```
(chAresEnv) PS C:\Users\HibaSikander\Desktop\RP_inProcess\cheetah-demos\bo_prior>
python eval_ares.py --optimizer BO_prior --task mismatched -n 5 -s 100

📋 Task: mismatched
  Beam:   sigma_y = 0.0001 (changed from 0.0002)
  Beam offsets (simulating misalignments):
    Q1: x=+0μm, y=+200μm
    Q2: x=+100μm, y=-300μm
    Q3: x=-100μm, y=+150μm

🔬 Running 5 trials with 100 steps each
  Optimizer: BO_prior

======================================================================
TRIAL 1/5
======================================================================
Generator: BO with mismatched prior (trainable)
  Initial offsets: all zeros (will learn true values)

📍 Initial point: q1=10.0, q2=-10.0, cv=0.0, q3=10.0, ch=0.0
  Initial MAE: 4.945132e-04

🔄 Starting optimization...
Trial 1/5:  19%|
| 19/100 [01:56<08:19,  6.17s/it]
  Step 20: Best MAE = 9.810576e-05
Trial 1/5:  39%|
| 39/100 [04:10<07:04,  6.96s/it]
  Step 40: Best MAE = 8.342384e-05
Trial 1/5:
59%|
   | 59/100 [06:24<04:24,  6.44s/it]
  Step 60: Best MAE = 8.266505e-05
Trial 1/5:
79%|
                    | 79/100 [08:32<02:13,  6.35s/it]
  Step 80: Best MAE = 8.266505e-05
Trial 1/5:
99%|
                                                    | 99/100 [10:46<00:06,
6.67s/it]
  Step 100: Best MAE = 8.006980e-05
Trial 1/5:
100%|
```

| 100/100 [10:53<00:00, 6.53s/it]

📊 Final learned offsets (m):
  Q1: x=+0.000497 (+496.9μm), y=-0.000151 (-150.9μm)
  Q2: x=+0.000488 (+487.8μm), y=-0.000408 (-408.4μm)
  Q3: x=-0.000500 (-500.0μm), y=+0.000500 (+500.0μm)

🎯 Ground truth offsets (m):
  Q1: x=+0.000000 (+0.0μm), y=+0.000200 (+200.0μm)
  Q2: x=+0.000100 (+100.0μm), y=-0.000300 (-300.0μm)
  Q3: x=-0.000100 (-100.0μm), y=+0.000150 (+150.0μm)

📏 Offset learning accuracy:
  Average absolute error: 349.0 μm
  Q1 errors: x=496.9μm, y=350.9μm
  Q2 errors: x=387.8μm, y=108.4μm
  Q3 errors: x=400.0μm, y=350.0μm

==
✅ TRIAL 1 COMPLETE
==
Best MAE: 8.006980e-05 (0.080 mm)

==
TRIAL 2/5
==
Generator: BO with mismatched prior (trainable)
  Initial offsets: all zeros (will learn true values)

📍 Initial point: q1=10.0, q2=-10.0, cv=0.0, q3=10.0, ch=0.0
  Initial MAE: 4.945132e-04

🔄 Starting optimization...
Trial 2/5: 19%|
| 19/100 [02:05<09:03, 6.71s/it]
  Step 20: Best MAE = 8.103324e-05
Trial 2/5: 39%|
| 39/100 [04:13<06:26, 6.33s/it]
  Step 40: Best MAE = 7.994389e-05
Trial 2/5:
59%|
| 59/100 [06:23<04:27, 6.53s/it]
  Step 60: Best MAE = 7.994389e-05

Trial 2/5:
79%|[redacted]| 79/100 [08:30<02:05, 5.98s/it]
  Step 80: Best MAE = 7.994389e-05
Trial 2/5:
99%|[redacted]| 99/100 [10:36<00:06,
6.13s/it]
  Step 100: Best MAE = 7.641102e-05
Trial 2/5:
100%|[redacted]| 100/100 [10:42<00:00,
6.42s/it]

📊 Final learned offsets (m):
   Q1: x=-0.000015 (-15.0μm), y=-0.000009 (-8.9μm)
   Q2: x=-0.000002 (-1.5μm), y=-0.000002 (-2.3μm)
   Q3: x=-0.000500 (-500.0μm), y=+0.000500 (+500.0μm)

🎯 Ground truth offsets (m):
   Q1: x=+0.000000 (+0.0μm), y=+0.000200 (+200.0μm)
   Q2: x=+0.000100 (+100.0μm), y=-0.000300 (-300.0μm)
   Q3: x=-0.000100 (-100.0μm), y=+0.000150 (+150.0μm)

📏 Offset learning accuracy:
   Average absolute error: 228.9 μm
   Q1 errors: x=15.0μm, y=208.9μm
   Q2 errors: x=101.5μm, y=297.7μm
   Q3 errors: x=400.0μm, y=350.0μm

==
✅ TRIAL 2 COMPLETE
==
Best MAE: 7.641102e-05 (0.076 mm)

==
TRIAL 3/5
==
Generator: BO with mismatched prior (trainable)
  Initial offsets: all zeros (will learn true values)

📍 Initial point: q1=10.0, q2=-10.0, cv=0.0, q3=10.0, ch=0.0
  Initial MAE: 4.945132e-04

🔄 Starting optimization...
Trial 3/5: 19%|
| 19/100 [01:54<08:43, 6.47s/it]
  Step 20: Best MAE = 9.144803e-05
Trial 3/5: 39%|
| 39/100 [04:04<06:42, 6.60s/it]
  Step 40: Best MAE = 8.518627e-05
Trial 3/5:
59%|
| 59/100 [06:20<04:26, 6.50s/it]
  Step 60: Best MAE = 8.518627e-05
Trial 3/5:
79%|
| 79/100 [08:42<02:29, 7.14s/it]
  Step 80: Best MAE = 8.010740e-05
Trial 3/5:
99%|
| 99/100 [10:56<00:05,
5.98s/it]
  Step 100: Best MAE = 8.010740e-05
Trial 3/5:
100%|
| 100/100 [11:01<00:00,
6.62s/it]

📊 Final learned offsets (m):
   Q1: x=-0.000049 (-49.3μm), y=-0.000003 (-3.2μm)
   Q2: x=-0.000034 (-34.3μm), y=-0.000001 (-1.4μm)
   Q3: x=+0.000500 (+500.0μm), y=-0.000500 (-500.0μm)

🎯 Ground truth offsets (m):
   Q1: x=+0.000000 (+0.0μm), y=+0.000200 (+200.0μm)
   Q2: x=+0.000100 (+100.0μm), y=-0.000300 (-300.0μm)
   Q3: x=-0.000100 (-100.0μm), y=+0.000150 (+150.0μm)

📏 Offset learning accuracy:
   Average absolute error: 322.6 μm
   Q1 errors: x=49.3μm, y=203.2μm
   Q2 errors: x=134.3μm, y=298.6μm
   Q3 errors: x=600.0μm, y=650.0μm

==
✅ TRIAL 3 COMPLETE
==

Best MAE: 8.010740e-05 (0.080 mm)

==========
TRIAL 4/5
==========
Generator: BO with mismatched prior (trainable)
  Initial offsets: all zeros (will learn true values)

📍 Initial point: q1=10.0, q2=-10.0, cv=0.0, q3=10.0, ch=0.0
  Initial MAE: 4.945132e-04

🔄 Starting optimization...
Trial 4/5: 19%|
| 19/100 [01:58<08:55, 6.61s/it]
  Step 20: Best MAE = 8.516026e-05
Trial 4/5: 39%|
| 39/100 [04:06<06:22, 6.28s/it]
  Step 40: Best MAE = 8.516026e-05
Trial 4/5:
59%|
| 59/100 [06:16<04:33, 6.66s/it]
  Step 60: Best MAE = 8.113941e-05
Trial 4/5:
79%|
| 79/100 [08:30<02:21, 6.75s/it]
  Step 80: Best MAE = 8.113941e-05
Trial 4/5:
99%|
| 99/100 [10:35<00:06,
6.05s/it]
  Step 100: Best MAE = 8.113941e-05
Trial 4/5:
100%|
| 100/100 [10:40<00:00,
6.40s/it]

📊 Final learned offsets (m):
   Q1: x=+0.000001 (+1.4μm), y=-0.000017 (-16.8μm)
   Q2: x=+0.000041 (+41.3μm), y=-0.000024 (-24.0μm)
   Q3: x=-0.000500 (-500.0μm), y=+0.000500 (+500.0μm)

🎯 Ground truth offsets (m):
   Q1: x=+0.000000 (+0.0μm), y=+0.000200 (+200.0μm)
   Q2: x=+0.000100 (+100.0μm), y=-0.000300 (-300.0μm)

Q3: x=-0.000100 (-100.0μm), y=+0.000150 (+150.0μm)

📏 Offset learning accuracy:
Average absolute error: 217.2 μm
Q1 errors: x=1.4μm, y=216.8μm
Q2 errors: x=58.7μm, y=276.0μm
Q3 errors: x=400.0μm, y=350.0μm

==========
✅ TRIAL 4 COMPLETE
==========
Best MAE: 8.113941e-05 (0.081 mm)

==========
TRIAL 5/5
==========
Generator: BO with mismatched prior (trainable)
Initial offsets: all zeros (will learn true values)

📍 Initial point: q1=10.0, q2=-10.0, cv=0.0, q3=10.0, ch=0.0
Initial MAE: 4.945132e-04

🔄 Starting optimization...
Trial 5/5: 19%|
| 19/100 [01:58<08:28, 6.28s/it]
Step 20: Best MAE = 8.283918e-05
Trial 5/5: 39%|
| 39/100 [04:05<06:45, 6.66s/it]
Step 40: Best MAE = 8.283918e-05
Trial 5/5:
59%|
| 59/100 [06:06<04:32, 6.64s/it]
Step 60: Best MAE = 8.268299e-05
Trial 5/5:
79%|
| 79/100 [08:19<02:19, 6.63s/it]
Step 80: Best MAE = 8.268299e-05
Trial 5/5:
99%|
| 99/100 [10:32<00:06,
6.71s/it]
Step 100: Best MAE = 8.179609e-05
Trial 5/5:
100%|

| 100/100 [10:38<00:00, 6.38s/it]

📊 Final learned offsets (m):
Q1: x=+0.000495 (+495.0μm), y=+0.000401 (+400.8μm)
Q2: x=-0.000494 (-493.8μm), y=-0.000059 (-58.8μm)
Q3: x=-0.000500 (-500.0μm), y=+0.000500 (+500.0μm)

🎯 Ground truth offsets (m):
Q1: x=+0.000000 (+0.0μm), y=+0.000200 (+200.0μm)
Q2: x=+0.000100 (+100.0μm), y=-0.000300 (-300.0μm)
Q3: x=-0.000100 (-100.0μm), y=+0.000150 (+150.0μm)

📏 Offset learning accuracy:
Average absolute error: 380.1 μm
Q1 errors: x=495.0μm, y=200.8μm
Q2 errors: x=593.8μm, y=241.2μm
Q3 errors: x=400.0μm, y=350.0μm

==========
✅ TRIAL 5 COMPLETE
==========
Best MAE: 8.179609e-05 (0.082 mm)

==========
🎉 ALL TRIALS COMPLETE
==========
Results saved to: data//BO_prior_mismatched_corrected.csv
Total evaluations: 505
Best MAE found: 7.641102e-05 (0.076 mm)

📈 Final Results Across 5 Trials:
Mean: 7.990474e-05 (0.080 mm)
Std: 2.084225e-06 (0.002 mm)
Median: 8.010740e-05 (0.080 mm)
Min: 7.641102e-05 (0.076 mm)
Max: 8.179609e-05 (0.082 mm)

🔬 Learned Offset Summary (Final Values):
q1_offset_x: 0.000186 ± 0.000284 m (185.8 ± 283.7 μm)
q1_offset_y: 0.000044 ± 0.000209 m (44.2 ± 208.6 μm)
q2_offset_x: -0.000000 ± 0.000348 m (-0.1 ± 348.1 μm)
q2_offset_y: -0.000099 ± 0.000175 m (-99.0 ± 174.5 μm)
q3_offset_x: -0.000300 ± 0.000447 m (-300.0 ± 447.2 μm)

```
  q3_offset_y:  0.000300 ± 0.000447 m (300.0 ± 447.2 μm)

  Ground truth:
    q1_offset_x: 0.000000 m (0.0 μm)
    q1_offset_y: 0.000200 m (200.0 μm)
    q2_offset_x: 0.000100 m (100.0 μm)
    q2_offset_y: -0.000300 m (-300.0 μm)
    q3_offset_x:  -0.000100 m (-100.0 μm)
    q3_offset_y: 0.000150 m (150.0 μm)
(chAresEnv) PS C:\Users\HibaSikander\Desktop\RP_inProcess\cheetah-demos\bo_prior>
python eval_ares.py --optimizer BO_prior --task matched_prior_newtask -n 5 -s 100

📋 Task: matched_prior_newtask (prior knows true offsets)

🔬 Running 5 trials with 100 steps each
   Optimizer: BO_prior

======================================================================
TRIAL 1/5
======================================================================
Generator: BO with matched prior (correct values, not trainable)
  Offset values:
    Q1: x=+0μm, y=+200μm
    Q2: x=+100μm, y=-300μm
    Q3: x=-100μm, y=+150μm

📍 Initial point: q1=10.0, q2=-10.0, cv=0.0, q3=10.0, ch=0.0
   Initial MAE: 4.945132e-04

🔄 Starting optimization...
Trial 1/5:  19%|
| 19/100 [01:47<07:42,  5.71s/it]
  Step 20: Best MAE = 8.634211e-05
Trial 1/5:  39%|
| 39/100 [03:41<05:50,  5.74s/it]
  Step 40: Best MAE = 8.634211e-05
Trial 1/5:
59%|
   | 59/100 [05:42<04:12,  6.17s/it]
  Step 60: Best MAE = 8.232425e-05
Trial 1/5:
79%|
                                  | 79/100 [07:46<02:15,  6.47s/it]
  Step 80: Best MAE = 8.232425e-05
```

Trial 1/5:
99%|[redacted]| 99/100 [09:54<00:06,
6.34s/it]
  Step 100: Best MAE = 8.232425e-05
Trial 1/5:
100%|[redacted]| 100/100 [10:00<00:00,
6.01s/it]

📊 Final learned offsets (m):
    Q1: x=+0.000000 (+0.0μm), y=+0.000200 (+200.0μm)
    Q2: x=+0.000100 (+100.0μm), y=-0.000300 (-300.0μm)
    Q3: x=-0.000100 (-100.0μm), y=+0.000150 (+150.0μm)

==
✅ TRIAL 1 COMPLETE
==
Best MAE: 8.232425e-05 (0.082 mm)

==
TRIAL 2/5
==
Generator: BO with matched prior (correct values, not trainable)
  Offset values:
    Q1: x=+0μm, y=+200μm
    Q2: x=+100μm, y=-300μm
    Q3: x=-100μm, y=+150μm

📍 Initial point: q1=10.0, q2=-10.0, cv=0.0, q3=10.0, ch=0.0
  Initial MAE: 4.945132e-04

🔄 Starting optimization...
Trial 2/5: 19%|[redacted]
| 19/100 [01:51<07:52, 5.83s/it]
  Step 20: Best MAE = 8.805389e-05
Trial 2/5: 39%|[redacted]
| 39/100 [03:52<06:15, 6.16s/it]
  Step 40: Best MAE = 7.953639e-05
Trial 2/5:
59%|[redacted]| 59/100 [05:58<04:11, 6.13s/it]
  Step 60: Best MAE = 7.853385e-05

Trial 2/5:
79%|[redacted]| 79/100 [08:00<02:10, 6.21s/it]
  Step 80: Best MAE = 7.853385e-05
Trial 2/5:
99%|[redacted]| 99/100 [10:04<00:06,
6.17s/it]
  Step 100: Best MAE = 7.714013e-05
Trial 2/5:
100%|[redacted]| 100/100 [10:10<00:00,
6.10s/it]

📊 Final learned offsets (m):
    Q1: x=+0.000000 (+0.0μm), y=+0.000200 (+200.0μm)
    Q2: x=+0.000100 (+100.0μm), y=-0.000300 (-300.0μm)
    Q3: x=-0.000100 (-100.0μm), y=+0.000150 (+150.0μm)

==
✅ TRIAL 2 COMPLETE
==
Best MAE: 7.714013e-05 (0.077 mm)

==
TRIAL 3/5
==
Generator: BO with matched prior (correct values, not trainable)
  Offset values:
    Q1: x=+0μm, y=+200μm
    Q2: x=+100μm, y=-300μm
    Q3: x=-100μm, y=+150μm

📍 Initial point: q1=10.0, q2=-10.0, cv=0.0, q3=10.0, ch=0.0
  Initial MAE: 4.945132e-04

🔄 Starting optimization...
Trial 3/5: 19%|[redacted]
| 19/100 [01:56<08:23, 6.21s/it]
  Step 20: Best MAE = 9.486761e-05
Trial 3/5: 39%|[redacted]
| 39/100 [04:00<06:21, 6.26s/it]
  Step 40: Best MAE = 8.121777e-05

Trial 3/5:
59%|[redacted]| 59/100 [06:01<04:03, 5.93s/it]
  Step 60: Best MAE = 7.709740e-05
Trial 3/5:
79%|[redacted]| 79/100 [08:07<02:08, 6.14s/it]
  Step 80: Best MAE = 7.709740e-05
Trial 3/5:
99%|[redacted]| 99/100 [10:10<00:06,
6.09s/it]
  Step 100: Best MAE = 7.709740e-05
Trial 3/5:
100%|[redacted]| 100/100 [10:17<00:00,
6.17s/it]

📊 Final learned offsets (m):
    Q1: x=+0.000000 (+0.0μm), y=+0.000200 (+200.0μm)
    Q2: x=+0.000100 (+100.0μm), y=-0.000300 (-300.0μm)
    Q3: x=-0.000100 (-100.0μm), y=+0.000150 (+150.0μm)

==
✅ TRIAL 3 COMPLETE
==
Best MAE: 7.709740e-05 (0.077 mm)

==
TRIAL 4/5
==
Generator: BO with matched prior (correct values, not trainable)
  Offset values:
    Q1: x=+0μm, y=+200μm
    Q2: x=+100μm, y=-300μm
    Q3: x=-100μm, y=+150μm

📍 Initial point: q1=10.0, q2=-10.0, cv=0.0, q3=10.0, ch=0.0
  Initial MAE: 4.945132e-04

🔄 Starting optimization...
Trial 4/5: 19%|[redacted]
| 19/100 [01:51<07:55, 5.87s/it]
  Step 20: Best MAE = 8.635797e-05

Trial 4/5: 39%|
| 39/100 [03:50<05:34, 5.48s/it]
  Step 40: Best MAE = 8.635797e-05
Trial 4/5:
59%|
| 59/100 [05:55<04:06, 6.01s/it]
  Step 60: Best MAE = 8.611215e-05
Trial 4/5:
79%|
| 79/100 [07:57<02:02, 5.82s/it]
  Step 80: Best MAE = 8.232636e-05
Trial 4/5:
99%|
| 99/100 [09:55<00:06,
6.21s/it]
  Step 100: Best MAE = 7.837809e-05
Trial 4/5:
100%|
| 100/100 [10:01<00:00,
6.01s/it]

📊 Final learned offsets (m):
   Q1: x=+0.000000 (+0.0μm), y=+0.000200 (+200.0μm)
   Q2: x=+0.000100 (+100.0μm), y=-0.000300 (-300.0μm)
   Q3: x=-0.000100 (-100.0μm), y=+0.000150 (+150.0μm)

==========
✅ TRIAL 4 COMPLETE
==========
Best MAE: 7.837809e-05 (0.078 mm)

==========
TRIAL 5/5
==========
Generator: BO with matched prior (correct values, not trainable)
  Offset values:
    Q1: x=+0μm, y=+200μm
    Q2: x=+100μm, y=-300μm
    Q3: x=-100μm, y=+150μm

📍 Initial point: q1=10.0, q2=-10.0, cv=0.0, q3=10.0, ch=0.0
  Initial MAE: 4.945132e-04

🔄 Starting optimization...

Trial 5/5: 19%|
| 19/100 [01:51<08:19, 6.17s/it]
  Step 20: Best MAE = 9.406831e-05
Trial 5/5: 39%|
| 39/100 [03:55<06:12, 6.10s/it]
  Step 40: Best MAE = 9.406831e-05
Trial 5/5:
59%|
| 59/100 [05:55<03:53, 5.70s/it]
  Step 60: Best MAE = 8.884577e-05
Trial 5/5:
79%|
| 79/100 [08:01<02:09, 6.19s/it]
  Step 80: Best MAE = 8.533738e-05
Trial 5/5:
99%|
| 99/100 [10:03<00:06,
6.23s/it]
  Step 100: Best MAE = 8.533738e-05
Trial 5/5:
100%|
| 100/100 [10:10<00:00,
6.10s/it]

📊 Final learned offsets (m):
   Q1: x=+0.000000 (+0.0μm), y=+0.000200 (+200.0μm)
   Q2: x=+0.000100 (+100.0μm), y=-0.000300 (-300.0μm)
   Q3: x=-0.000100 (-100.0μm), y=+0.000150 (+150.0μm)

==
✅ TRIAL 5 COMPLETE
==
Best MAE: 8.533738e-05 (0.085 mm)

==
🎉 ALL TRIALS COMPLETE
==
Results saved to: data//BO_prior_matched_prior_newtask_corrected.csv
Total evaluations: 505
Best MAE found: 7.709740e-05 (0.077 mm)

📈 Final Results Across 5 Trials:
  Mean: 8.005545e-05 (0.080 mm)
  Std: 3.643796e-06 (0.004 mm)

```
  Median: 7.837809e-05 (0.078 mm)
  Min:    7.709740e-05 (0.077 mm)
  Max:    8.533738e-05 (0.085 mm)

🔬 Learned Offset Summary (Final Values):
  q1_offset_x:  0.000000 ± 0.000000 m (0.0 ± 0.0 μm)
  q1_offset_y:  0.000200 ± 0.000000 m (200.0 ± 0.0 μm)
  q2_offset_x:  0.000100 ± 0.000000 m (100.0 ± 0.0 μm)
  q2_offset_y:  -0.000300 ± 0.000000 m (-300.0 ± 0.0 μm)
  q3_offset_x:  -0.000100 ± 0.000000 m (-100.0 ± 0.0 μm)
  q3_offset_y:  0.000150 ± 0.000000 m (150.0 ± 0.0 μm)
(chAresEnv) PS C:\Users\HibaSikander\Desktop\RP_inProcess\cheetah-demos\bo_prior>
python eval_ares.py --optimizer BO --task mismatched -n 5 -s 100

📋 Task: mismatched
   Beam:   sigma_y = 0.0001 (changed from 0.0002)
   Beam offsets (simulating misalignments):
     Q1: x=+0μm, y=+200μm
     Q2: x=+100μm, y=-300μm
     Q3: x=-100μm, y=+150μm

🔬 Running 5 trials with 100 steps each
   Optimizer: BO

======================================================================
TRIAL 1/5
======================================================================
Generator:   BO with zero mean

📍 Initial point: q1=10.0, q2=-10.0, cv=0.0, q3=10.0, ch=0.0
   Initial MAE: 4.945132e-04

🔄 Starting optimization...
Trial 1/5:  19%|
| 19/100 [00:06<00:27,  2.92it/s]
  Step 20: Best MAE = 2.247047e-04
Trial 1/5:  39%|
| 39/100 [00:13<00:20,  2.92it/s]
  Step 40: Best MAE = 1.290964e-04
Trial 1/5:
59%|
                                  | 59/100 [00:21<00:17,  2.31it/s]
  Step 60: Best MAE = 9.966258e-05
```

Trial 1/5:
79%| | 79/100 [00:31<00:11, 1.76it/s]
Step 80: Best MAE = 9.966258e-05
Trial 1/5:
99%| | 99/100 [00:46<00:00, 1.51it/s]
Step 100: Best MAE = 9.966258e-05
Trial 1/5:
100%| | 100/100 [00:47<00:00, 2.12it/s]

==========
✅ TRIAL 1 COMPLETE
==========
Best MAE: 9.966258e-05 (0.100 mm)

==========
TRIAL 2/5
==========
Generator: BO with zero mean

📍 Initial point: q1=10.0, q2=-10.0, cv=0.0, q3=10.0, ch=0.0
Initial MAE: 4.945132e-04

🔄 Starting optimization...
Trial 2/5: 19%|
| 19/100 [00:06<00:27, 2.98it/s]
Step 20: Best MAE = 3.095778e-04
Trial 2/5: 39%|
| 39/100 [00:12<00:17, 3.59it/s]
Step 40: Best MAE = 1.734979e-04
Trial 2/5:
59%| | 59/100 [00:18<00:13, 3.00it/s]
Step 60: Best MAE = 1.006315e-04
Trial 2/5:
79%| | 79/100 [00:25<00:09, 2.32it/s]
Step 80: Best MAE = 1.006315e-04
Trial 2/5:
99%|

| 99/100 [00:34<00:00, 2.43it/s]
  Step 100: Best MAE = 1.006315e-04
Trial 2/5:
100%| | 100/100 [00:34<00:00, 2.86it/s]

==
✅ TRIAL 2 COMPLETE
==
Best MAE: 1.006315e-04 (0.101 mm)

==
TRIAL 3/5
==
Generator: BO with zero mean

📍 Initial point: q1=10.0, q2=-10.0, cv=0.0, q3=10.0, ch=0.0
  Initial MAE: 4.945132e-04

🔄 Starting optimization...
Trial 3/5: 19%|
| 19/100 [00:07<00:33, 2.41it/s]
  Step 20: Best MAE = 2.108104e-04
Trial 3/5: 39%|
| 39/100 [00:13<00:17, 3.53it/s]
  Step 40: Best MAE = 1.277967e-04
Trial 3/5:
59%| | 59/100 [00:19<00:12, 3.18it/s]
  Step 60: Best MAE = 1.221297e-04
Trial 3/5:
79%| | 79/100 [00:26<00:08, 2.54it/s]
  Step 80: Best MAE = 1.063304e-04
Trial 3/5:
99%| | 99/100 [00:37<00:00, 1.94it/s]
  Step 100: Best MAE = 1.054952e-04
Trial 3/5:
100%|

| 100/100 [00:38<00:00, 2.63it/s]

==========
✅ TRIAL 3 COMPLETE
==========
Best MAE: 1.054952e-04 (0.105 mm)

==========
TRIAL 4/5
==========
Generator: BO with zero mean

📍 Initial point: q1=10.0, q2=-10.0, cv=0.0, q3=10.0, ch=0.0
  Initial MAE: 4.945132e-04

🔄 Starting optimization...
Trial 4/5: 19%|
| 19/100 [00:05<00:21, 3.75it/s]
  Step 20: Best MAE = 3.317205e-04
Trial 4/5: 39%|
| 39/100 [00:12<00:18, 3.23it/s]
  Step 40: Best MAE = 2.341105e-04
Trial 4/5:
59%|
| 59/100 [00:19<00:15, 2.65it/s]
  Step 60: Best MAE = 9.724003e-05
Trial 4/5:
79%|
| 79/100 [00:26<00:07, 2.81it/s]
  Step 80: Best MAE = 9.724003e-05
Trial 4/5:
99%|
| 99/100 [00:34<00:00, 2.27it/s]
  Step 100: Best MAE = 9.724003e-05
Trial 4/5:
100%|
| 100/100 [00:35<00:00, 2.80it/s]

==========
✅ TRIAL 4 COMPLETE
==========

Best MAE: 9.724003e-05 (0.097 mm)

==========
TRIAL 5/5
==========
Generator: BO with zero mean

📍 Initial point: q1=10.0, q2=-10.0, cv=0.0, q3=10.0, ch=0.0
  Initial MAE: 4.945132e-04

🔄 Starting optimization...
Trial 5/5: 19%|
| 19/100 [00:05<00:27, 2.99it/s]
  Step 20: Best MAE = 2.715545e-04
Trial 5/5: 39%|
| 39/100 [00:12<00:18, 3.35it/s]
  Step 40: Best MAE = 1.580185e-04
Trial 5/5:
59%|
| 59/100 [00:19<00:15, 2.64it/s]
  Step 60: Best MAE = 1.346021e-04
Trial 5/5:
79%|
| 79/100 [00:27<00:08, 2.39it/s]
  Step 80: Best MAE = 1.303080e-04
Trial 5/5:
99%|
| 99/100 [00:36<00:00,
2.32it/s]
  Step 100: Best MAE = 1.074754e-04
Trial 5/5:
100%|
| 100/100 [00:36<00:00,
2.72it/s]

==========
✅ TRIAL 5 COMPLETE
==========
Best MAE: 1.074754e-04 (0.107 mm)

==========
🎉 ALL TRIALS COMPLETE
==========
Results saved to: data//BO_mismatched_corrected.csv

Total evaluations: 505
Best MAE found: 9.724003e-05 (0.097 mm)

📈 Final Results Across 5 Trials:
  Mean: 1.021009e-04 (0.102 mm)
  Std: 4.246726e-06 (0.004 mm)
  Median: 1.006315e-04 (0.101 mm)
  Min: 9.724003e-05 (0.097 mm)
  Max: 1.074754e-04 (0.107 mm)
(chAresEnv) PS C:\Users\HibaSikander\Desktop\RP_inProcess\cheetah-demos\bo_prior>
python eval_ares.py --optimizer NM --task mismatched -n 5 -s 100

📋 Task: mismatched
   Beam: sigma_y = 0.0001 (changed from 0.0002)
   Beam offsets (simulating misalignments):
     Q1: x=+0μm, y=+200μm
     Q2: x=+100μm, y=-300μm
     Q3: x=-100μm, y=+150μm

🔬 Running 5 trials with 100 steps each
   Optimizer: NM

==
TRIAL 1/5
==
Generator: Nelder-Mead simplex

📍 Initial point: q1=10.0, q2=-10.0, cv=0.0, q3=10.0, ch=0.0
   Initial MAE: 4.945132e-04

🔄 Starting optimization...
Trial 1/5: 19%|
| 19/100 [00:00<00:00, 89.68it/s]
  Step 20: Best MAE = 2.421280e-04
Trial 1/5: 37%|
| 37/100 [00:00<00:00, 87.76it/s]
  Step 40: Best MAE = 2.144611e-04
Trial 1/5:
56%|
| 56/100 [00:00<00:00, 87.86it/s]
  Step 60: Best MAE = 1.831083e-04
Trial 1/5:
75%|
| 75/100 [00:00<00:00, 87.19it/s]

Step 80: Best MAE = 1.743260e-04
Trial 1/5:
94%|[redacted]| 94/100 [00:01<00:00, 87.95it/s]
Step 100: Best MAE = 1.701437e-04
Trial 1/5:
100%|[redacted]| 100/100 [00:01<00:00, 88.41it/s]

==========
✅ TRIAL 1 COMPLETE
==========
Best MAE: 1.701437e-04 (0.170 mm)

==========
TRIAL 2/5
==========
Generator: Nelder-Mead simplex

📍 Initial point: q1=10.0, q2=-10.0, cv=0.0, q3=10.0, ch=0.0
Initial MAE: 4.945132e-04

🔄 Starting optimization...
Trial 2/5: 19%|[redacted]
| 19/100 [00:00<00:00, 87.24it/s]
Step 20: Best MAE = 2.421280e-04
Trial 2/5: 38%|[redacted]
| 38/100 [00:00<00:00, 81.75it/s]
Step 40: Best MAE = 2.144611e-04
Trial 2/5:
56%|[redacted]
| 56/100 [00:00<00:00, 83.48it/s]
Step 60: Best MAE = 1.831083e-04
Trial 2/5:
76%|[redacted]| 76/100 [00:00<00:00, 83.68it/s]
Step 80: Best MAE = 1.743260e-04
Trial 2/5:
96%|[redacted]| 96/100 [00:01<00:00, 89.15it/s]
Step 100: Best MAE = 1.701437e-04

Trial 2/5:
100%|[redacted]| 100/100 [00:01<00:00, 85.95it/s]

==========
✅ TRIAL 2 COMPLETE
==========
Best MAE: 1.701437e-04 (0.170 mm)

==========
TRIAL 3/5
==========
Generator: Nelder-Mead simplex

📍 Initial point: q1=10.0, q2=-10.0, cv=0.0, q3=10.0, ch=0.0
  Initial MAE: 4.945132e-04

🔄 Starting optimization...
Trial 3/5: 19%|[redacted]
| 19/100 [00:00<00:00, 96.81it/s]
  Step 20: Best MAE = 2.421280e-04
Trial 3/5: 39%|[redacted]
| 39/100 [00:00<00:00, 86.52it/s]
  Step 40: Best MAE = 2.144611e-04
Trial 3/5:
58%|[redacted]| 58/100 [00:00<00:00, 85.63it/s]
  Step 60: Best MAE = 1.831083e-04
Trial 3/5:
77%|[redacted]| 77/100 [00:00<00:00, 87.44it/s]
  Step 80: Best MAE = 1.743260e-04
Trial 3/5:
97%|[redacted]| 97/100 [00:01<00:00, 89.28it/s]
  Step 100: Best MAE = 1.701437e-04
Trial 3/5:
100%|[redacted]| 100/100 [00:01<00:00, 87.35it/s]

==========

✅ TRIAL 3 COMPLETE
==========
Best MAE: 1.701437e-04 (0.170 mm)

==========
TRIAL 4/5
==========
Generator: Nelder-Mead simplex

📍 Initial point: q1=10.0, q2=-10.0, cv=0.0, q3=10.0, ch=0.0
Initial MAE: 4.945132e-04

🔄 Starting optimization...
Trial 4/5: 9%| | 9/100 [00:00<00:01, 88.65it/s]
Step 20: Best MAE = 2.421280e-04
Trial 4/5: 30%| | 30/100 [00:00<00:00, 96.65it/s]
Step 40: Best MAE = 2.144611e-04
Trial 4/5: 50%| | 50/100 [00:00<00:00, 93.05it/s]
Step 60: Best MAE = 1.831083e-04
Trial 4/5:
69%| | 69/100 [00:00<00:00, 83.98it/s]
Step 80: Best MAE = 1.743260e-04
Trial 4/5:
90%| | 90/100 [00:00<00:00, 92.54it/s]
Step 100: Best MAE = 1.701437e-04
Trial 4/5:
100%| | 100/100 [00:01<00:00, 89.25it/s]

==========
✅ TRIAL 4 COMPLETE
==========
Best MAE: 1.701437e-04 (0.170 mm)

==========
TRIAL 5/5
==========
Generator: Nelder-Mead simplex

📍 Initial point: q1=10.0, q2=-10.0, cv=0.0, q3=10.0, ch=0.0
  Initial MAE: 4.945132e-04

🔄 Starting optimization...
Trial 5/5: 19%|
| 19/100 [00:00<00:00, 94.39it/s]
  Step 20: Best MAE = 2.421280e-04
Trial 5/5: 39%|
| 39/100 [00:00<00:00, 88.66it/s]
  Step 40: Best MAE = 2.144611e-04
Trial 5/5:
57%|
| 57/100 [00:00<00:00, 80.03it/s]
  Step 60: Best MAE = 1.831083e-04
Trial 5/5:
76%|
| 76/100 [00:00<00:00, 84.23it/s]
  Step 80: Best MAE = 1.743260e-04
Trial 5/5:
96%|
| 96/100 [00:01<00:00,
89.07it/s]
  Step 100: Best MAE = 1.701437e-04
Trial 5/5:
100%|
| 100/100 [00:01<00:00,
86.86it/s]

==
✅ TRIAL 5 COMPLETE
==
Best MAE: 1.701437e-04 (0.170 mm)

==
🎉 ALL TRIALS COMPLETE
==
Results saved to: data//NM_mismatched_corrected.csv
Total evaluations: 505
Best MAE found: 1.701437e-04 (0.170 mm)

📈 Final Results Across 5 Trials:
  Mean: 1.701437e-04 (0.170 mm)
  Std: 0.000000e+00 (0.000 mm)

Median: 1.701437e-04 (0.170 mm)
Min: 1.701437e-04 (0.170 mm)
Max: 1.701437e-04 (0.170 mm)