Fig. 1: Average convergence trend of MFEA-OC and other compared algorithms over 20 independent runs on the single-objective MTO test suite 1
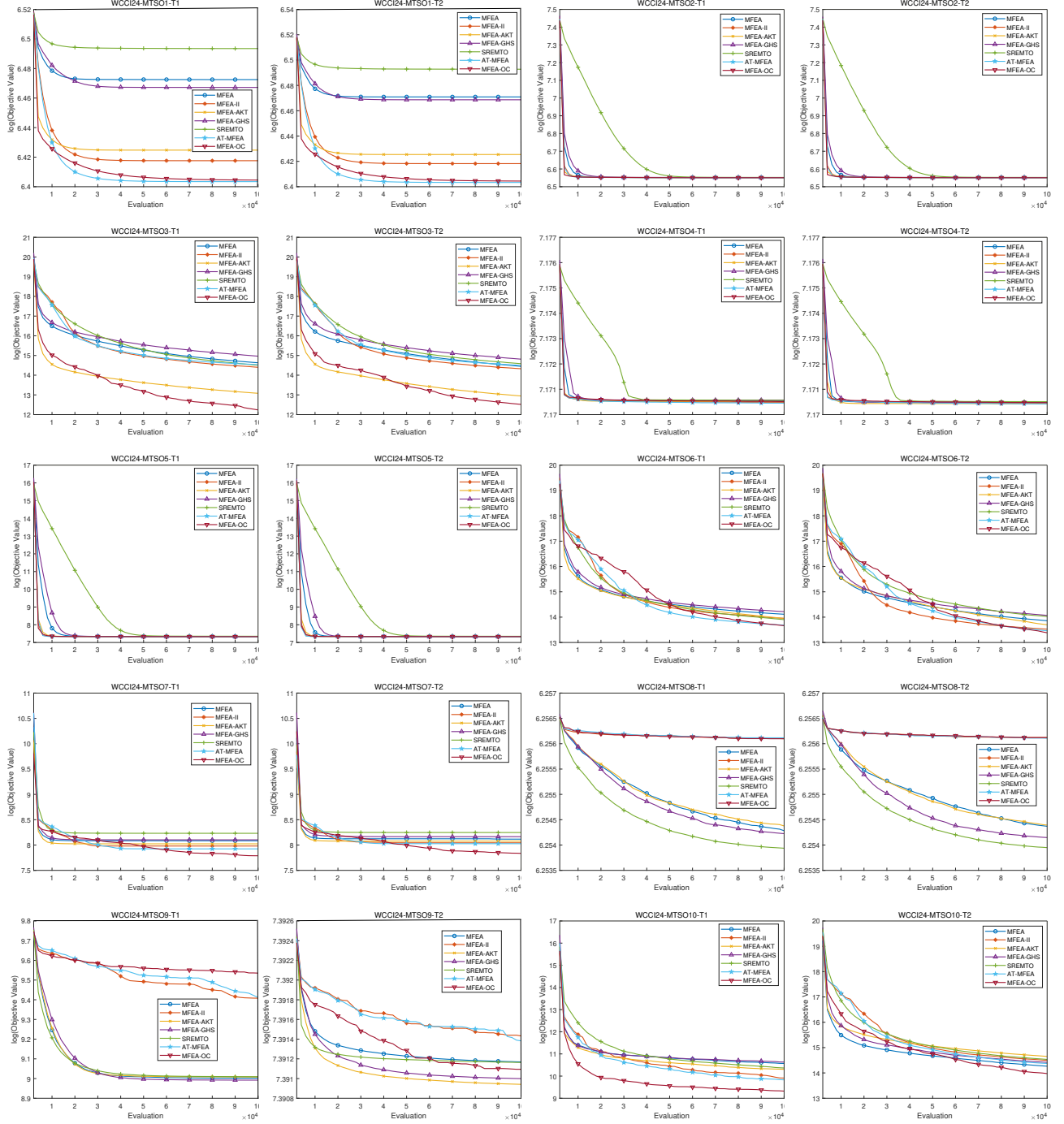
Fig. 2: Average convergence trend of MFEA-OC and other algorithm in WCCI2024 for independent 20 runs
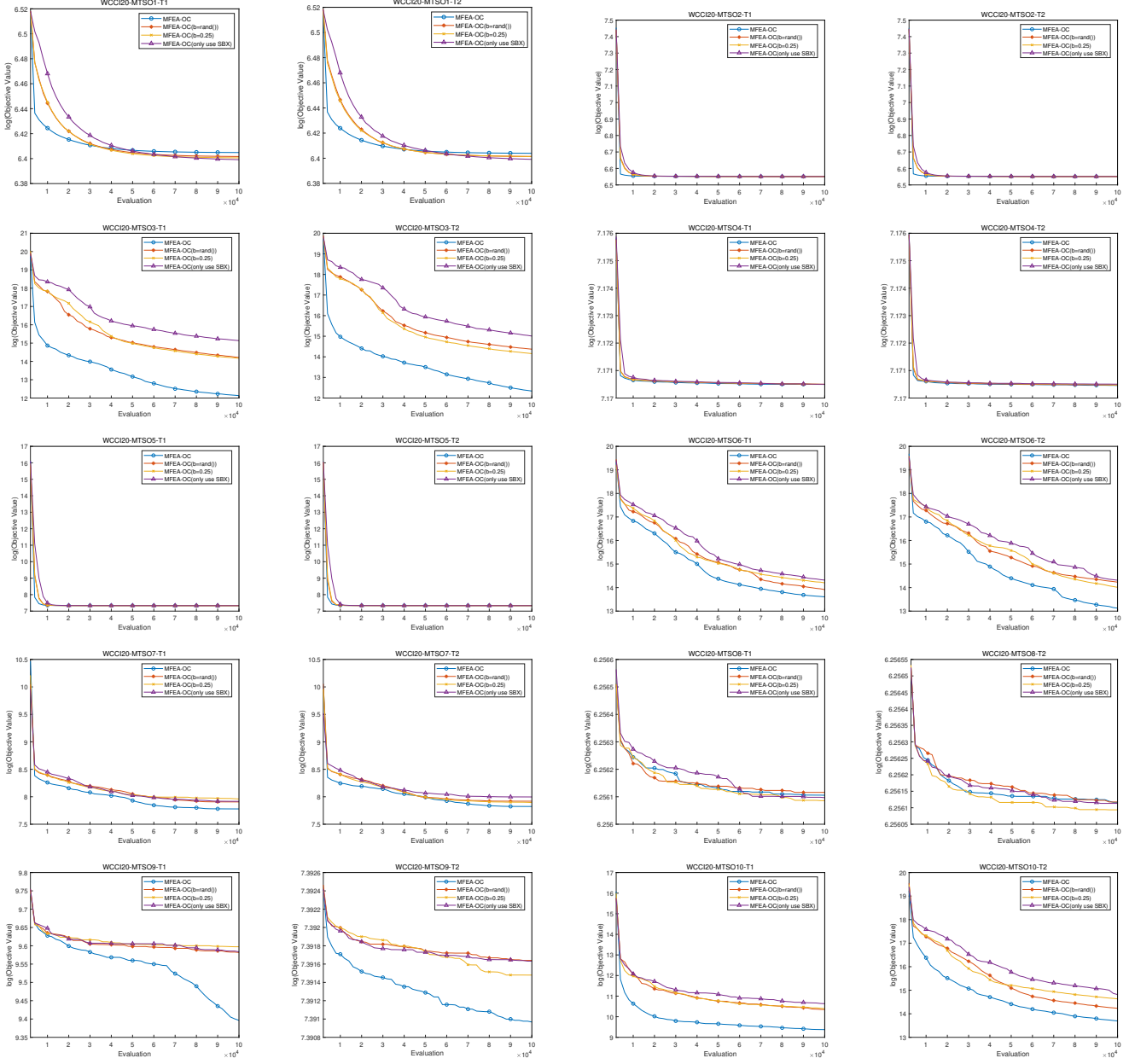
Fig. 3: Average convergence trend of four versions of the MFEA-OC over 20 independent runs on the single-objective MTO test suite WCCI2020

TABLE I: The averaged standard objective value of MFEA-OC with only use one of the formulas (**??**) and (**??**) over 20 independent runs on the single-objective MTO test suite WCCI2020

|	MFEA-OC(early phase)	MFEA-OC(later phase)
WCCI20-MTSO1-T1	**6.1881e+02 (1.26e+00)**	6.2375e+02 (1.54e+00) -
WCCI20-MTSO1-T2	**6.1931e+02 (1.25e+00)**	6.2345e+02 (1.51e+00) -
WCCI20-MTSO2-T1	**7.0457e+02 (5.78e-01)**	7.0631e+02 (1.07e+00) -
WCCI20-MTSO2-T2	**7.0493e+02 (7.29e-01)**	7.0658e+02 (8.75e-01) -
WCCI20-MTSO3-T1	**4.1210e+06 (1.28e+06)**	4.6187e+07 (2.13e+07) -
WCCI20-MTSO3-T2	**4.2915e+06 (1.39e+06)**	4.7416e+07 (2.13e+07) -
WCCI20-MTSO4-T1	**1.3007e+03 (7.04e-02)**	1.3007e+03 (7.19e-02) =
WCCI20-MTSO4-T2	**1.3006e+03 (8.18e-02)**	1.3007e+03 (1.13e-01) =
WCCI20-MTSO5-T1	**1.6049e+03 (3.06e+01)**	1.6476e+03 (4.34e+01) -
WCCI20-MTSO5-T2	**1.6014e+03 (2.22e+01)**	1.6091e+03 (3.33e+01) =
WCCI20-MTSO6-T1	**2.5229e+07 (9.39e+06)**	3.9525e+07 (9.34e+06) -
WCCI20-MTSO6-T2	**2.3058e+07 (6.74e+06)**	3.8833e+07 (9.73e+06) -
WCCI20-MTSO7-T1	**3.8993e+03 (2.48e+02)**	4.5973e+03 (3.64e+02) -
WCCI20-MTSO7-T2	**3.9893e+03 (1.86e+02)**	4.6511e+03 (3.88e+02) -
WCCI20-MTSO8-T1	**5.2127e+02 (3.56e-02)**	5.2127e+02 (3.74e-02) =
WCCI20-MTSO8-T2	5.2126e+02 (3.79e-02)	**5.2126e+02 (3.36e-02) =**
WCCI20-MTSO9-T1	**1.5302e+04 (4.04e+02)**	1.5443e+04 (3.84e+02) =
WCCI20-MTSO9-T2	**1.6226e+03 (3.20e-01)**	1.6228e+03 (2.65e-01) -
WCCI20-MTSO10-T1	**5.0232e+04 (1.78e+04)**	1.2594e+05 (5.34e+04) -
WCCI20-MTSO10-T2	**1.7001e+07 (5.89e+06)**	3.9651e+07 (1.28e+07) -
+ / - / =	Base	0 / 14 / 6
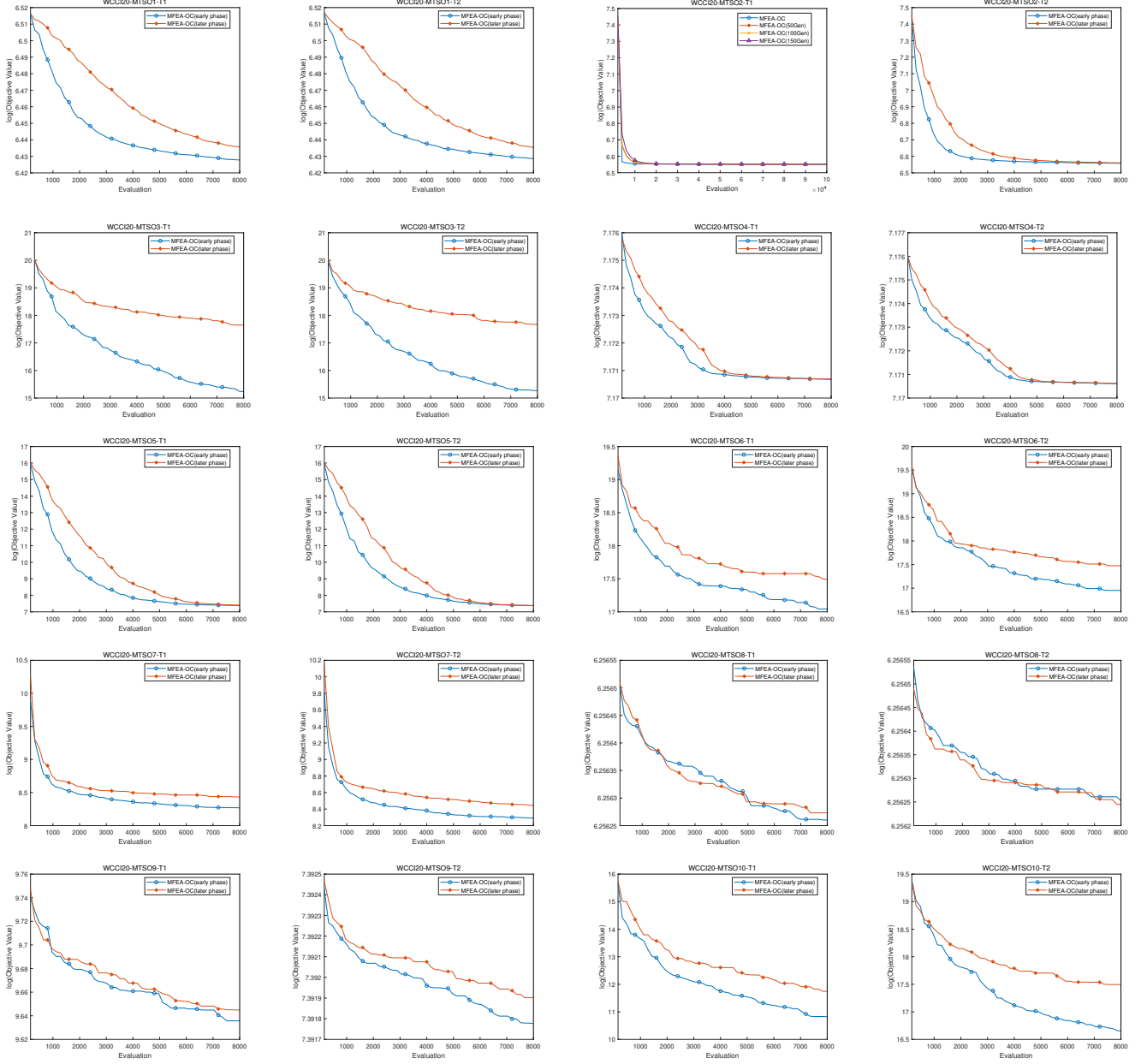
Fig. 4: Average convergence trend of MFEA-OC with only use one of the formulas (11) and (12) over 20 independent runs on the single-objective MTO test suite WCCI2020
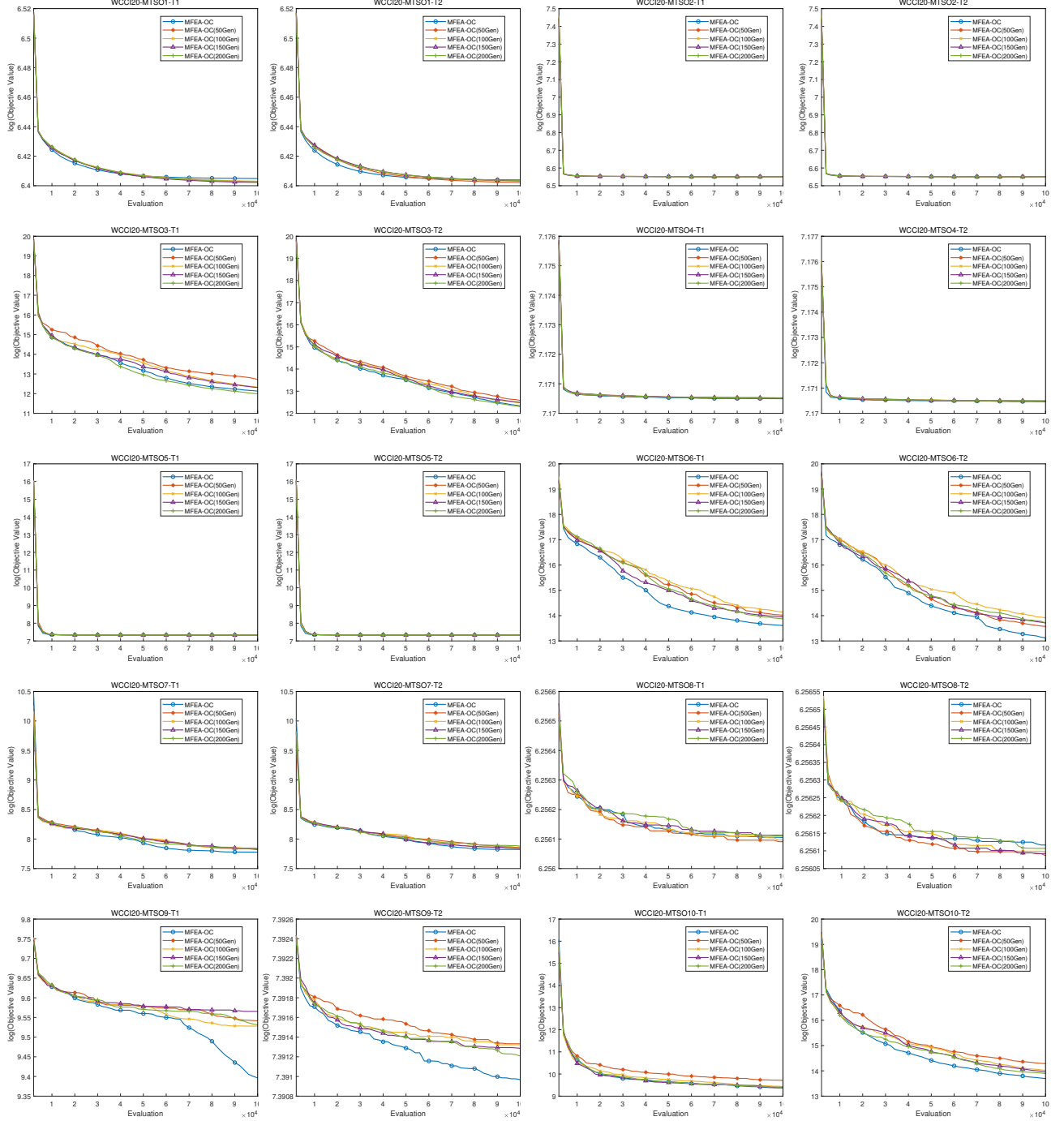
Fig. 5: Average convergence trend of different switching strategies of the MFEA-OC algorithm over 20 independent runs on the single-objective MTO test suite WCCI2020
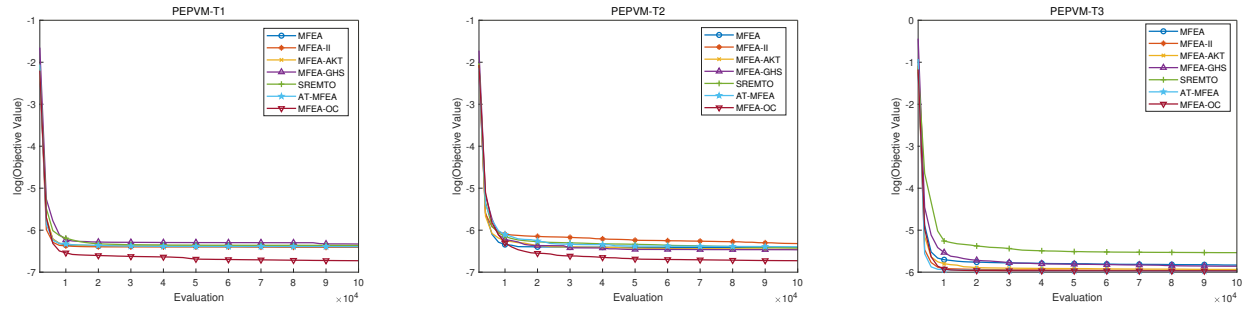
Fig. 6: The convergence trend of seven compared methods, over 20 independent runs on the real-world application.