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# Supplementary File of "A General Framework of Dynamic Constrained Multi-objective Evolutionary Algorithms for Constrained Optimization"

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# I. Results of the Peer Algorithms on the Test Suite setG

TABLE I COMPARISON OF DCNSGA-II-DE, DCM2M-DE AND DCHYPE-DE WITH CMODE [2],  $\varepsilon$ ADE [3], DPDE[1], ECHT-ARMOR-DE1[4] AND ECHT-ARMOR-DE2[4] OVER 25 INDEPENDENT RUNS ON G01-G16

			E	ont		I		Fcn/e	ant	
Alg.s	FEs	ь	Fcn/ Mn	opt w	sd	FEs	b	Mn	w	sd
			g01/-15				-	g02/-0.8	03619	
DCNSGAII-DE	240,116	-15.0000	-15.0000	-15.0000	5.52E-10	240,208	-0.803619	-0.803619	-0.803619	1.44E-07
DCM2M-DE	240,000	-15.0000	-15.0000	-15.0000	8.52E-07	240,000	-0.803619	-0.803618	-0.803617	5.48E-07
DCHypE-DE	240,000	-15.0000	-15.0000	-15.0000	7.89E-07	240,000	-0.803619	-0.803619	-0.803619	2.65E-08
CMODE $\varepsilon$ ADE	240,000 240,000	-15.0000 -15.0000	-15.0000 -15.0000	-15.0000 -15.0000	1.93E-07 0.0E+00	240,000 240,000	-0.803608 -0.803617	-0.803178 -0.803604	-0.792608 -0.803542	2.20E-03 4.45E-05
DPDE	240,000	-15.0000	-15.0000	-15.0000	0.0E+00	240,000	-0.803617	-0.802350	-0.795326	1.18E-03
ECHT-ARMOR-DE1	240,000	-	-15.0000	-	0.0E+00	240,000	-	-0.790034	-	1.23E-02
ECHT-ARMOR-DE2	240,000	-	-15.0000	-	0.0E+00	240,000	-	-0.795264	-	8.10E-03
	,		g03/-1	.0005				g04/-3066	55.5387	
DCNSGAII-DE	240,000	-1.0005	-1.0005	-1.0005	8.99E-08	240,040	-30665.539	-30665.539	-30665.539	1.94E-07
DCM2M-DE	240,020	-1.0005	-1.0005	-1.0005	1.23E-07	240,008	-30665.539	-30665.539	-30665.539	1.04E-06
DCHypE-DE	240,000	-1.0005	-1.0005	-1.0005	4.02E-07	240,100	-30665.539	-30665.539	-30665.538	5.17E-05
CMODE $\varepsilon$ ADE	240,000 240,000	-1.0005 -1.0005	-1.0005 -1.0005	-1.0005 -1.0005	3.51E-08 1.34E-10	240,000 240,000	-30665.539 -30665.539	-30665.539 -30665.539	-30665.539 -30665.539	1.11E-11 3.71E-12
DPDE	240,000	-1.0005	-1.0005	-1.0005	0.0E+00	240,000	-30665.539	-30665.539	-30665.539	0.0E+00
ECHT-ARMOR-DE1	240,000	1.0005	-1.0005	-	0.00E+00	240,000	-	-30665.539	-	0.00E+00
ECHT-ARMOR-DE2	240,000	_	-1.0005	_	0.00E+00	240,000	_	-30665.539	=	0.00E+00
			g05/512					g06/-696		
DCNSGAII-DE	240,556	5126.497	5126.497	5126.497	8.94E-11	240,000	-6961.814	-6961.814	-6961.814	3.13E-05
DCM2M-DE	240,116	5126.497	5126.497	5126.497	6.00E-10	240,124	-6961.814	-6961.814	-6961.814	6.22E-05
DCHypE-DE CMODE	240,000 240,000	5126.497 5126.497	5126.497 5126.497	5126.497 5126.497	9.33E-07 9.25E-13	240,012 240,000	-6961.814 -6961.814	-6961.814 -6961.814	-6961.814 -6961.814	6.38E-05 1.85E-12
CMODE εADE	240,000	5126.497	5126.497	5126.497	9.25E-13 1.46E-12	240,000	-6961.814 -6961.814	-6961.814 -6961.814	-6961.814 -6961.814	1.85E-12 4.89E-13
DPDE	240,000	5126.497	5126.497	5126.497	0.0E+00	240,000	-6961.814	-6961.814	-6961.814	0.00E+00
ECHT-ARMOR-DE1	240,000	- 5120.477	5126.497	-	0.00E+00	240,000	-	-6961.814	-	0.00E+00
ECHT-ARMOR-DE2	240,000	_	5126.497	_	0.00E+00	240,000	_	-6961.814	=	0.0E+00
	,		g07/2	4.306				g08/-0.0	95825	
DCNSGAII-DE	240,004	24.306	24.306	24.306	1.34E-05	240,068	-0.095825	-0.095825	-0.095825	4.54E-17
DCM2M-DE	240,004	24.306	24.306	24.306	4.67E-06	240,000	-0.095825	-0.095825	-0.095825	4.33E-16
DCHypE-DE	240,000	24.306	24.306	24.307	2.57E-04	240,028	-0.095825	-0.095825	-0.095825	9.27E-16
CMODE $\varepsilon$ ADE	240,000 240,000	24.306 24.306	24.306 24.306	24.306 24.306	1.21E-14 4.07E-05	240,000 240,000	-0.095825 -0.095825	-0.095825 -0.095825	-0.095825 -0.095825	1.10E-17 0.0E+00
DPDE	240,000	24.306	24.306	24.306	6.25E-09	240,000	-0.095825	-0.095825	-0.093823	0.0E+00
ECHT-ARMOR-DE1	240,000	24.500	24.306	_	0.00E+00	240,000	-	-0.095825	-	0.00E+00
ECHT-ARMOR-DE2	240,000	_	24.306	_	0.00E+00	240,000	_	-0.095825	=	0.0E+00
			g09/680.					g10/704		
DCNSGAII-DE	240,032	680.630	680.630	680.630	3.90E-05	240,420	7049.248	7049.250	7049.266	3.56E-03
DCM2M-DE	240,064	680.630	680.630	680.630	4.05E-09	240,124	7049.248	7049.253	7049.265	4.39E-03
DCHypE-DE CMODE	240,084 240,000	680.630 680.630	680.630 680.630	680.630 680.630	1.16E-06 1.46E-11	240,132 240,000	7049.249 7049.248	7049.259 <b>7049.248</b>	7049.302 7049.248	1.25E-02 3.65E-12
εADE	240,000	680.630	680.630	680.630	7.21E-12	240,000	7049.248	7049.248	7049.248	3.03E-12 4.46E-05
DPDE	240,000	680.630	680.630	680.630	3.65E-14	240,000	7049.248	7049.248	7049.248	8.36E-08
ECHT-ARMOR-DE1	240,000	-	680.630	-	0.00E+00	240,000	-	7049.248	-	0.00E+00
ECHT-ARMOR-DE2	240,000	_	680.630	_	0.00E+00	240,000	_	7049.248	=	0.00E+00
	,		g11/0.7	49900				g12/-1	.000	
DCNSGAII-DE	240,260	0.7499	0.7499	0.7499	2.34E-10	240,000	-1.0000	-1.0000	-1.0000	0.00E+00
DCM2M-DE	240,104	0.7499	0.7499	0.7499	3.32E-12	240,000	-1.0000	-1.0000	-1.0000	0.00E+00
DCHypE-DE	240,000	0.7499 0.7499	0.7499 0.7499	0.7499	1.34E-08	240,000	-1.0000	-1.0000 -1.0000	-1.0000	0.00E+00
CMODE $\varepsilon$ ADE	240,000									
				0.7499	1.13E-16	240,000	-1.0000 -1.0000		-1.0000 -1.0000	0.0E+00
	240,000	0.7499	0.7499	0.7499	1.11E-16	240,000	-1.0000	-1.0000	-1.0000	0.0E+00
DPDE ECHT-ARMOR-DE1		0.7499 0.7499	0.7499 0.7499 0.7499	0.7499 0.7499			-1.0000 -1.0000			0.0E+00 0.0E+00
DPDE	240,000 240,000	0.7499	0.7499 0.7499 0.7499 0.7499	0.7499 0.7499 - -	1.11E-16 0.0E+00	240,000 240,000	-1.0000	-1.0000 -1.0000 -1.0000 -1.0000	-1.0000 -1.0000 -	0.0E+00
DPDE ECHT-ARMOR-DE1 ECHT-ARMOR-DE2	240,000 240,000 240,000 240,000	0.7499 0.7499 - -	0.7499 0.7499 0.7499 0.7499 g13/0.0:	0.7499 0.7499 - - - 539415	1.11E-16 0.0E+00 0.00E+00 0.0E+00	240,000 240,000 240,000 240,000	-1.0000 -1.0000 -	-1.0000 -1.0000 -1.0000 -1.0000	-1.0000 -1.0000 - - - .7649	0.0E+00 0.0E+00 0.00E+00 0.0E+00
DPDE ECHT-ARMOR-DE1 ECHT-ARMOR-DE2  DCNSGAII-DE	240,000 240,000 240,000 240,000 240,316	0.7499 0.7499 - - 0.05394	0.7499 0.7499 0.7499 0.7499 g13/0.03	0.7499 0.7499 - - 539415 0.05394	1.11E-16 0.0E+00 0.00E+00 0.0E+00 3.40E-09	240,000 240,000 240,000 240,000 240,036	-1.0000 -1.0000 - - - -47.7649	-1.0000 -1.0000 -1.0000 -1.0000 g14/-47 -47.7649	-1.0000 -1.0000 - - - .7649 -47.7649	0.0E+00 0.0E+00 0.00E+00 0.0E+00 3.58E-06
DPDE ECHT-ARMOR-DE1 ECHT-ARMOR-DE2  DCNSGAII-DE DCM2M-DE	240,000 240,000 240,000 240,000 240,316 240,064	0.7499 0.7499 - - 0.05394 0.05394	0.7499 0.7499 0.7499 0.7499 g13/0.03 0.05394 0.05394	0.7499 0.7499 - 539415 0.05394 0.05394	1.11E-16 0.0E+00 0.00E+00 0.0E+00 3.40E-09 2.68E-12	240,000 240,000 240,000 240,000 240,036 240,068	-1.0000 -1.0000 - - - - -47.7649 -47.7649	-1.0000 -1.0000 -1.0000 -1.0000 g14/-47 -47.7649 -47.7649	-1.0000 -1.0000 - - - - .7649 -47.7649 -47.7649	0.0E+00 0.0E+00 0.00E+00 0.0E+00 3.58E-06 6.44E-06
DPDE ECHT-ARMOR-DE1 ECHT-ARMOR-DE2  DCNSGAII-DE DCM2M-DE DCHypE-DE	240,000 240,000 240,000 240,000 240,316 240,064 240,100	0.7499 0.7499 - - - 0.05394 0.05394 0.05394	0.7499 0.7499 0.7499 0.7499 g13/0.0: 0.05394 0.05394	0.7499 0.7499 - - 539415 0.05394 0.05394 0.05394	1.11E-16 0.0E+00 0.00E+00 0.0E+00 3.40E-09 2.68E-12 4.53E-09	240,000 240,000 240,000 240,000 240,036 240,068 240,100	-1.0000 -1.0000 - - - - -47.7649 -47.7649	-1.0000 -1.0000 -1.0000 -1.0000 g14/-47 -47.7649 -47.7649	-1.0000 -1.0000 - - - - -         -	0.0E+00 0.0E+00 0.00E+00 0.0E+00 3.58E-06 6.44E-06 1.03E-05
DPDE ECHT-ARMOR-DE1 ECHT-ARMOR-DE2  DCNSGAII-DE DCM2M-DE DCHypE-DE CMODE	240,000 240,000 240,000 240,000 240,316 240,064 240,100 240,000	0.7499 0.7499 - - 0.05394 0.05394 0.05394 0.05394	0.7499 0.7499 0.7499 0.7499 g13/0.0: 0.05394 0.05394 0.05394	0.7499 0.7499 - - 539415 0.05394 0.05394 0.05394 0.05394	1.11E-16 0.0E+00 0.00E+00 0.0E+00 3.40E-09 2.68E-12 4.53E-09 1.13E-16	240,000 240,000 240,000 240,000 240,036 240,068 240,100 240,000	-1.0000 -1.0000 - - - -47.7649 -47.7649 -47.7649	-1.0000 -1.0000 -1.0000 -1.0000 g14/-47 -47.7649 -47.7649 -47.7649	-1.0000 -1.0000 - - - -    	0.0E+00 0.0E+00 0.00E+00 0.0E+00 3.58E-06 6.44E-06 1.03E-05 2.29E-14
DPDE ECHT-ARMOR-DEI ECHT-ARMOR-DE2  DCNSGAII-DE DCM2M-DE DCHypE-DE CMODE \$\varepsilon ADE \$	240,000 240,000 240,000 240,000 240,000 240,064 240,100 240,000 240,000	0.7499 0.7499 - - 0.05394 0.05394 0.05394 0.05394 0.05394	0.7499 0.7499 0.7499 0.7499 g13/0.03 0.05394 0.05394 0.05394 0.05394	0.7499 0.7499 - 539415 0.05394 0.05394 0.05394 0.05394 0.05394	1.11E-16 0.0E+00 0.00E+00 0.0E+00 3.40E-09 2.68E-12 4.53E-09 1.13E-16 0.0E+00	240,000 240,000 240,000 240,000 240,036 240,068 240,100 240,000 240,000	-1.0000 -1.0000 - - - -47.7649 -47.7649 -47.7649 -47.7649	-1.0000 -1.0000 -1.0000 -1.0000 g14/-47 -47.7649 -47.7649 -47.7649 -47.7649	-1.0000 -1.0000 - - - -     	0.0E+00 0.0E+00 0.00E+00 0.0E+00 3.58E-06 6.44E-06 1.03E-05 2.29E-14 9.84E-06
DPDE ECHT-ARMOR-DE1 ECHT-ARMOR-DE2  DCNSGAII-DE DCM2M-DE DCHypE-DE CMODE	240,000 240,000 240,000 240,000 240,316 240,064 240,100 240,000	0.7499 0.7499 - - 0.05394 0.05394 0.05394 0.05394	0.7499 0.7499 0.7499 0.7499 g13/0.0: 0.05394 0.05394 0.05394	0.7499 0.7499 - - 539415 0.05394 0.05394 0.05394 0.05394	1.11E-16 0.0E+00 0.00E+00 0.0E+00 3.40E-09 2.68E-12 4.53E-09 1.13E-16	240,000 240,000 240,000 240,000 240,036 240,068 240,100 240,000	-1.0000 -1.0000 - - - -47.7649 -47.7649 -47.7649	-1.0000 -1.0000 -1.0000 -1.0000 g14/-47 -47.7649 -47.7649 -47.7649	-1.0000 -1.0000 - - - -    	0.0E+00 0.0E+00 0.00E+00 0.0E+00 3.58E-06 6.44E-06 1.03E-05 2.29E-14
DPDE ECHT-ARMOR-DEI ECHT-ARMOR-DE2  DCNSGAII-DE DCM2M-DE DCHypE-DE CMODE \$\varepsilon ADE DPDE	240,000 240,000 240,000 240,000 240,316 240,316 240,064 240,100 240,000 240,000 240,000	0.7499 0.7499 - - 0.05394 0.05394 0.05394 0.05394 0.05394	0.7499 0.7499 0.7499 0.7499 g13/0.0: 0.05394 0.05394 0.05394 0.05394 0.05394	0.7499 0.7499 - 539415 0.05394 0.05394 0.05394 0.05394 0.05394	1.11E-16 0.0E+00 0.00E+00 0.0E+00 3.40E-09 2.68E-12 4.53E-09 1.13E-16 0.0E+00 1.16E-17	240,000 240,000 240,000 240,000 240,000 240,068 240,100 240,000 240,000 240,000	-1.0000 -1.0000 - - - -47.7649 -47.7649 -47.7649 -47.7649	-1.0000 -1.0000 -1.0000 -1.0000 g14/-47 -47.7649 -47.7649 -47.7649 -47.7649 -47.7649	-1.0000 -1.0000 - - - -     	0.0E+00 0.0E+00 0.0E+00 0.0E+00 3.58E-06 6.44E-06 1.03E-05 2.29E-14 9.84E-06 2.56E-09
DPDE ECHT-ARMOR-DE1 ECHT-ARMOR-DE2  DCNSGAII-DE DCM2M-DE DCHypE-DE CMODE &ADE DPDE ECHT-ARMOR-DE1	240,000 240,000 240,000 240,000 240,000 240,006 240,100 240,000 240,000 240,000 240,000	0.7499 0.7499 - - - 0.05394 0.05394 0.05394 0.05394 0.05394	0.7499 0.7499 0.7499 0.7499 g13/0.0: 0.05394 0.05394 0.05394 0.05394 0.05394 0.05394	0.7499 0.7499 - 539415 0.05394 0.05394 0.05394 0.05394 0.05394	1.11E-16 0.0E+00 0.00E+00 0.0E+00 3.40E-09 2.68E-12 4.53E-09 1.13E-16 0.0E+00 1.16E-17 0.00E+00	240,000 240,000 240,000 240,000 240,000 240,068 240,100 240,000 240,000 240,000 240,000	-1.0000 -1.0000  -47.7649 -47.7649 -47.7649 -47.7649 -47.7649	-1.0000 -1.0000 -1.0000 -1.0000 -1.0000 g14/-47 -47.7649 -47.7649 -47.7649 -47.7649 -47.7649 -47.7649	-1.0000 -1.0000  -          	0.0E+00 0.0E+00 0.0E+00 0.0E+00 3.58E-06 6.44E-06 1.03E-05 2.29E-14 9.84E-06 2.56E-09 0.00E+00
DPDE ECHT-ARMOR-DE1 ECHT-ARMOR-DE2  DCNSGAII-DE DCM2M-DE DCM2M-DE CMODE &ADE DPDE ECHT-ARMOR-DE1 ECHT-ARMOR-DE2  DCNSGAII-DE	240,000 240,000 240,000 240,000 240,000 240,006 240,000 240,000 240,000 240,000 240,000 240,000 240,000	0.7499 0.7499 - - 0.05394 0.05394 0.05394 0.05394 0.05394 - - - 961.71502	0.7499 0.7499 0.7499 0.7499 0.05394 0.05394 0.05394 0.05394 0.05394 0.05394 0.05394 0.05394	0.7499 0.7499 	1.11E-16 0.0E+00 0.00E+00 0.0E+00 3.40E-09 2.68E-12 4.53E-09 1.13E-16 0.0E+00 1.16E-17 0.00E+00 0.00E+00	240,000 240,000 240,000 240,000 240,000 240,068 240,100 240,000 240,000 240,000 240,000 240,000 240,000	-1.0000 -1.0000 -1.0000 -1.0000 -47.7649 -47.7649 -47.7649 -47.7649 -1.905155	-1.0000 -1.0000 -1.0000 -1.0000 -1.0000 g14/-47 -47.7649 -47.7649 -47.7649 -47.7649 -47.7649 -47.7649 -1.005155	-1.0000 -1.0000 -1.0000 - - 	0.0E+00 0.0E+00 0.0E+00 0.0E+00 3.58E-06 6.44E-06 1.03E-05 2.29E-14 9.84E-06 2.56E-09 0.00E+00 0.00E+00
DPDE ECHT-ARMOR-DEI ECHT-ARMOR-DE2  DCNSGAII-DE DCM2M-DE DCHypE-DE CMODE &ADE DPDE ECHT-ARMOR-DEI ECHT-ARMOR-DE2  DCNSGAII-DE DCNSGAII-DE DCM2M-DE	240,000 240,000 240,000 240,000 240,006 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000	0.7499 0.7499 	0.7499 0.7499 0.7499 0.7499 0.7499 g13/0.0 0.05394 0.05394 0.05394 0.05394 0.05394 0.05394 0.15394 0.15394 0.15394 0.15394 0.15394 0.15394	0.7499 0.7499 0.7499 - 5339415 0.05394 0.05394 0.05394 0.05394 - - - 715022 961.71502	1.11E-16 0.0E+00 0.00E+00 0.0E+00 0.0E+00 3.40E-09 2.68E-12 4.53E-09 1.13E-16 0.0E+00 1.16E-17 0.00E+00 0.00E+00 3.39E-11 3.30E-11	240,000 240,000 240,000 240,000 240,006 240,006 240,000 240,000 240,000 240,000 240,000 240,000 240,000	-1.0000 -1.0000 -1.0000 -1.0000 -1.0000 -47.7649 -47.7649 -47.7649 -47.7649 -1.905155 -1.905155	-1.0000 -1.0000 -1.0000 -1.0000 g14/-47 -47.7649 -47.7649 -47.7649 -47.7649 -47.7649 -47.7649 -17.649 -17.649 -17.649 -17.649 -17.649 -17.649 -17.649 -17.649 -17.649 -17.649	-1.0000 -1.0000 -1.0000 -1.0000 -1.0000 -1.0000 -1.7649 -47.7649 -47.7649 -47.7649 -1.905155 -1.905155	0.0E+00 0.0E+00 0.00E+00 0.0E+00 3.58E-06 6.44E-06 1.03E-05 2.29E-14 9.84E-06 0.00E+00 0.00E+00 4.40E-11 8.71E-10
DPDE ECHT-ARMOR-DEI ECHT-ARMOR-DEI ECHT-ARMOR-DE DCNSGAII-DE DCHypE-DE CMODE ¢ADE DPDE ECHT-ARMOR-DEI ECHT-ARMOR-DEI ECHT-ARMOR-DE DCM2M-DE DCM2M-DE DCM2M-DE	240,000 240,000 240,000 240,000 240,000 240,006 240,100 240,000 240,000 240,000 240,000 240,000 240,000 240,000	0.7499 0.7499 	0.7499 0.7499 0.7499 0.7499 0.05394 0.05394 0.05394 0.05394 0.05394 0.05394 0.05394 0.15394 0.15394 0.15394 0.15394 0.15394 0.15394 0.15394 0.15394	0.7499 0.7499 0.7499 - 539415 0.05394 0.05394 0.05394 0.05394 - - - - - - - - - - - - - - - - - - -	1.11E-16 0.0E+00 0.00E+00 0.0E+00 0.0E+00 3.40E-09 2.68E-12 4.53E-09 1.13E-16 0.0E+00 1.16E-17 0.00E+00 0.00E+00 3.39E-11 3.30E-11 4.50E-08	240,000 240,000 240,000 240,000 240,000 240,008 240,100 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000	-1.0000 -1.0000 -1.0000  - - - - -47.7649 -47.7649 -47.7649 -47.7649  - - - -1.905155 -1.905155	-1.0000 -1.0000 -1.0000 -1.0000 g14/-47 -47.7649 -47.7649 -47.7649 -47.7649 -47.7649 -47.7649 -1.905155 -1.905155	-1.0000 -1.0000 -1.0000 -1.0000 -1.0000 -1.0000 -1.0000 -1.0000 -1.0000 -1.0000 -1.0000 -1.0000 -1.0000 -1.0000 -1.0000 -1.00000 -1.00	0.0E+00 0.0E+00 0.00E+00 0.0E+00 3.58E-06 6.44E-06 1.03E-05 2.29E-14 9.84E-06 2.56E-09 0.00E+00 0.00E+00 4.40E-11 1.32E-09
DPDE ECHT-ARMOR-DE1 ECHT-ARMOR-DE2  DCNSGAII-DE DCM2M-DE DCM2M-DE CMODE &ADE DPDE ECHT-ARMOR-DE1 ECHT-ARMOR-DE2  DCNSGAII-DE DCM2M-DE DCM2M-DE DCM2M-DE DCHypE-DE CMODE	240,000 240,000 240,000 240,000 240,000 240,006 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000	0.7499 0.7499 0.7499 - - - 0.05394 0.05394 0.05394 0.05394 0.05394 - - - - 961.71502 961.71502 961.71502	0.7499 0.7499 0.7499 0.7499 13/0.00 0.95394 0.05394 0.05394 0.05394 0.05394 0.05394 0.05394 0.95394 0.95394 0.95394 0.95394 0.95394 0.95394 0.95394 0.95394	0.7499 0.7499 	1.11E-16 0.0E+00 0.00E+00 0.0E+00 0.0E+00 3.40E-09 2.68E-12 4.53E-09 1.13E-16 0.0E+00 0.00E+00 0.00E+00 3.39E-11 3.30E-11 4.50E-08 6.94E-13	240,000 240,000 240,000 240,000 240,000 240,006 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000	-1.0000 -1.0000 -1.0000 -1.0000 -1.0000 -47.7649 -47.7649 -47.7649 -47.7649 -1.905155 -1.905155 -1.905155	-1.0000 -1.0000 -1.0000 -1.0000 -1.0000 g14/-47 -47.7649 -47.7649 -47.7649 -47.7649 -47.7649 -47.7649 -1.905155 -1.905155 -1.905155	-1.0000 -1.0000 -1.0000 	0.0E+00 0.0E+00 0.0E+00 0.0E+00 3.58E-06 6.44E-06 1.03E-05 2.29E-14 9.84E-06 2.56E-09 0.00E+00 0.00E+00 4.40E-11 8.71E-10 1.32E-09 6.78E-16
DPDE ECHT-ARMOR-DEI ECHT-ARMOR-DEI DCNSGAII-DE DCM2M-DE DCHypE-DE CMODE &ADE DPDE ECHT-ARMOR-DEI ECHT-ARMOR-DEI DCNSGAII-DE DCM2M-DE DCM2M-DE DCM2M-DE CMODE &ADE	240,000 240,000 240,000 240,000 240,000 240,006 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000	0.7499 0.7499 0.7499 - - - 0.05394 0.05394 0.05394 0.05394 - - 961.71502 961.71502 961.71502 961.71502	0.7499 0.7499 0.7499 0.7499 0.7499 13/0.0 0.05394 0.05394 0.05394 0.05394 0.05394 0.05394 0.15394 0.15394 0.15394 0.15394 0.15394 0.15394 0.15394 0.15394 0.15394 0.15394 0.15394 0.15394	0.7499 0.7499 0.7499 - 5339415 0.05394 0.05394 0.05394 0.05394 - - - 715022 961.71502 961.71502 961.71502 961.71502	1.11E-16 0.0E+00 0.00E+00 0.0E+00 0.0E+00 3.40E-09 2.68E-12 4.53E-09 1.13E-16 0.0E+00 1.16E-17 0.00E+00 0.00E+00 3.39E-11 4.50E-08 6.94E-13 5.68E-13	240,000 240,000 240,000 240,000 240,000 240,006 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000	-1.0000 -1.0000 -1.0000 -1.0000 -1.0000 -1.0000 -1.0000 -1.00000 -1.0000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.0000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000	-1.0000 -1.0000 -1.0000 -1.0000 g14/-47 -47.7649 -47.7649 -47.7649 -47.7649 -47.7649 -47.7649 -47.7649 -1.905155 -1.905155 -1.905155 -1.905155	-1.0000 -1.0000 -1.0000 -1.0000 -1.0000 -1.0000 -1.7649 -47.7649 -47.7649 -47.7649 -1.905155 -1.905155 -1.905155 -1.905155	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 3.58E-06 6.44E-06 1.03E-05 2.29E-14 9.84E-06 2.56E-09 0.00E+00 0.00E+00 4.40E-11 8.71E-10 1.32E-09 6.78E-16 1.33E-15
DPDE ECHT-ARMOR-DEI ECHT-ARMOR-DEI ECHT-ARMOR-DE DCNSGAII-DE DCHypE-DE CMODE & ADE DPDE ECHT-ARMOR-DEI ECHT-ARMOR-DEI ECHT-ARMOR-DE DCM2M-DE DCM2M-DE DCM2M-DE CMODE & ADE DPDE	240,000 240,000 240,000 240,000 240,006 240,006 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000	0.7499 0.7499 0.7499 - - - 0.05394 0.05394 0.05394 0.05394 0.05394 - - - - 961.71502 961.71502 961.71502	0.7499 0.7499 0.7499 0.7499 0.7499 13/0.0: 0.05394 0.05394 0.05394 0.05394 0.05394 0.05394 0.05399 0.0539	0.7499 0.7499 	1.11E-16 0.0E+00 0.00E+00 0.0E+00 0.0E+00 3.40E-09 2.68E-12 4.53E-09 1.13E-16 0.0E+00 1.16E-17 0.00E+00 0.00E+00 3.39E-11 4.50E-08 6.94E-13 5.68E-13 0.0E+00	240,000 240,000 240,000 240,000 240,000 240,006 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000	-1.0000 -1.0000 -1.0000 -1.0000 -1.0000 -47.7649 -47.7649 -47.7649 -47.7649 -1.905155 -1.905155 -1.905155	-1.0000 -1.0000 -1.0000 -1.0000 g14/-47 -47.7649 -47.7649 -47.7649 -47.7649 -47.7649 -47.7649 -1.905155 -1.905155 -1.905155 -1.905155	-1.0000 -1.0000 -1.0000 	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 3.58E-06 6.44E-06 1.03E-05 2.29E-14 9.84E-06 2.56E-09 0.00E+00 4.40E-11 8.71E-10 1.32E-09 6.78E-16 1.33E-15 0.0E+00
DPDE ECHT-ARMOR-DEI ECHT-ARMOR-DEI DCNSGAII-DE DCM2M-DE DCHypE-DE CMODE &ADE DPDE ECHT-ARMOR-DEI ECHT-ARMOR-DEI DCNSGAII-DE DCM2M-DE DCM2M-DE DCM2M-DE CMODE &ADE	240,000 240,000 240,000 240,000 240,000 240,006 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000	0.7499 0.7499 0.7499 - - - 0.05394 0.05394 0.05394 0.05394 - - 961.71502 961.71502 961.71502 961.71502	0.7499 0.7499 0.7499 0.7499 0.7499 13/0.0 0.05394 0.05394 0.05394 0.05394 0.05394 0.05394 0.15394 0.15394 0.15394 0.15394 0.15394 0.15394 0.15394 0.15394 0.15394 0.15394 0.15394 0.15394	0.7499 0.7499 0.7499 - 5339415 0.05394 0.05394 0.05394 0.05394 - - - 715022 961.71502 961.71502 961.71502 961.71502	1.11E-16 0.0E+00 0.00E+00 0.0E+00 0.0E+00 3.40E-09 2.68E-12 4.53E-09 1.13E-16 0.0E+00 1.16E-17 0.00E+00 0.00E+00 3.39E-11 4.50E-08 6.94E-13 5.68E-13	240,000 240,000 240,000 240,000 240,000 240,006 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000 240,000	-1.0000 -1.0000 -1.0000 -1.0000 -1.0000 -1.0000 -1.0000 -1.00000 -1.0000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.0000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.00000 -1.000	-1.0000 -1.0000 -1.0000 -1.0000 g14/-47 -47.7649 -47.7649 -47.7649 -47.7649 -47.7649 -47.7649 -47.7649 -1.905155 -1.905155 -1.905155 -1.905155	-1.0000 -1.0000 -1.0000 -1.0000 -1.0000 -1.0000 -1.7649 -47.7649 -47.7649 -47.7649 -1.905155 -1.905155 -1.905155 -1.905155	0.0E+00 0.0E+00 0.0E+00 0.0E+00 0.0E+00 3.58E-06 6.44E-06 1.03E-05 2.29E-14 9.84E-06 2.56E-09 0.00E+00 0.00E+00 4.40E-11 8.71E-10 1.32E-09 6.78E-16 1.33E-15

b, Mn, w, and sd represent the best, mean, worst, and standard deviation, respectively, of results over all runs; FEs represents the function evaluations for CMODE,  $\varepsilon$ ADE, DPDE, ECHT-ARMOR-DE1, and ECHT-ARMOR-DE2; For DCNSGAII-DE, DCM2M-DE, and DCHypE-DE, FEs represents the average evaluations.

TABLE II COMPARISON OF DCNSGA-II-DE, DCM2M-DE AND DCHYPE-DE WITH CMODE [2],  $\varepsilon$ ADE [3], DPDE[1], ECHT-ARMOR-DE1[4] AND ECHT-ARMOR-DE2[4] OVER 25 INDEPENDENT RUNS ON G17-G24

Alg.s			1	Fen	/opt			Fcn/opt			
DCNSGAII-DE   240,116   8853.5339   8853	Alg.s	FEs	b			sd	FEs	ь			sd
DCMZM-DE   240,000   8853.5339   8853.5339   8853.5339   7.44E-06   240,104   -0.866025   -0.866025   -0.866025   0.866025   1.29E-07	·		g17/8853.5339								
DCHypE-DE         240,100         8853.5339         8853.5340         8853.5340         2.85E-05         240,100         -0.866025         -	DCNSGAII-DE	240,116	8853.5339	8853.5339	8853.5339	3.38E-08	240,188	-0.866025	-0.866025	-0.866025	7.48E-08
CMODE         240,000         8853,5339         8853,5339         8853,5339         0.0E+00         240,000         -0.866025         -0.866025         -0.866025         5.16E-08           εADE         240,000         8863,6985         8893,6240         8964,3240         3.34E-12         240,000         -0.865967         -0.865025         -0.866025         -0.86025         -0.866025         -0.86025         -0.86025         -0.86025         -0.	DCM2M-DE	240,000	8853.5339	8853.5339	8853.5339	7.44E-06	240,148	-0.866025	-0.866025	-0.866025	1.29E-07
EADE	DCHypE-DE	240,100	8853.5339	8853.5340	8853.5340	2.85E-05	240,100	-0.866025	-0.866024	-0.866021	9.79E-07
DPDE	CMODE	240,000	8853.5339	8853.5339	8853.5339	0.0E+00	240,000	-0.866025	-0.866025	-0.866025	5.16E-08
ECHT-ARMOR-DEI         240,000         -         8853.5397         -         0.00E+00         240,000         -         -0.866025         -         0.00E+00           ECHT-ARMOR-DE2         240,000         -         8853.5397         -         0.00E+00         240,000         -         -0.866025         -         0.00E+00           DCNSGAII-DE         240,000         32.6556         32.6684         32.8414         3.79E-02         1,000,000         0.2676         0.3223*         0.3752         2.29E-02           DCM2M-DE         240,000         32.6557         32.6824         32.7899         3.24E-02         1,000,000         0.2689         0.3383*         0.4572         2.59E-02           CMODE         240,000         32.6556         -         -         -         -         -         -         -         -         -         -         -         -         -         -		240,000	8863.6985	8893.6240	8964.3240	3.31E+01	240,000	-0.865967	-0.865731	-0.865047	2.21E-04
DCNSGAII-DE   240,000   - 8853.5397   - 0.00E+00   240,000   - 0.866025   - 0.00E+00   200/NA			8853.5339		8853.5339			-0.866025		-0.866025	
DCNSGAII-DE   240,000   32,6556   32,6684   32,8414   3,79E-02   1,000,000   0,2676   0,3223*   0,3752   2,29E-02	ECHT-ARMOR-DE1	240,000	_	8853.5397	_	0.00E+00	240,000	-	-0.866025	_	0.00E+00
DCNSGAIL-DE   240,000   32,6556   32,6684   32,8814   3,798-02   1,000,000   0,2676   0,3223*   0,3752   2,29E-02     DCM2M-DE   240,004   32,6558   32,6824   32,7998   4,12E-02   1,000,000   0,2689   0,3383*   0,4572   2,59E-02     DCM2M-DE   240,000   32,6558   32,6585   32,6785   32,7899   3,24E-02   1,000,000   0,2793   0,3298*   0,4507   9,47E-02     EADE   240,000   32,6556   32,6655   32,6655   32,6655   32,6556   4,7824   4,7824   4,7824     ECHT-ARMOR-DE1   240,000   240,000   240,000   240,000   193,7245   193,7245   193,7245   193,7245   193,7245   193,7245   193,7245   193,7245   193,7245   10,000,000   240,000   193,7245   193,7245   193,7245   10,000,000   240,000   193,7245   193,7245   193,7245   10,000,000   240,000   193,7245   193,7245   193,7245   230,3984   324,7028   4,09E-11   -	ECHT-ARMOR-DE2	240,000	_		_	0.00E+00	240,000	-	-0.866025	_	0.00E+00
DCM2M-DE											
DCHypE-DE							1,000,000				
CMODE εADE         240,000 240,000         32.6556         32.6556         32.6556         32.6556         32.6556         32.6556         32.6556         32.6556         32.6556         32.6556         32.6556         32.6556         32.6556         32.6556         32.6556         32.6556         32.6556         32.6556         4.16±08         - </td <td>DCM2M-DE</td> <td>240,004</td> <td></td> <td>32.6824</td> <td>32.7908</td> <td>4.12E-02</td> <td>1,000,000</td> <td>0.2689</td> <td></td> <td>0.4572</td> <td>2.59E-02</td>	DCM2M-DE	240,004		32.6824	32.7908	4.12E-02	1,000,000	0.2689		0.4572	2.59E-02
EADE	DCHypE-DE	240,100	32.6558	32.6785	32.7899	3.24E-02	1,000,000	0.2793	0.3298*	0.4507	9.47E-02
DPDE         240,000         32.6556         32.6556         32.6556         - <th< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td>_</td><td>_</td><td>-</td><td>_</td><td>-  </td></th<>							_	_	-	_	-
ECHT-ARMOR-DE1         240,000         -         32.6556         -         8.39E-06         -	$\varepsilon ADE$	240,000	32.6556	32.6605	32.6958	8.55E-03	_	-	-	_	-
CHT-ARMOR-DE2   240,000   -	DPDE	240,000	32.6556	32.6556	32.6556	6.17E-08	-	-	-	_	-
DCNSGAII-DE   240,036   193.7245   193.72	ECHT-ARMOR-DE1	240,000	-	32.6556	_	8.39E-06	-	-	-	_	-
DCNSGAIL-DE   240,036   193.7245   193.72	ECHT-ARMOR-DE2	240,000	-	32.6556	_	1.90E-05	_	-	-	_	-
DCM2M-DE   240,000   193.7245   193.7245   193.7245   193.7245   240.762   3300.306* 17837.055   5.86E+03					3.7245						ĺ
DCHype-DE	DCNSGAII-DE	240,036	193.7245		193.7245	1.11E-06	468,320	238.978	268.670	320.275	2.22E+01
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	DCM2M-DE									17837.055	5.86E+03
ECHT-ARMOR-DE1 240,000 193.7245 193.7245 193.7245 4.09E-11	DCHypE-DE	240,684	193.7245	193.7245	193.7245	2.35E-06	504,784	245.258	268.706	305.515	1.46E+01
DPDE	CMODE	240,000				6.00E+01	_	-	-	_	-
ECHT-ARMOR-DE1         240,000         -         193,7245         -         0.00E+00         -		240,000	193.7245	193.7245	193.7245	4.09E-11	_	_	-	_	-
ECHT-ARMOR-DE2         240,000         -         193.7245         -         0.00E+00         -	DPDE	240,000	193.7245	193.7262	193.7536	8.36E-04	_	_	-	_	-
DCNSGAII-DE   240,228			-		-		-	-	-	-	-
DCNSGAII-DE         240,228         -400.0551         -400.0551         -400.0551         -400.0551         -400.0551         -400.0551         -400.0551         -400.0551         -400.0551         -400.0551         -400.0551         -400.0551         -400.0551         -400.0551         -400.0551         -400.0551         -400.051         -40	ECHT-ARMOR-DE2	240,000	-			0.00E+00	-	-	-	-	-
DCM2M-DE         240,044         -400.0550         -400.0511         -400.063         1.06E-02         240,000         -5.5080         -5.5080         -5.5080         -5.5080         -3.5080											
DCHypE-DE 240,100 -400.0548 -400.0532 -400.0515 8.93E-04 240,000 -5.5080 -5.50											
CMODE 240,000 -400.0549 -399.9532 -397.4744 4.69E-02 240,000 -5.5080 -5.5080 -5.5080 1.81E-15											
EADE   240,000   -400.0551   -382.8252   -100.0465   6.01E+01   240,000   -5.5080   -5.5080   -5.5080   8.88E-16											
DPDE   240,000   -400.0551   -399.2752   -396.9405   1.52E+00   240,000   -5.5080   -5.5080   -5.5080   0.0E+00			-400.0551		-396.9405			-5.5080		-5.5080	
ECHT-ARMOR-DE1   240,000  400.0551   - 2.68E-09   240,000  5.5080   - 0.00E+00			_		_			-		-	
ECHT-ARMOR-DE2   240,000   - <b>-400.0551</b> - 1.76E-08   240,000   - <b>-5.5080</b> - 0.0E+00	ECHT-ARMOR-DE2	240,000		-400.0551		1.76E-08	240,000		-5.5080		0.0E+00

b, Mn, w, and sd represent the best, mean, worst and standard deviation, respectively, of the results over all runs; FEs represents the function evaluations for CMODE, εADE, DPDE, ECHT-ARMOR-DE1,ECHT-ARMOR-DE2; For DCNSGAII-DE, DCM2M-DE,DCHypE-DE, the FEs represents the average evaluations; Results with \* means that there are infeasible solutions over 25 independent runs.

# II. Results of the Peer Algorithms on the Test Suite setC

TABLE III EXPERIMENTAL RESULT OF DCNSGA-II-DE, DCM2M-DE, DCHYPE-DE, CMODE [2],  $\varepsilon$ ADE [3], AIS[5] AND ECHT-ARMOR-DE[4] OVER 25 INDEPENDENT ON C01-C18 WITH 10 DIMENSIONS.

Algs								1			
CNNSGAILDE   200,200	Alg.s	FEs	ь			sd	FEs	b			sd
Demail				c01-	10D				c02-10		
Description   Carbon   Carbo											1.50E-06
CATOR 200,000   -0.7473											4.32E-06
## ADE   20,000	DCHypE-DE										3.90E-07
CHITARMORD   20,000	CMODE										3.05E-01
ECHT-ARMOR-DE   20,000											7.32E-01
DCNSGAILDE   200,000											2.05E-03 3.35E-03
Densaga   Den	ECTI-ARMOR-DE	200,000	-0.7473			1.43E-03	200,000	-2.2111			3.33E-03
DCMSM-DE   200,000   0.000E-00   0.000E-00   0.000E-00   200,000   9.784E-06   9.769E-06   9.769E-0	DCNSGAII-DE	200 000	0.00E+00			0.00E+00	200.056	-9 788F-06			6.58E-08
DCHypE-DE         200,000         0.000E-00         0.000E-00         0.000E-00         0.000E-00         0.500E-00         8.7856E-00         8.8756E-00         9.00000         1.000E-05         1.000E-05 <td></td> <td>1.05E-07</td>											1.05E-07
CHÓDE         200000         0.0000+00         3.5502E+00         8.8756E+00         8.9756E+00         2.00000         1.0000E-05         9.971E-06         9.932E-06         4.2856E+02         2.00000         1.0000E-05         9.971E-06         9.932E-06         4.2856E+02         2.00000         8.8756E+00         8.8756E+00         8.9756E+00         9.8756E+00         9.971E-06         4.9756E-02         2.00000         4.9756E-02         2.00000         4.9756E-02         2.00000         2.9756E-02         2.7866E-02         2.00000         2.9756E-02         2.7866E-02         2.00000         2.9756E-02         2.7866E-02											6.90E-08
ASE   20,000   8,8756E+00   8,8756E+00   8,8756E+00   2,043E+08   20,000   1,000E+05   1,000E+05   0,00E+00   2,00E+00   2,00E+00   2,00E+00   2,00E+00   1,00E+05   1,00E+05   1,00E+05   0,0E+00   2,00E+00											6.98E-08
ASS   20,000   0,00E+00   3,7472E-9   2,1342E-98   4,81E-94   20,000   1,000E-65   7,97E-06   7,00E-05   5,00E-05   5,00											0.00E+00
Densignation   Den											4.28E-03
DCNSAILDE   D0.192											0.00E+00
DCMMMDE				c05-	10D				c06-10	D	
DCHypE-DE CMODE         200,000 200,000         4.835HE-02 4.835E+02 200,000         4.835HE-02 4.919E+02 2971E+02 200,000         4.366E+02 1.56E+02 200,000         2.000,000 1.469E-02 4.836LE-	DCNSGAII-DE	201,092	-4.8361E+02	-4.8361E+02	-4.8361E+02	3.39E-08	200,104	-5.7866E+02			1.42E-04
CMÓDE         200,000         4357EHO2         4.5198EHO2         2.975TEHO2         1.56EHO2         200,000         5.7866EHO2         5.7885EHO2         2.275BEHO2         2.7895EHO2         2.275BEHO2         2.7895EHO2         2.7895EHO2         2.7885EHO2         2.275BEHO2         2.7885EHO2         2.7885EHO2         2.786EHO2         2.7885EHO2         2.786EHO2         2.786EHO2         2.786EHO2         2.786EHO2         2.786EHO2         2.786EHO2         2.786EHO2         2.785EHO2         2.786EHO2         2.786EHO2         2.786EHO2         2.786EHO2         2.787EHO2         2.786EHO2         2.786EHO2         2.787EHO2         2.787EHO2         2.786EHO2         2.787EHO2	DCM2M-DE	200,564	-4.8361E+02	-4.8361E+02	-4.8361E+02	5.44E-08	200,124	-5.7866E+02	-5.7866E+02	-5.7866E+02	5.89E-06
ABE   20,000	DCHypE-DE	200,000	-4.8361E+02		-4.8361E+02	4.43E-08	200,000	-5.7866E+02	-5.7866E+02	-5.7866E+02	7.01E-07
ABE   20,000	CMODE										2.27E-02
Company   Com				1.7441E+02							1.76E+02
DCNSGAILDE   200,000											7.35E-08
DCNSGAILDE   20,000	ECHT-ARMOR-DE	200,000	-4.8361E+02			0.00E+00	200,000	-5.7866E+02			4.05E-13
DCMMPDE   DCM											
Deftype-De   200,100   25,198E-08   3,7193E-03   9,298ZE-02   1,82E-02   200,000   4,35E-12   3,98E-00   1,05E+01   4,05E-04   4											4.22E+00
CMÓDE         200,00         0.00E+00         0.00E+00         0.00E+00         0.00E+00         2.00E+00         1.11E-52         2.29E+00         1.09E+01         4.88           AIS         200,000         0.00E+00         0.00E+00         0.00E+00         0.00E+00         2.00.000         5.55E+12         2.99E+00         1.09E+01         4.88           ECHT-ARMOR-DE         200,000         0.00E+00         0.00E+00         0.00E+00         0.00E+00         2.00.000         0.00E+00         7.53E+00         1.09E+01         5.02           DCNSGAII-DE         200,000         0.00E+00         6.167E-01         7.7084E+00         2.090e+00         2.00000         2.541E-06         2.83TE-01         4.173E+01         1.99E+01         5.00           CMODE         200,000         0.00E+00         6.167E-01         7.7084E+00         2.509E+00         2.00,000         2.541E-06         2.83TE-01         4.173E+01         1.99E+01         1.99E+01         1.99E+01         1.99E+01         1.99E+01         1.99E+01         1.99E+01         2.00E+02         1.473E+01         1.99E+01         2.00E+02         1.473E+01         1.99E+01         4.00E+02         2.00E+02         1.93E+02         3.50E+01         1.99E+01         4.275E+02         2.373E+01         4.1											1.47E+01
ADE ADE 200,000 0.00E+00 0.00E+00 0.00E+00 0.00E+00 200,000 1.11E-25 2.99F+00 1.09E+01 4.84 ECHT-ARMOR-DE 200,000 0.00E+00 0.00E+00 0.00E+00 0.00E+00 200,000 5.55E-12 4.09Fe+00 1.09E+01 5.05											4.02E+00
AIS											4.65E+00
ECHT-ARMOR-DE   200,000   0.00E+00   0.00											4.80E+00
DCNSGAILDE   200,000   0.00E+00   7.39IE+00   1.0215E+02   2.18E+01   200,000   2.541E-06   2.837E+01   4.173E+01   1.75											1.46E+00
DCNSGAIL-DE   200,000   0.00E+00   7.391E+00   1.021SE+02   2.18E+01   200,004   2.542E-06   3.190E+01   4.173E+01   1.72	ECHT-ARMOR-DE	200,000	0.00E+00			0.00E+00	200,000	0.00E+00			5.05E+00
DCMZM-DE   200,012   0.00E+00   6.167E-01   7.7084E+00   2.09E+00   200,000   2.541E-06   2.83TE+01   4.173E+01   1.99		***				* 400 04					
DCNSGAIL-DE   200,000   0.00E+00   3.083E-01   7.7084E+00   2.0000   2.541E-06   2.503E+01   4.172E+01   2.00CMODE   2.00000   2.043E+03   1.3370E+06*   3.0800E+07   6.15E+06   2.00000   2.421E+05   2.63E+09*   2.539E+10   6.22E+08   2.00000   2.421E+05   2.63E+09*   2.539E+10   6.22E+08   2.00000   2.00000   2.00E+00   2.00E+09   2.539E+10   6.22E+08   2.00000   2.421E+05   2.63E+09*   2.539E+10   6.22E+08   2.00000   2.00E+00   2.00E+09   2.00E+09   2.539E+10   6.22E+08   2.00000   2.68E+17   1.620E+03   2.534E+03   5.00E+08   2.00000   2.00E+00   2.											1.75E+01
CMÓDE         200,000         2.043E+03         1.3370E+06*         3.0800E+07         6.15E+06         200,000         1.439E+02         7.094E+03*         6.326E+04         1.55           AIS         200,000         5.201E-08         2.688E+09*         3.8323E+10         8.08E+08         200,000         2.421E+05         2.613E+09*         2.539E+10         6.22           ECHT-ARMOR-DE         200,000         0.00E+00         1.00E+01         4.4082E+00         8.85E+01         200,000         0.00E+00         0.00											1.94E+01
ADE											2.04E+01
AIS											1.59E+04
ECHT-ARMOR-DE   200,000   0.00E+00   1.76E-01   4.4082E+00   8.85E-01   200,000   0.00E+00   0.00E+00   0.00E+00   0.00E+00   0.00E+00											6.23E+09
DCNSGAII-DE   632,932											5.05E+02
DCNSGAII-DE   632,932	ECH1-ARMOR-DE	200,000	0.00E+00			8.83E-01	200,000	0.00E+00			0.00E+00
DCM2M-DE	DCNSCAII DE	622 022	4.4617E 02			5 02E 02111	1 000 000	0.1945E+02			4.93E+02
DCHypE-DE   568,508   -1.5228E-03   -4.0592E-04*   1.3116E-03   1.19E-03   371,760   -5.5435E+02   -1.1099E+02*   -1.9924E-01   2.21											2.76E+02
CMÔDE         200,000         -8,7341E-02         -8,3908E-02*         -1,5227E-03         1,72E-02         200,000         -8,8703E+02*         -6,475E+02*         -1,9924E-01         2.01           ADE         200,000         -1,7812E+00         -3,0902E-01*         3,9047E-01         6,94E-01         200,000         -8,8704E+02*         -8,8754E+02**         -2,5535E+02*         200,000         -1,9925E-01         -1,9925E-01         -1,925E-01*         -1,622*         -1,924*         -1,924*<					2.1037E-03						2.70E+02 2.21E+02
ECHT-ARMOR-DE 200,000 -1.7812E+00 -3.092E-01* 3.9047E-01 6.94E-01* 200,000 -8.8704E+02* -8.8704E+02* -2.555E+02* 6.02											2.01E+02
AIS											2.40E-07
ECHT-ARMOR-DE 200,000 -1.5227E-03 -4.2716E-02* -8.7342E-02 4.45E-02 200,000 -1.9925E-01 -1.9925E-01 -1.9925E-01 1.6925E-01											6.02E+01
DCNSGAII-DE   200,000   -6.8429E+01   -6.6849E+01   -6.2490E+01   2.55E+00   200,000   0.00E+00											1.65E-13
DCNSGAII-DE   200,000   6.8429E+01   -6.849E+01   -6.2490E+01   2.55E+00   200,000   0.00E+00   0.00E+00   0.00E+00   0.00E+00   DCM2M-DE   200,010   -6.8429E+01   -6.8429E+01   -6.8429E+01   2.36E+00   200,000   0.00E+00   0.000E+00   0.00E+00   0.00E+00   0.00E+00   0.0	ECITI-AKMOK-DE	200,000	-1.3227E-03			4.43L-02	200,000	-1.9923L-01			1.03L-13
DCM2M-DE   200,012   -6.8429E+01   -6.8429E+01   -6.8429E+01   -7.39E-08   200,000   0.00E+00	DCNSGAII-DE	200.000	-6.8429E+01			2.55E+00	200,000	0.00E+00			0.00E+00
DCHypE-DE   200,100   -6.8429E+01   -5.9162E+01   -5.1546E+01   4.42E+00   200,000   0.00E+00   0.000E+00   0.00E+00   0.00E+00   0.00E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.											0.00E+00
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$											0.00E+00
ECHT-ARMOR-DE 200,000 -6.8429E+01 -6.8429E+01 -6.8429E+01 2.30E-07 200,000 0.00E+00 0.00E+0											8.57E-09
AIS 200,000 -6.8430E+01 -6.7874E+01 -6.7071E+01 3.11E-01 200,000 1.5314E-14 1.2213E-04 2.2116E-04 2.95											0.00E+00
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$											2.95E-08
DCNSGAII-DE   200,000   3.266E-10   2.0900E+00   4.4974E+00   1.86E+00   200,072   0.00E+00   1.4022E-03   1.9146E-02   4.77											0.00E+00
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$							1		c16-10		
DCHypE-DE         200,100         1.0152E-06         1.3224E+00         3.6732E+00         1.76E+00         200,100         2.1538E-06         3.3640E-03         5.3054E-02         1.15           CMODE         200,000         3.752TE-01         1.0878E+02         1.4696E+03         2.89E+02         200,000         8.6718E-08         6.1158E-05         5.3984E-02         1.4           €ADE         200,000         3.7819E-11         7.9284E+06         6.5892E+07         1.73E+07         200,000         0.00E+00         1.5391E-01         1.0279E+00         2.8           AIS         200,000         2.5265E-20         5.1855E-09         2.8151E-08         1.15E-08         200,000         0.00E+00         0.00E+00         0.000E+00         0.000E+00         0.000E+00         0.000E+00         0.00E+00         0.00											4.78E-03
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$				1.1754E+00	3.6732E+00						4.60E-03
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$											1.18E-02
AIS 200,000 2.5265E-20 5.1855E-09 2.8151E-08 1.15E-08 200,000 0.00E+00 0.0											1.47E-04
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$											2.86E-01
DCNSGAII-DE 200,100 0.00E+00 0.00E+00 0.00E+00 0.00E+00 200,000 0.00E+00 0.											0.00E+00
DCNSGAII-DE 200,100 0.00E+00 <b>0.00E+00</b> 0.000E+00 0.00E+00 200,000 0.00E+00 <b>0.00E+00</b> 0.00E+00 0.00E+	ECHT-ARMOR-DE	200,000	0.00E+00			1.65E+00	200,000	0.00E+00			5.05E-02
DCM2M-DE   200,344   4.1422E-18   1.3219E-02   3.2708E-01   6.40E-02   200,056   0.00E+00   <b>0.00E+00</b>   0.000E+00   0.000E+00   0.00E+00   0.0							l				
											0.00E+00
DCHVPE DE 1.200.040   0.00E±00 0.00E±00 0.000E±00 0.00E±00   200.000   0.00E±00 0.00E±00 0.000E±00 0.00											0.00E+00
DCIType=DE 200,040 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E	DCHypE-DE	200,040	0.00E+00	0.00E+00	0.000E+00	0.00E+00	200,000	0.00E+00	0.00E+00	0.000E+00	0.00E+00
											4.48E+03
											2.54E+03
											1.27E+00
ECHT-ARMOR-DE 200,000 0.00E+00 <b>0.00E+00</b> 0.00E+00 0.00E+00 200,000 0.00E+00 <b>0.00E+00</b> 0.00E+00 0.00E	ECHT-ARMOR-DE	200,000	0.00E+00	0.00E+00	0.000E+00	0.00E+00	200,000	0.00E+00	0.00E+00	0.00E+00	0.00E+00

b, Mn, w, and sd represent the best, mean, worst and standard deviation, respectively, of results over all runs; FEs represents the function evaluations for CMODE,  $\varepsilon$ ADE, AIS, and ECHT-ARMOR-DE; For DCNSGAII-DE, DCM2M-DE, and DCHypE-DE, the FEs represents the average evaluations; Results with \* means that there are infeasible solutions over 25 independent runs.

TABLE IV EXPERIMENTAL RESULTS OF DCNSGA-II-DE, DCM2M-DE, DCHYPE-DE WITH CMODE [2],  $\varepsilon$ ADE [3], AIS[5] AND ECHT-ARMOR-DE[4] OVER 25 INDEPENDENT RUNS ON C01-C18 WITH 30 DIMENSIONS.

Decembra   Pet				Fen					Fcn		
December   Company   Co	Alg.s	FEs	b			sd	FEs	b			sd
Demonstrate   Color	D. 001/02   11 D.D.						500.400				
Delign											
CMODE         600000         6.92188         0.92099         0.81794         4.18450         600000         -0.13399         0.87004         3.22030         2.2016 of 1.2000           CADE         600000         4.02188         4.88924         4.88124         2.38120         600000         2.2207         2.1706         2.2016         2.2017         2.1706         2.2016         2.2007         2.2017         2.1706         2.2016         2.2017         2.2017         2.2017         2.2017         2.2017         2.2017         2.2017         2.2017         2.2017         2.2018											
ASIS   0,0000											
CHI-ARMORD   60,000											
CNNSGAIL-DE											
DCNSGAI-DE   DCNSGAI-DE   SE678EH0   28678EH0   286	ECHT-ARMOR-DE	600,000	-0.81806			2.51E-02	600,000	-2.2607			7.36E-02
DCMSALDE   DCMSALDE   DCMSALDE   SERVIEND											
Description											
CMODE         69,000         0.006+00         2.4886-01         2.8878-101         2.8878-101         4.606-00         60,000         1.498-04         4.998-01         4.098-01           εADE         600,000         2.8578-101         2.8678-101         2.8788-101											
AS DE 600,000 2.875/EHO 2.8673E+01 2.8673E+											
CHITARNOR   600,000   \$357465   66788Fab   3901E+01   4266Fab   600,000   -238E-02   198E-03   129E-02   198E-03   129E-02   198E-03   129E-02   198E-03   129E-02   198E-03   129E-04   198E-03   129E-04											
CNNSGAIL-DE											
DCNSGAILDE   614,684   4483.61   4483.61   438.61   37E-07   600,004   530.64   530.64   530.54   350.94   330.05     DCNSGAILDE   600,000   438.361   4483.61   488.61   180E-07   600,000   530.64   530.64   530.64   530.52   278E-02     CRODE   600,000   481.21   488.81   757.91   1.09E-02   600,000   516.83   489.97   418.63   2.99E-01     ECHTARMOR-DE   600,000   481.22   433.35   76.41   1.49E-02   600,000   530.53   419.11   394.65   8.29E-01     DCNSGAILDE   600,000   5.7476E-11   4.29E-017   7.674E-01   2.02E-017   600,000   1.8371E-01   600,000   1.877E-01   600,000   600,000   1.877E-01   600,000   600,000   1.877E-01   600,000	ECHT-ARMOR-DE		2.5801E-24		2.8673E+01	7.94E+00		-3.33E-06	8.37E-02		
DCMM-DE   61,684   481,61   483,61				c05-30	)D					D	
DCMSGAILDE   COMODO   -4813.61   -483.61											
CHÓDE εADE         600,000 (AB)         799,98 (BA)         293.25 (BA)         554.42 (FILE)         1916-02 (BO)000 (BA)         600,000 (BA)         438.34 (AB)         294.15 (AB)         571.91 (AB)         1056-02 (BO)000 (BO)000 (BA)         230.33 (AB)         448.61 (AB)         299.61 (AB)         425.01 (AB)         251.61 (BO)000 (BO)000 (BA)         600,000 (AB)         431.21 (AB)         42.52 (AB)         20.00 (AB)         448.22 (AB)         20.00 (AB)         448.22 (AB)         24.25 (AB)         44.298 (AB)         42.25 (AB)         44.298 (AB)         42.25 (AB)         42.27 (AB)											
εADE AIS         600,000 (481.34)         439.19 (432.35)         571.91 (479.15)         1,09E-102 (500.00)         253.50 (500.00)         419.11 (479.15)         545.65 (479.15)         2,829.10 (479.15)           DCNSGAIL-DE DCNSGAIL-DE CKMODE (600.00)         600,000 (1,287)E-10 (2,197.15)         5.7476E-11 (4,296.16)         4,269.10 (4,796.16)         7,6174E-10 (2,976.16)         2,00E-10 (2,976.16)         1,8371E-10 (2,976.16)         4,270E-10 (4,796.16)         1,870E-10 (2,976.16)         1,972E-10 (2,976.16)         3,778E-10 (2,976.16)         1,972E-10 (2,976.16)         3,778E-10 (2,976.16)         1,972E-10 (2,976.16)         1,972											
ASI											
Densarrian											
CONSIGNATION   CONTINUE   CONTI			-481.22								
DCMSGAILDE   600,000   7.4776E-11   4.294E-01   7.6714F-01   3.20E-01   600,000   1.8712E-10   5.634E-01   2.515E-01   3.79E-01   DCMSGAILDE   600,000   1.4772E-10   3.575E-01   7.3709E-01   2.91E-01   600,000   1.096E-01   3.566E-01   2.91E-01   600,000   1.096E-01   3.575E-01   2.970E-01   3.275E-01   600,000   1.096E-01   3.575E-01   2.970E-01   3.275E-01   600,000   1.096E-01   3.575E-01   600,000   600,000   1.096E-11   600,000   1.096E-01   3.575E-01   600,000		,					,				
OEHyBE-DE         600,000         2.2391E401         5.4363E401         2.24743E401         Celebral         600,000         1.0896E400         2.9378E401         3.278E401         2.2378E101         2.2378E101         2.2378E101         2.2378E101         2.238E101         600,000         1.4033E17         1.0421E401         2.231E01         1.0207E402         2.88F401         600,000         1.4033E17         1.0421E401         2.231E01         1.0207E402         2.288E101         600,000         0.0000E40         1.0138E402         2.018E01         1.0207E402         2.000         0.0000E400         2.0101E401         1.5113E402         2.028E01         1.0278E01         2.011E401         1.0278E01         2.011E401         1.0278E01         2.011E401         2.0288E01         1.0288E01         607168         3.1309E01         7.7447E601         2.7340E402         7.747E01         1.0278E01         2.011E401         2.0288E01         1.0288E01         6.02988         9.0611E-08         7.027E01         2.011E01         7.747E01         0.0000         1.0288E01         7.747E01         0.0000         1.0278E01         1.0288E01<	DCNSGAII-DE	600,000	5.7476E-11			3.20E+01	600,000	1.8371E+00		1.1876E+02	3.81E+01
CMÓDE         600.000         2.2367E-07         2.3707E-04         2.9979E-03         2.999E-01         600.000         4.1186E-02         4.1699E-01         1.0996E-10         2.931E-01           AIS         600.000         1.7096E-15         1.0730E-00         2.3370E-00         1.61840         600.000         9.7601E-17         1.6531E-00         3.833E-00         6.418E-01           CHTA RIMOR-DE         600.000         0.0000E+00         1.0730E-02         2.3370E+00         6.60000         9.7601E-17         1.6531E-00         3.833E-00         6.418E-01           DCNSGAIL-DE         600.006         4.2986E-10         4.1274E-10         1.2588E-02         3.71E-01         607.168         3.1309E-01         7.572E-01         2.774E-01         2.774E-01           DCNSGAIL-DE         600.000         5.3017E-10         6.4530E-00         9.882E-01         1.98E-01         607.68         9.161E-08         7.6729E-01         2.714E-02         5.774E-01           DCMDED         600.000         5.3017E-12         6.4530E-00         9.882E-01         1.98E-01         600.000         1.1336E-12         3.8653E-13         3.516E-13         1.88E-01           ECHT-ARMOR-DE         600.000         5.9318E-0         2.701E-0         4.518E-0         2.318E-0											
ADE         600.00         2.7570E-14         2.4723E+01         2.0207E-02         2.988E+01         600.00         1.4033E-17         1.0421E+01         2.1212E+01         1.066E+01           ECHT ARMOR-DE         600.000         0.00000E+00         1.0789E-25         1.045E-24         2.20E-25         600.000         0.0000E+00         2.0101E+01         1.5113E+02         3.383E+00         6.41E-01           DCMZM-DE         600.006         4.9806E-10         1.278E+01         1.1045E-24         2.20E-25         600.000         3.1309E-01         7.747E+01         2.73E+01           DCMZM-DE         600.000         5.890E-10         1.077E+01         1.019E-01         6.02968         9.0611E-08         7.67E+01         2.030E-02         7.74E+01           CMODE         600.000         3.501Te10         6.4540E+00         9.8829E+01         1.98E+01         600,900         1.632E+13         3.030E+01         7.532E+01         1.04E+13           ASB         600.000         8.915E-12         1.515E+13         3.87E+12         1.9000         1.627E+12         1.435E+13         3.330E+02         1.635E+13         1.56E+13           ASB         600.000         8.915E-12         1.555E+13         3.530E+10         1.52E+13         1.55E+13         1.56E+1	DCHypE-DE										
AS 600,000 1,7096E-15 1,0730E-00 2,3370E-00 1,01E-00 600,000 9,7601E-17 1,6531E-00 3,5833E-00 6,41E-01   DCNSGAIL-DE 600,006 4,59669E-10 41,274E-01 1,5058E+02 2,02E-15 600,000 0,000E+00 1,5113E-02 7,74E-01   DCNSGAIL-DE 600,006 4,59669E-10 41,274E-01 1,5058E+02 3,71E+01 607,168   DCNSGAIL-DE 600,000 5,8017E-10 6,458E-00 9,85918-01 1,98E-01 60,000E-00 1,774T-01 1,0109E-02   CMODE 600,000 5,8017E-10 6,458E-00 9,85918-01 1,98E-01 60,000E-00 1,3369E-01 7,538E-01 0,2030E-102 7,74E-01   CMODE 600,000 3,3701E-12 1,5175E-13* 3,6716E-13 8,84E-12 60,0000 1,1336E-12 3,8633E-13* 3,5416E-13 1,04E-13   AIS 600,000 4,9156E-20 1,5654E-00 2,488E-01 1,96E-00 60,000   8,9156E-20 1,5654E-00 2,488E-01 1,96E-00 60,0000 1,1336E-12 1,335E-13* 3,3416E-13 1,04E-13   AIS 600,000 8,9156E-20 1,5654E-00 2,488E-01 1,96E-00 60,000 6,000E-10 1,4855E-01 1,56E-13   DCNSGAIL-DE 1,000,000 -7,6071E-01 6,7184E-02* 1,4093E-01 1,50E-01 1,000,000 9,1845E-02 3,1098E-02* 6,333E-02* 2,77E-10   DCNSGAIL-DE 1,000,000 -7,6071E-01 6,7184E-02* 1,4093E-01* 1,50E-01 1,000,000 9,1845E-02* 4,2261E-02* 7,3235E-02* 4,93E-02   DCMDED 600,000 -3,9234E-01 1,335E-12* 1,8671E-02 8,74E-03* 6,000,000 9,1845E-02* 4,2261E-02* 7,3335E-02* 4,93E-02   AIS 600,000 -3,9234E-01 1,335E-02* 1,357E-01 6,000,000 1,94E-01* 1,4652E-01* 1,35E-01* 3,3358E-02* 6,000,000 1,94E-01* 1,35E-01* 3,3358E-02* 6,000,000 1,94E-01* 1,35E-01* 3,3358E-02* 6,000,000 1,94E-01* 1,35E-01* 3,3358E-02* 6,000,000 1,94E-01* 1,35E-01* 1,35E-01* 3,3358E-02* 6,000,000 1,94E-01* 1,35E-01* 1,3											
Company   Com											
CONSIGNATION   CONTROL											
DCNSGAIL-DE   C000.068   4.59669E-10   4.1274E-01   1.2568E+02   3.71E+01   607.168   3.1309E-01   7.744T8-01   2.714E-01   2.77E+01   DCMYDE-DE   600.000   6.00016   2.892E-10   1.000E-02   2.78E+01   600.000   6.000E-01   2.300E-01   2.77E+01   1.000E-02   2.78E+01   600.000   6.000E-01   2.300E-01   2.77E+01   6.000E-02   2.70E-02   6.4540E-00   9.8829E-01   1.98E+01   600.000   1.130E-12   3.8633E+13   3.46EE-13   1.0EE-13   3.40EE   600.000   6.000E-13   3.6633E+13   3.46EE-13   1.0EE-13   3.40EE   600.000   6.000E-13   3.6633E+13   3.46EE-13   1.0EE-13   3.40EE   600.000   6.000E-13   6.553E-00   2.48EE-00   2.48EE-01   1.0EE-01   600.000   6.020E-13   6.553E-01   5.593E-01   1.88EE-01   600.000   6.000E-13   6.553E-01   5.593E-01   1.88EE-01   600.000   6.000E-13   6.553E-01   6.553E-01   1.88EE-01   600.000   6.000E-13   6.553E-01   6.	ECITI-AKWOK-DE	000,000	0.0000E+00			2.20E-23	000,000	0.0000E+00			4.70E±01
DCM2M-DE   600,016   2.8922E-10   1.0777E-01   1.0109E+02   2.78E+01   602.968   9.0611E-08   7.6729E-01   2.0300E+02   7.16E+01   CMODE   600,000   5.017E-10   5.1575E-13*   3.6716E+13   8.84E+12   600,000   1.1336E+12   3.853E+13*   3.4516E+13   1.04E+13   AIS   600,000   8.9156E-20   1.5654E+00   2.4188E+01   1.96E+00   600,000   1.6277E+12   3.853E+13*   3.2418E+13   1.56E+13   AIS   600,000   6.000E+10   4.6110E+10   1.1527E+02   2.31E+01   600,000   2.1834E-05   1.7847E+01   5.5992E+01   1.88E+01   5.5992E+01   1.5992E+01   1.5992E	DCNSGAII-DE	600.068	4.59669E-10			3.71E+01	607.168	3.1309E+01			7.74E+01
CMODE   G00,000   S.801TE-10   6.4540E+00   9.8829E+01   1.98E+01   6.30,172   3.1309E+01   7.5328E+01   2.0300E+02   7.16E+01   3.40E   6.00,000   6.00000   6.000000   6.000000   6.00000   6.00000   6.00000   6.00000   6.00000   6.00000   6.00000   6.00000   6.00000   6.00000   6.00000   6.00000   6.00000   6.00000   6.00000   6.00000   6.00000   6.00000   6.000000   6.000000   6.000000   6.000000   6.000000   6.000000   6.000000   6.000000   6.000000   6.000000   6.000000   6.000000   6.0000000   6.0000000   6.0000000000											
CMODE         600,000         3.170[E+12]         1.5175E+13³         3.6716E+13         8.84B+12         600,000         1.336E+12         3.8653E+13*         3.5416E+13         1.04E+13           AIS         600,000         8.9156E-20         1.5664E+00         2.418E+01         1.90E+00         600,000         2.1834E+13*         3.2418E+13*         1.56E+13           ECHT-ARMOR-DE         600,000         8.9156E-20         1.5664E+00         2.418E+01         1.90E+00         600,000         2.1834E-03         1.7847E-01         5.992E+01         1.88E+01           DCNSGAII-DE         1.000,000         -6.3438E-02         2.7021E-02**         3.8499E-01         1.000,000         9.91845E+02         -2.230E+02*         6.000E+02         4.918E+02         4.92E+02         2.215E+01         6.000E+02         9.91845E+02         -2.2261E+02*         4.91E+02         2.000E+02         9.91845E+02         -2.2261E+02*         7.3235E+02         4.91E+02         2.70E+02         4.91E+02         2.20F+02         4.91E+02         2.20F+02         4.91E+02         2.20F+02         4.91E+02         2.20F+02         4.91E+02         2.27E+02         4.91E+02         2.27E+02         4.91E+02         4.2881E+02         4.2881E+03         6.0000         4.9032E+01         1.31E+02         6.0000         <											
ASS   600,000   8.9156E-20   1.6564E-00   2.4188E-01   1.96E-00   600,000   6.0209E-13   1.7847E-01   5.992E-01   1.88E-01									3.8653E+13*		
DCNSGAII-DE   00,000   0,00E+00   4,6110E+00   1,152TE+02   2,31E+01   00,000   6,0209E-13   6,5536E+01   5,333E+02   1,07E+02											
DCNSGAIL-DE   1,000,000				1.5654E+00							
DCNSGAII-DE	ECH1-ARMOR-DE	600,000	0.00E+00			2.31E+01	600,000	0.0209E-13			1.0/E+02
DCM2M-DE   1,000,000   -7,6071E-01   6.7184E-02*   4.4093E-01   2.36E-01   969,964   -9,1845E+02   -4.2261E+02*   7.3235E+02   4.91E+02   CMODE   600,000   -4.2382E-02   2.1157E-01   6.10E-02   1,000,000   -1.9926E-01   1.3152E+01*   3.3358E+02   6.68E+01   6.6	DCNSGAILDE	1 000 000	-6 3433F-02			1.06E-01	1.000.000	-9 1845F±02			4 93F±02
DCHypE-DE   1,000,000											
CMÓDE         600,000         -3.9234E-04         1.3333E-02*         1.8671E-02         8.74E-03         600,000         -1.9926E-01         1.3152E-01**         3.3338E-02         6.684e01           ANS         600,000         -1.641E-04         -1.579E-04         -1.793E-04         4.70E-05         600,000         -1.9642E-01         1.8117E+00**         3.3338E-02         6.8400         4.52E-04           ECHT-ARMOR-DE         600,000         -1.641E-04         1.137E-03**         1.8671E-02         5.28E-03         600,000         -1.9926E-01         1.6076E-01         7.6343E-01         1.93E-01           DCNSGAII-DE         600,000         -68.429         -68.429         -68.429         -68.429         -68.429         -68.429         -1.60E-07         600,000         2.836E-02         4.2276E+01         7.5125E+01         2.27E+01           DCM2M-DE         600,000         -68.429         -68.429         -68.429         1.46E-07         600,000         2.818E+01         7.5125E+01         2.27E+01           CMODE         600,000         -43.561         -38.279         -34.445         2.28E+00         600,000         4.3581E+00         8.961E+00         1.4388E+01         2.575E+01         2.275E+01           ECHT-ARMOR-DE         600,000 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>											
AIS 600,000 -1.641E-04 -1.579E-04 -1.793E-04 4.67E-05 600,000 -1.9642E-01 -1.6076E-01 7.6343E-06 4.52E-04 ECHT-ARMOR-DE 600,000 -3.9234E-04 1.1327E-03* 1.8671E-02 5.28E-03 600,000 -1.9926E-01 1.07676E-01 7.6343E-01 1.93E-01 1.9											
DCNSGAII-DE   600,000											
DCNSGAII-DE   600,000   -68.429   -68.428   -67.709   3.23E-01   600,000   9.8184E+00   5.1435E+01   7.7232E+01   2.21E+01   2.21E+01   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.00000   0.0000   0.000000   0.00000   0.00000   0.00000   0.000000   0.000000   0.0000000   0.0000000   0.0000000   0.0000000   0.0000000   0.0000000   0.0000000   0.0000000   0.0000000   0.00000000											
DCNSGAII-DE   600,000   -68.429   -67.7709   -3.33E-01   -600,000   -69.8429   -68.429   -67.453   -66.810   3.24E-01   -600,000   -69.8429   -67.453   -66.002   -27.2E-01   -600,000   -69.8429   -67.453   -66.602   -27.2E-01   -600,000   -69.8429   -67.453   -66.002   -69	ECHT-ARMOR-DE	600,000	-3.9234E-04			5.28E-03	600,000	-1.9926E-01			1.93E-01
DCM2M-DE   600,000   -68.429   -68.429   -68.429   1.46E-07   600,000   2.3096E-02   4.2276E+01   7.5281E+01   2.92E+01   CMODE   600,000   -68.429   68.228   -67.709   3.23E-01   600,000   9.8184±00   5.1435E+01   7.7232E+01   2.92E+01   2.92E+01   600,000   4.5341E+00   5.1435E+01   7.7232E+01   2.92E+01   600,000   6.84D   600,000   -43.561   -38.279   -34.445   2.28E+00   600,000   4.5341E+00   8.9621E+00   1.4388E+01   2.55E+00   6.000   6.0000   6.0000   6.8402   -67.453   -66.810   3.24E-01   600,000   5.4002E-08   4.3667E+00   1.5406E+01   4.73E+00   600,000   6.0000   -68.429   -66.236   -66.002   2.27E-01   600,000   6.7351E-15   8.6828E+07   1.5555E-06   3.14E-07   6.0000   6.7351E-15   8.6828E+07   1.5555E-06   3.14E-07   6.0000   6.7341E-00   6.0000   6.7341E-15   8.6828E+07   1.5555E-06   3.14E-07   6.0000   6.7341E-15   8.6828E+07   6.6135E+02   1.570E+04   2.74E+03   6.0000   6.0000   6.0000   6.0000   6.7341E-15   8.6828E+07   6.6135E+02   1.570E+04   2.74E+03   6.000000   6.00000   6.00000   6.00000   6.00000   6.00000   6.00000   6.00000   6.00000   6.00000   6.00000   6.00000   6.00000   6.00000   6.00000   6.00000   6.00000   6.0000000   6.000000   6.0000000   6.0000000   6.0000000   6.0000000000	DCNSCAII DE	600,000	-68 420			0.54E.00	600,000	8 1516E : 00			2.275 : 01
DCHypE-DE         600,000         -68.429         68.228         −67.709         3.23E-01         600,000         9.8184E+00         5.1435E+01         7.7232E+01         2.81E+01           CMODE         600,000         −43.561         −38.279         −34.445         2.28E+00         600,000         4.5341E+00         8.9621E+00         1.4388E+01         2.55E+00           AIS         600,000         −68.429         −66.236         −66.002         2.27E-01         600,000         −6.731E-15         8.6828E-07         1.5555E-06         3.14E-07           ECHT-ARMOR-DE         600,000         −67.416         −64.646         −60.0769         1.97E+00         600,000         1.5809E-27         −6.6135E+02         1.1507E+04         2.47E+03           DCNSGAII-DE         600,000         1.2060E+01         2.7367E+01         7.4319E+01         1.69E+01         600,164         0.00E+00         0.00E+00 <td></td>											
CMODE         600,000         −43.561         −38.279         −34.445         2.28E+00         600,000         4.5341E+00         8.9621E+00         1.4388E+01         2.55E+00           AIS         600,000         −68.429         −66.236         −66.002         2.27E-01         600,000         5.4002E-08         4.3667E+00         1.5406E+01         4.73E+00           ECHT-ARMOR-DE         600,000         −67.416         −64.646         −60.769         1.97E+00         600,000         1.5809E-27         6.6135E+02         1.1507E+04         2.47E+03           CIF-30D           CIS-30D         c15-30D         c16-30D											
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C15-30D   C15-30D   C16-30D   C16											
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	ECHT-ARMOR-DE	600,000	-67.416			1.97E+00	600,000	1.5809E-27			2.47E+03
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AIS 600,000 1.9950E-09 3.4128E+01 7.2308E+01 3.82E+01 600,000 3.9634E-11 8.2062E-02 5.4746E-01 1.12E-01 600,000 600,000 600,000E+00 600,000 600,000E+00 600,000E+00 600,000 600,000E+00 600,000E+00 600,000 600,000E+00 600,000 600,000E+00 600,000 600,000E+00 600,000 600,000E+00 600,000E+00 600,000 600,000 600,000E+00 600,000 600,000 600,000E+00 600,000 600,000E+00 600,000 600,000 600,000E+00 600,000 600,000E+00 600,000 600,000E+00 600,000 600,000 600,000E+00 600,000 600,000E+00 600,000 600,000 600,000E+00 600,000 600,000E+00 600,000 600,000E+00 600,000 600,000E+00 600,000 600,000E+00 600,000 600,000 600,000E+00 600,000 600,000E+00 600,000 600,000E+00 600,000 600,000E+00 600,000 600,000 600,000E+00 600,000E+00 600,000 600,000E+00 600,000E+00 600,000 600,000E+00 600,000E+00 600,000 600,000E+00 600,000 600,000E+00 600,000 600,000E+00 600,000 600,000E+00 600,000 600,000E+00 600,000 600,000E+00 60											
C17-30  C18-30  C18-	AIS	600,000	1.9950E-09	3.4128E+01	7.2308E+01	3.82E+01	600,000	3.9634E-11	8.2062E-02	5.4746E-01	1.12E-01
DCNSGAIL-DE         663,864         9.7212E-05         2.1765E+00*         1.9164E+01         4.50E+00         600,000         0.00E+00				3.1316E+08	5.9937E+09				0.00E+00	0.00E+00	
DCM2M-DE         635,616         5.2263E-04         3.5238E+00*         2.6361E+01         7.47E+00         600,156         3.7912E-21         5.1814E-02         6.4906E-01         1.76E-01           DCHypE-DE         842,024         5.4585E-08         2.6095E+00*         2.4723E+01         5.64E+00         600,012         0.00E+00         0.00E+00 <td></td>											
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EADE 600,000 1.3429E+02 5.0001E+02* 1.6112E+03 8.27E+02 600,000 5.3558E+05 1.8358E+06 4.3910E+06 2.02E+06 600,000 4.1942E+07 3.6051E+00 8.9452E+00 2.54E+00 600,000 1.9887E+08 4.0152E+01 6.2643E+01 1.80E+01											
AIS 600,000 4.1942E-07 3.6051E+00 8.9452E+00 2.54E+00 600,000 1.9887E-08 4.0152E+01 6.2643E+01 1.80E+01											

b, Mn, w, and sd represent the best, mean, worst and standard deviation, respectively, of results over all runs; FEs represents the function evaluations for CMODE,  $\varepsilon$ ADE, AIS, and ECHT-ARMOR-DE; For DCNSGAII-DE, DCM2M-DE, and DCHypE-DE, the FEs represents the average evaluations; Results with \* means that there are infeasible solutions over 25 independent runs.

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