.80%**
		2	**802309.15**	**802309.15**	**0.00%**	6185.14	6659.51	**802309.15**	**802309.15**	**0.00%**	129.25	448.94	**93.26%**	-	0.00%
		3	647569.72	671721.61	3.60%	7175.42	7200.00	**671721.61**	**671721.61**	**0.00%**	2289.07	2803.85	**61.06%**	**100.00%**	0.00%
		4	**906766.86**	**906766.86**	**0.00%**	2207.14	2943.12	**906766.86**	**906766.86**	**0.00%**	339.40	633.89	**78.46%**	-	0.00%
		5	**775549.07**	**775549.07**	**0.00%**	632.75	773.06	**775549.07**	**775549.07**	**0.00%**	197.97	496.11	**35.83%**	-	0.00%
		6	**1157498.17**	**1157498.17**	**0.00%**	699.05	724.58	**1157498.17**	**1157498.17**	**0.00%**	152.14	177.33	**75.53%**	-	0.00%
		7	**743236.60**	**743236.60**	**0.00%**	4182.17	4242.55	**743236.60**	**743236.60**	**0.00%**	254.44	287.59	**93.22%**	-	0.00%
		8	**744603.72**	**744603.72**	**0.00%**	2330.36	2474.78	**744603.72**	**744603.72**	**0.00%**	202.67	330.37	**86.65%**	-	0.00%
		9	**945166.54**	**945166.54**	**0.00%**	162.72	208.78	**945166.54**	**945166.54**	**0.00%**	24.12	128.52	**38.44%**	-	0.00%
		10	**940529.22**	**940529.22**	**0.00%**	122.70	148.81	**940529.22**	**940529.22**	**0.00%**	20.92	56.23	**62.21%**	-	0.00%
		11	**617112.52**	**617112.52**	**0.00%**	2925.25	3226.34	**617060.98**	**617112.52**	**0.00%**	181.42	486.65	**84.92%**	-	0.00%
		12	**868167.22**	**868167.22**	**0.00%**	3199.11	3270.87	**868167.22**	**868167.22**	**0.00%**	471.34	525.61	**83.93%**	-	0.00%
		13	**913894.46**	**913917.92**	**0.00%**	886.41	1339.77	**913917.92**	**913917.92**	**0.00%**	60.08	338.22	**74.76%**	-	0.00%
		14	**769213.84**	**769260.12**	**0.00%**	1598.59	1759.19	**769260.12**	**769260.12**	**0.00%**	146.70	244.91	**86.08%**	-	0.00%
		15	**823814.61**	**823814.61**	**0.00%**	1632.36	1935.83	**823814.61**	**823814.61**	**0.00%**	109.08	317.32	**83.61%**	-	0.00%
		16	**719750.56**	**719750.56**	**0.00%**	1355.11	2812.95	**719750.56**	**719750.56**	**0.00%**	98.28	1253.65	**55.43%**	-	0.00%
		17	**820156.57**	**820195.62**	**0.00%**	3941.72	4134.87	**820195.62**	**820195.62**	**0.00%**	160.37	481.62	**88.35%**	-	0.00%
		18	**818156.35**	**818156.35**	**0.00%**	39.19	46.01	**818156.35**	**818156.35**	**0.00%**	21.80	25.02	**45.63%**	-	0.00%
		19	**631975.74**	**632007.29**	**0.00%**	3517.61	5090.34	**632007.29**	**632007.29**	**0.00%**	252.54	1513.60	**70.27%**	-	0.00%
		20	**1172363.11**	**1172363.11**	**0.00%**	177.74	244.91	**1172363.11**	**1172363.11**	**0.00%**	22.50	87.41	**64.31%**	-	0.00%
6	15	1	684354.69	717891.62	4.67%	7184.22	7200.00	**704961.57**	**704961.57**	**0.00%**	3811.95	4214.18	**41.47%**	**100.00%**	**1.80%**
		2	870576.75	880137.97	1.09%	6991.00	7200.00	**877359.76**	**877359.76**	**0.00%**	993.75	1441.00	**79.99%**	**100.00%**	**0.32%**
		3	688161.74	744280.11	7.54%	7194.38	7200.00	**725351.10**	**725351.10**	**0.00%**	3807.23	4371.25	**39.29%**	**100.00%**	**2.54%**
		4	**1014365.62**	**1014365.62**	**0.00%**	5090.92	5884.98	**1014365.62**	**1014365.62**	**0.00%**	499.08	1480.86	**74.84%**	-	0.00%
		5	**865000.26**	**865000.26**	**0.00%**	810.41	907.39	**865000.26**	**865000.26**	**0.00%**	419.24	623.99	**31.23%**	-	0.00%
		6	**1302455.56**	**1302455.56**	**0.00%**	729.28	775.01	**1302455.56**	**1302455.56**	**0.00%**	83.37	107.16	**86.17%**	-	0.00%
		7	760095.38	859143.37	11.53%	7199.24	7200.00	**815633.88**	**815654.90**	**0.00%**	547.13	590.24	**91.80%**	**100.00%**	**5.06%**
		8	830346.16	830607.16	0.03%	7170.39	7200.00	**830607.16**	**830607.16**	**0.00%**	621.61	683.27	**90.51%**	**100.00%**	0.00%
		9	**1041192.55**	**1041192.55**	**0.00%**	294.11	390.48	**1041192.55**	**1041192.55**	**0.00%**	44.36	122.47	**68.64%**	-	0.00%
		10	**1009760.17**	**1009760.17**	**0.00%**	866.95	903.53	**1009760.17**	**1009760.17**	**0.00%**	79.24	210.82	**76.67%**	-	0.00%
		11	664913.70	665163.60	0.04%	6381.44	7200.00	**664913.70**	**664913.70**	**0.00%**	302.50	1148.66	**84.05%**	**100.00%**	**0.04%**
		12	933431.43	984155.88	5.15%	7176.08	7200.00	**955821.86**	**955821.86**	**0.00%**	1776.66	1922.96	**73.29%**	**100.00%**	**2.88%**
		13	**1008513.87**	**1008513.87**	**0.00%**	884.36	1085.88	**1008513.87**	**1008513.87**	**0.00%**	98.27	350.99	**67.68%**	-	0.00%
		14	**843383.73**	**843383.73**	**0.00%**	4575.75	4850.03	**843383.73**	**843383.73**	**0.00%**	294.07	402.33	**91.70%**	-	0.00%
		15	875643.72	884079.96	0.95%	6801.69	7200.00	**884079.96**	**884079.96**	**0.00%**	1088.92	1977.62	**72.53%**	**100.00%**	0.00%
		16	**790442.31**	**790442.31**	**0.00%**	2602.63	6117.03	**790442.31**	**790442.31**	**0.00%**	176.48	3558.31	**41.83%**	-	0.00%
		17	897655.90	905970.59	0.92%	7106.97	7200.00	**905970.59**	**905970.59**	**0.00%**	405.92	699.56	**90.28%**	**100.00%**	0.00%
		18	**904010.15**	**904010.15**	**0.00%**	87.02	97.31	**904010.15**	**904010.15**	**0.00%**	21.75	33.19	**65.89%**	-	0.00%
		19	696339.05	700756.48	0.63%	5547.38	7200.00	**700756.48**	**700756.48**	**0.00%**	432.92	3482.50	**51.63%**	**100.00%**	0.00%
		20	**1251470.12**	**1251470.12**	**0.00%**	911.05	1007.83	**1251470.12**	**1251470.12**	**0.00%**	225.25	322.19	**68.03%**	-	0.00%
8	10	1	705406.17	712028.13	0.93%	7183.16	7200.00	**712028.13**	**712028.13**	**0.00%**	1498.18	1536.77	**78.66%**	**100.00%**	0.00%
		2	**893809.71**	**893809.71**	**0.00%**	3042.31	3141.63	**893809.71**	**893809.71**	**0.00%**	112.27	176.63	**94.38%**	-	0.00%
		3	695476.45	749524.29	7.21%	7197.80	7200.00	**727913.21**	**727913.21**	**0.00%**	3365.19	3642.79	**49.41%**	**100.00%**	**2.88%**
		4	**1028605.32**	**1028605.32**	**0.00%**	805.42	979.52	**1028605.32**	**1028605.32**	**0.00%**	223.44	372.03	**62.02%**	-	0.00%
		5	**879065.78**	**879065.78**	**0.00%**	235.13	275.98	**879065.78**	**879065.78**	**0.00%**	142.57	204.06	**26.06%**	-	0.00%
		6	**1333015.79**	**1333015.79**	**0.00%**	165.38	217.25	**1333015.79**	**1333015.79**	**0.00%**	28.48	85.31	**60.73%**	-	0.00%
		7	**826726.85**	**826726.85**	**0.00%**	2905.17	2920.35	**826726.85**	**826726.85**	**0.00%**	1603.28	1618.23	**44.59%**	-	0.00%
		8	**834755.50**	**834755.50**	**0.00%**	3747.16	3778.81	**834755.50**	**834755.50**	**0.00%**	852.53	886.93	**76.53%**	-	0.00%
		9	**1027236.15**	**1027236.15**	**0.00%**	239.67	317.28	**1027236.15**	**1027236.15**	**0.00%**	17.75	91.72	**71.09%**	-	0.00%
		10	**994789.84**	**994789.84**	**0.00%**	1345.53	1391.31	**994789.84**	**994789.84**	**0.00%**	152.66	199.14	**85.69%**	-	0.00%
		11	**676521.87**	**676521.87**	**0.00%**	5157.75	5794.72	**676521.87**	**676521.87**	**0.00%**	295.29	555.28	**90.42%**	-	0.00%

		12	**964498.20**	**964564.93**	**0.00%**	5130.12	5261.81	**964564.93**	**964564.93**	**0.00%**	641.55	779.69	**85.18%**	-	0.00%
		13	**1013888.74**	**1013978.46**	**0.00%**	300.36	515.89	**1013978.46**	**1013978.46**	**0.00%**	90.28	168.17	**67.40%**	-	0.00%
		14	**859640.18**	**859640.18**	**0.00%**	702.75	787.81	**859640.18**	**859640.18**	**0.00%**	123.42	215.03	**72.71%**	-	0.00%
		15	**884174.77**	**884174.77**	**0.00%**	3534.84	3746.51	**884174.77**	**884174.77**	**0.00%**	122.34	376.42	**89.95%**	-	0.00%
		16	**790705.03**	**790705.03**	**0.00%**	1004.81	1658.23	**790669.86**	**790705.03**	**0.00%**	115.42	553.49	**66.62%**	-	0.00%
		17	**930020.14**	**930048.54**	**0.00%**	2486.02	2606.71	**930020.14**	**930020.14**	**0.00%**	256.74	467.55	**82.06%**	-	0.00%
		18	**911592.17**	**911592.17**	**0.00%**	75.36	80.61	**911592.17**	**911592.17**	**0.00%**	39.14	47.83	**40.66%**	-	0.00%
		19	715179.68	718299.82	0.43%	5204.22	7200.00	**715373.68**	**715373.68**	**0.00%**	86.18	1967.07	**72.68%**	**100.00%**	**0.41%**
		20	**1247167.07**	**1247167.07**	**0.00%**	344.33	358.17	**1247167.07**	**1247167.07**	**0.00%**	62.12	76.36	**78.68%**	-	0.00%
10	10	1	755309.73	765070.26	1.28%	7192.81	7200.00	**763133.08**	**763133.08**	**0.00%**	2949.95	3038.64	**57.80%**	**100.00%**	**0.25%**
		2	**954108.87**	**954108.87**	**0.00%**	2795.94	2930.94	**954108.87**	**954108.87**	**0.00%**	160.28	322.58	**88.99%**	-	0.00%
		3	739167.15	798121.82	7.39%	7198.08	7200.00	**775041.98**	**775041.98**	**0.00%**	2184.71	2328.42	**67.66%**	**100.00%**	**2.89%**
		4	**1097436.27**	**1097436.27**	**0.00%**	1206.03	1382.44	**1097436.27**	**1097436.27**	**0.00%**	220.22	518.67	**62.48%**	-	0.00%
		5	**933582.21**	**933582.21**	**0.00%**	662.63	709.58	**933582.21**	**933582.21**	**0.00%**	168.73	271.63	**61.72%**	-	0.00%
		6	**1416378.80**	**1416378.80**	**0.00%**	286.47	327.81	**1416378.80**	**1416378.80**	**0.00%**	27.18	85.78	**73.83%**	-	0.00%
		7	**881796.55**	**881796.55**	**0.00%**	2543.69	2553.64	**881796.55**	**881796.55**	**0.00%**	2060.48	2072.61	**18.84%**	-	0.00%
		8	**905199.84**	**905199.84**	**0.00%**	2695.72	2720.69	**905199.84**	**905199.84**	**0.00%**	666.65	710.77	**73.88%**	-	0.00%
		9	**1093605.55**	**1093605.55**	**0.00%**	177.19	229.31	**1093605.55**	**1093605.55**	**0.00%**	24.74	192.92	**15.87%**	-	0.00%
		10	**1049161.82**	**1049161.82**	**0.00%**	1259.95	1331.80	**1049161.82**	**1049161.82**	**0.00%**	175.99	356.17	**73.26%**	-	0.00%
		11	**715000.43**	**715000.43**	**0.00%**	3576.92	3730.70	**715000.43**	**715000.43**	**0.00%**	458.19	579.91	**84.46%**	-	0.00%
		12	**1034564.55**	**1034564.55**	**0.00%**	4825.83	4954.75	**1034564.55**	**1034564.55**	**0.00%**	563.82	639.96	**87.08%**	-	0.00%
		13	**1080852.81**	**1080852.81**	**0.00%**	131.39	196.28	**1080852.81**	**1080852.81**	**0.00%**	34.17	135.22	**31.11%**	-	0.00%
		14	**912917.34**	**912917.34**	**0.00%**	1293.41	1347.08	**912917.34**	**912917.34**	**0.00%**	237.03	311.83	**76.85%**	-	0.00%
		15	**927512.84**	**927512.84**	**0.00%**	2260.62	2379.05	**927512.84**	**927512.84**	**0.00%**	192.20	556.23	**76.62%**	-	0.00%
		16	**840587.16**	**840587.16**	**0.00%**	432.13	808.73	**840587.16**	**840587.16**	**0.00%**	67.94	743.20	**8.10%**	-	0.00%
		17	**1001976.45**	**1001976.45**	**0.00%**	2149.03	2205.46	**1001976.45**	**1001976.45**	**0.00%**	1179.41	1236.33	**43.94%**	-	0.00%
		18	**958713.68**	**958713.68**	**0.00%**	82.67	87.92	**958713.68**	**958713.68**	**0.00%**	20.83	33.38	**62.04%**	-	0.00%
		19	**773778.70**	**773778.70**	**0.00%**	2743.03	4246.25	**773778.70**	**773778.70**	**0.00%**	95.84	1887.31	**55.55%**	-	0.00%
		20	**1315441.76**	**1315441.76**	**0.00%**	323.09	354.94	**1315441.76**	**1315441.76**	**0.00%**	57.11	78.56	**77.87%**	-	0.00%
20	10	1	959738.58	959848.58	0.01%	7182.33	7200.00	**959848.58**	**959848.58**	**0.00%**	349.69	387.11	**94.62%**	**100.00%**	0.00%
		2	**1155235.60**	**1155235.60**	**0.00%**	1966.39	2423.99	**1155235.60**	**1155235.60**	**0.00%**	42.92	317.22	**86.91%**	-	0.00%
		3	934790.99	948175.70	1.41%	7185.12	7200.00	**948175.70**	**948175.70**	**0.00%**	1982.25	2061.38	**71.37%**	**100.00%**	0.00%
		4	**1316736.71**	**1316736.71**	**0.00%**	739.36	1015.14	**1316736.71**	**1316736.71**	**0.00%**	130.87	349.74	**65.55%**	-	0.00%
		5	**1124693.36**	**1124693.36**	**0.00%**	640.83	701.67	**1124693.36**	**1124693.36**	**0.00%**	91.83	154.75	**77.95%**	-	0.00%
		6	**1650632.47**	**1650632.47**	**0.00%**	140.56	206.23	**1650632.47**	**1650632.47**	**0.00%**	18.73	68.04	**67.01%**	-	0.00%
		7	**1063359.59**	**1063428.53**	**0.00%**	825.48	842.30	**1063411.39**	**1063428.53**	**0.00%**	111.98	130.16	**84.55%**	-	0.00%
		8	**1117882.82**	**1117882.82**	**0.00%**	346.84	389.91	**1117882.82**	**1117882.82**	**0.00%**	44.11	74.79	**80.82%**	-	0.00%
		9	**1320581.14**	**1320581.14**	**0.00%**	297.44	384.01	**1320581.14**	**1320581.14**	**0.00%**	76.06	274.53	**28.51%**	-	0.00%
		10	**1270287.25**	**1270287.25**	**0.00%**	233.89	270.61	**1270287.25**	**1270287.25**	**0.00%**	118.73	152.85	**43.52%**	-	0.00%
		11	**875051.12**	**875127.31**	**0.00%**	460.25	565.08	**875127.31**	**875127.31**	**0.00%**	60.87	191.23	**66.16%**	-	0.00%
		12	**1265990.97**	**1265990.97**	**0.00%**	1313.63	1357.92	**1265990.97**	**1265990.97**	**0.00%**	88.91	111.10	**91.82%**	-	0.00%
		13	**1233454.07**	**1233454.07**	**0.00%**	145.89	194.55	**1233454.07**	**1233454.07**	**0.00%**	66.32	131.36	**32.48%**	-	0.00%
		14	**1127236.57**	**1127236.57**	**0.00%**	1771.72	1875.16	**1127236.57**	**1127236.57**	**0.00%**	55.22	163.38	**91.29%**	-	0.00%
		15	**1089614.03**	**1089614.03**	**0.00%**	1834.50	2041.95	**1089614.03**	**1089614.03**	**0.00%**	17.94	132.36	**93.52%**	-	0.00%
		16	**987660.57**	**987670.90**	**0.00%**	803.37	1619.72	**987660.60**	**987660.60**	**0.00%**	57.60	529.43	**67.31%**	-	0.00%
		17	**1266466.68**	**1266466.68**	**0.00%**	940.13	1015.58	**1266466.68**	**1266466.68**	**0.00%**	63.73	111.53	**89.02%**	-	0.00%
		18	**1103887.28**	**1103887.28**	**0.00%**	303.72	377.39	**1103887.28**	**1103887.28**	**0.00%**	47.41	131.78	**65.08%**	-	0.00%
		19	**969563.12**	**969563.12**	**0.00%**	857.35	2330.97	**969563.12**	**969563.12**	**0.00%**	50.50	1210.18	**48.08%**	-	0.00%
		20	**1549807.58**	**1549807.58**	**0.00%**	116.63	162.72	**1549807.58**	**1549807.58**	**0.00%**	9.58	45.86	**71.82%**	-	0.00%