# Results for instances from collection
# `Dispersion-QKP with strategy ran`

# File dispersion-qkp-ran_0300_005.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 300 |
| Density ($\Delta$) | 5.0 % |
| Edges ($m$) | 2,201 |

| | | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 3,836.0 | 0.34 | 1.80 | **0.00** | — | 21.24 | 6.50 | **0.00** | **0.00** | **0.00** | 0.3 | 2.7 | 120.0 | 4.5 | 1.1 | 0.4 | 9.0 |
| 5.0 | 7,396.0 | 0.35 | 1.48 | **0.00** | — | 52.94 | 0.79 | **0.00** | **0.00** | **0.00** | 0.5 | 5.8 | 120.0 | 5.7 | 1.4 | 0.3 | 8.0 |
| 10.0 | 14,088.0 | 0.16 | 0.54 | **0.00** | — | 61.52 | 2.06 | **0.00** | **0.00** | **0.00** | 0.7 | 4.4 | 120.0 | 7.6 | 1.2 | 0.3 | 3.0 |
| 25.0 | 32,567.0 | 0.07 | 0.07 | **0.00** | — | 54.45 | 21.75 | **0.00** | **0.00** | **0.00** | 1.1 | 5.4 | 120.0 | 12.4 | 1.9 | 0.4 | 13.0 |
| 50.0 | 61,016.0 | 0.20 | 0.11 | **0.00** | — | 33.45 | 0.45 | **0.00** | **0.00** | **0.01** | 1.5 | 3.5 | 120.0 | 12.3 | 1.6 | 0.7 | 12.0 |
| 75.0 | 87,934.0 | 0.04 | 0.06 | **0.00** | — | 22.17 | 1.15 | **0.00** | **0.00** | **0.00** | 1.9 | 2.0 | 120.0 | 10.9 | 1.5 | 0.2 | 17.0 |
| Avg | | 0.19 | 0.68 | **0.00** | — | 40.96 | 5.45 | **0.00** | **0.00** | **0.00** | 1.0 | 4.0 | 120.0 | 8.9 | 1.5 | 0.4 | 10.3 |
| Min | | 0.04 | 0.06 | **0.00** | — | 21.24 | 0.45 | **0.00** | **0.00** | **0.00** | 0.3 | 2.0 | 120.0 | 4.5 | 1.1 | 0.2 | 3.0 |
| Max | | 0.35 | 1.80 | **0.00** | — | 61.52 | 21.75 | **0.00** | **0.00** | **0.01** | 1.9 | 5.8 | 120.0 | 12.4 | 1.9 | 0.7 | 17.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 21 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 0.0042 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.0150 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0079 |

# File dispersion-qkp-ran_0300_010.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 300 |
| Density ($\Delta$) | 10.0 % |
| Edges ($m$) | 4,528 |

| $\gamma$ | Best OFV | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 7,186.0 | 1.57 | 0.07 | **0.00** | — | 50.59 | — | **0.00** | **0.00** | **0.00** | 0.3 | 2.9 | 120.0 | 3.6 | 120.0 | 0.6 | 7.0 |
| 5.0 | 13,916.0 | 0.89 | 0.14 | **0.00** | — | 106.56 | — | **0.00** | **0.00** | **0.00** | 0.5 | 3.1 | 120.0 | 4.4 | 120.0 | 0.5 | 7.0 |
| 10.0 | 26,913.0 | 0.20 | **0.00** | **0.00** | — | 117.43 | — | **0.00** | **0.00** | **0.00** | 0.7 | 7.5 | 120.0 | 6.9 | 120.0 | 1.0 | 22.0 |
| 25.0 | 63,706.0 | 0.22 | 0.11 | **0.00** | — | 77.11 | — | **0.00** | **0.00** | **0.01** | 1.1 | 5.0 | 120.0 | 11.4 | 120.0 | 4.9 | 54.0 |
| 50.0 | 123,347.0 | 0.51 | **0.00** | **0.00** | — | 44.66 | — | **0.00** | **0.00** | **0.00** | 1.5 | 3.7 | 120.0 | 11.0 | 120.0 | 4.3 | 120.0 |
| 75.0 | 180,546.0 | 0.02 | 0.02 | **0.00** | — | 21.29 | — | **0.00** | **0.00** | **0.00** | 1.8 | 2.0 | 120.0 | 10.9 | 120.0 | 1.2 | 55.0 |
| Avg | | 0.57 | 0.06 | **0.00** | — | 69.61 | — | **0.00** | **0.00** | **0.00** | 1.0 | 4.0 | 120.0 | 8.0 | 120.0 | 2.1 | 44.2 |
| Min | | 0.02 | **0.00** | **0.00** | — | 21.29 | — | **0.00** | **0.00** | **0.00** | 0.3 | 2.0 | 120.0 | 3.6 | 120.0 | 0.5 | 7.0 |
| Max | | 1.57 | 0.14 | **0.00** | — | 117.43 | — | **0.00** | **0.00** | **0.01** | 1.8 | 7.5 | 120.0 | 11.4 | 120.0 | 4.9 | 120.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 13 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 0.0129 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.0150 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0089 |

# File dispersion-qkp-ran_0300_025.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 300 |
| Density ($\Delta$) | 25.0 % |
| Edges ($m$) | 11,187 |

| | | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 16,668.0 | 1.71 | **0.00** | **0.00** | — | 415.24 | 4,648.72 | **0.00** | **0.00** | **0.00** | 0.3 | 2.7 | 120.0 | 2.4 | 1.5 | 4.4 | 20.0 |
| 5.0 | 32,139.0 | **0.00** | **0.00** | **0.00** | — | 310.56 | — | **0.00** | **0.00** | **0.00** | 0.5 | 3.3 | 120.0 | 4.4 | 120.0 | 9.1 | 40.0 |
| 10.0 | 61,174.0 | 0.02 | 0.21 | **0.00** | — | 227.26 | — | **0.00** | 0.04 | **0.00** | 0.7 | 5.2 | 120.0 | 6.8 | 120.0 | 37.4 | 120.0 |
| 25.0 | 151,655.0 | 0.01 | 0.01 | **0.00** | — | 145.00 | — | **0.00** | 0.01 | **0.00** | 1.1 | 4.3 | 120.0 | 11.4 | 120.0 | 22.9 | 120.0 |
| 50.0 | 292,807.0 | 0.04 | 0.04 | **0.00** | — | 72.11 | — | **0.00** | 0.05 | 0.01 | 1.6 | 3.7 | 120.0 | 11.7 | 120.0 | 18.4 | 120.0 |
| 75.0 | 430,482.0 | 0.05 | 0.02 | **0.00** | — | 32.47 | — | **0.00** | 0.29 | **0.00** | 2.0 | 2.0 | 120.0 | 10.8 | 120.0 | 34.9 | 120.0 |
| Avg | | 0.30 | 0.05 | **0.00** | — | 200.44 | — | **0.00** | 0.07 | **0.00** | 1.0 | 3.5 | 120.0 | 7.9 | 100.2 | 21.2 | 90.0 |
| Min | | **0.00** | **0.00** | **0.00** | — | 32.47 | 4,648.72 | **0.00** | **0.00** | **0.00** | 0.3 | 2.0 | 120.0 | 2.4 | 1.5 | 4.4 | 20.0 |
| Max | | 1.71 | 0.21 | **0.00** | — | 415.24 | — | **0.00** | 0.29 | 0.01 | 2.0 | 5.2 | 120.0 | 11.7 | 120.0 | 37.4 | 120.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 9 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 0.0170 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.0160 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0086 |

# File dispersion-qkp-ran_0300_050.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 300 |
| Density ($\Delta$) | 50.0 % |
| Edges ($m$) | 22,322 |

| | | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 33,849.0 | 0.53 | 0.44 | **0.00** | — | 285.66 | — | **0.00** | **0.00** | **0.00** | 0.4 | 2.9 | 120.0 | 3.7 | 120.0 | 3.4 | 54.0 |
| 5.0 | 63,941.0 | 1.03 | 0.13 | **0.00** | — | 385.91 | — | **0.00** | **0.00** | **0.00** | 0.5 | 6.0 | 120.0 | 4.5 | 120.0 | 30.2 | 120.0 |
| 10.0 | 120,417.0 | 0.06 | 0.06 | **0.00** | — | 332.87 | — | **0.00** | 0.61 | **0.00** | 0.8 | 7.0 | 120.0 | 7.4 | 120.0 | 120.3 | 120.0 |
| 25.0 | 294,808.0 | 0.55 | 0.29 | **0.00** | — | 192.41 | — | **0.00** | 1.08 | **0.01** | 1.2 | 5.6 | 120.0 | 10.2 | 120.0 | 120.5 | 120.0 |
| 50.0 | 577,776.0 | 0.22 | 0.05 | **0.00** | — | 82.68 | — | **0.00** | 0.93 | **0.01** | 1.7 | 3.4 | 120.0 | 9.5 | 120.0 | 120.6 | 120.0 |
| 75.0 | 855,682.0 | 0.40 | 0.18 | **0.00** | — | 34.73 | — | **0.00** | 0.84 | **0.00** | 2.0 | 2.1 | 120.0 | 9.8 | 120.0 | 120.1 | 120.0 |
| Avg | | 0.47 | 0.19 | **0.00** | — | 219.04 | — | **0.00** | 0.58 | **0.00** | 1.1 | 4.5 | 120.0 | 7.5 | 120.0 | 85.9 | 109.0 |
| Min | | 0.06 | 0.05 | **0.00** | — | 34.73 | — | **0.00** | **0.00** | **0.00** | 0.4 | 2.1 | 120.0 | 3.7 | 120.0 | 3.4 | 54.0 |
| Max | | 1.03 | 0.44 | **0.00** | — | 385.91 | — | **0.00** | 1.08 | **0.01** | 2.0 | 7.0 | 120.0 | 10.2 | 120.0 | 120.6 | 120.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 7 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 0.0341 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.0310 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0085 |

# File dispersion-qkp-ran_0300_075.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 300 |
| Density ($\Delta$) | 75.0 % |
| Edges ($m$) | 33,514 |

| | | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 47,288.0 | **0.00** | **0.00** | **0.00** | — | 341.74 | — | **0.00** | **0.00** | **0.00** | 0.3 | 2.7 | 120.0 | 3.5 | 120.0 | 6.5 | 77.0 |
| 5.0 | 91,363.0 | 0.40 | **0.00** | **0.00** | — | 450.48 | — | **0.00** | **0.00** | **0.00** | 0.5 | 3.2 | 120.0 | 4.7 | 120.0 | 113.3 | 120.0 |
| 10.0 | 176,858.0 | 1.43 | 0.81 | **0.00** | — | 429.40 | — | **0.00** | 1.36 | **0.00** | 0.7 | 5.7 | 120.0 | 6.4 | 120.0 | 120.3 | 120.0 |
| 25.0 | 440,392.0 | 0.72 | 0.38 | **0.00** | — | 220.07 | — | **0.00** | 1.85 | **0.00** | 1.2 | 5.4 | 120.0 | 10.1 | 120.0 | 120.8 | 120.0 |
| 50.0 | 855,143.0 | 0.24 | 0.11 | **0.00** | — | 84.03 | — | **0.00** | 2.56 | **0.01** | 1.6 | 3.1 | 120.0 | 9.7 | 120.0 | 120.2 | 120.0 |
| 75.0 | 1,269,346.0 | 0.03 | **0.00** | **0.00** | — | 35.12 | — | **0.00** | 1.99 | **0.00** | 1.9 | 2.4 | 120.0 | 9.8 | 120.0 | 65.6 | 120.0 |
| Avg | | 0.47 | 0.22 | **0.00** | — | 260.14 | — | **0.00** | 1.29 | **0.00** | 1.0 | 3.7 | 120.0 | 7.4 | 120.0 | 91.1 | 112.8 |
| Min | | **0.00** | **0.00** | **0.00** | — | 35.12 | — | **0.00** | **0.00** | **0.00** | 0.3 | 2.4 | 120.0 | 3.5 | 120.0 | 6.5 | 77.0 |
| Max | | 1.43 | 0.81 | **0.00** | — | 450.48 | — | **0.00** | 2.56 | **0.01** | 1.9 | 5.7 | 120.0 | 10.1 | 120.0 | 120.8 | 120.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 6 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 0.0497 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.0150 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0083 |

# File dispersion-qkp-ran_0300_100.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 300 |
| Density ($\Delta$) | 100.0 % |
| Edges ($m$) | 44,850 |

| | | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 65,033.0 | **0.00** | **0.00** | **0.00** | — | 570.72 | 15,165.96 | **0.00** | **0.00** | **0.01** | 0.4 | 4.1 | 120.0 | 3.2 | 2.5 | 10.3 | 87.0 |
| 5.0 | 124,204.0 | 0.85 | 0.58 | **0.00** | — | 484.76 | 518.36 | 0.14 | **0.00** | **0.00** | 0.5 | 5.4 | 120.0 | 4.6 | 4.1 | 121.2 | 120.0 |
| 10.0 | 241,306.0 | 1.47 | 1.34 | **0.00** | — | 433.16 | 1,110.10 | **0.00** | 0.90 | **0.00** | 0.7 | 7.8 | 120.0 | 6.9 | 2.4 | 97.3 | 120.0 |
| 25.0 | 597,277.0 | 0.04 | **0.00** | **0.00** | — | 222.71 | — | **0.00** | 2.03 | **0.00** | 1.2 | 9.4 | 120.0 | 10.2 | 120.0 | 28.9 | 120.0 |
| 50.0 | 1,151,475.0 | 0.44 | 0.34 | **0.00** | — | 80.59 | — | 0.28 | 1.47 | **0.01** | 1.6 | 3.2 | 120.0 | 11.3 | 120.0 | 120.1 | 120.0 |
| 75.0 | 1,706,068.0 | 0.11 | 0.04 | **0.00** | — | 28.04 | — | 0.02 | 1.76 | **0.00** | 1.9 | 2.4 | 120.0 | 10.6 | 120.0 | 120.1 | 120.0 |
| Avg | | 0.48 | 0.38 | **0.00** | — | 303.33 | — | 0.07 | 1.03 | **0.00** | 1.0 | 5.4 | 120.0 | 7.8 | 61.5 | 83.0 | 114.5 |
| Min | | **0.00** | **0.00** | **0.00** | — | 28.04 | 518.36 | **0.00** | **0.00** | **0.00** | 0.4 | 2.4 | 120.0 | 3.2 | 2.4 | 10.3 | 87.0 |
| Max | | 1.47 | 1.34 | **0.00** | — | 570.72 | — | 0.28 | 2.03 | **0.01** | 1.9 | 9.4 | 120.0 | 11.3 | 120.0 | 121.2 | 120.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 5 |
| Running time in seconds for writing input file ($t^{\mathrm{write}}$) | 0.0673 |
| Running time in seconds for executing parametric cut procedure ($t^{\mathrm{cut}}$) | 0.0150 |
| Running time in seconds for reading result file ($t^{\mathrm{read}}$) | 0.0087 |

# File dispersion-qkp-ran_0500_005.txt

| Property of graph | Value |
| --- | --- |
| Nodes ($n$) | 500 |
| Density ($\Delta$) | 5.0 % |
| Edges ($m$) | 6,096 |

| | | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| $\gamma$ | Best OFV | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 9,486.0 | 2.03 | 1.25 | 0.03 | — | 70.49 | — | **0.00** | **0.00** | **0.01** | 1.0 | 6.2 | 120.0 | 24.7 | 120.0 | 1.1 | 27.0 |
| 5.0 | 17,823.0 | 0.32 | 0.34 | **0.00** | — | 64.31 | — | **0.00** | **0.00** | **0.00** | 1.5 | 4.7 | 120.0 | 37.1 | 120.0 | 2.6 | 24.0 |
| 10.0 | 34,386.0 | 0.41 | **0.00** | **0.00** | — | 94.02 | — | **0.00** | **0.00** | **0.00** | 2.2 | 9.3 | 120.0 | 51.3 | 120.0 | 4.6 | 52.0 |
| 25.0 | 82,600.0 | 0.23 | 0.12 | **0.00** | — | 81.93 | — | **0.00** | **0.00** | **0.01** | 3.7 | 7.2 | 120.0 | 82.6 | 120.0 | 13.3 | 120.0 |
| 50.0 | 161,344.0 | 0.24 | 0.05 | **0.00** | — | 48.76 | — | **0.00** | **0.00** | **0.01** | 5.2 | 6.4 | 120.0 | 63.2 | 120.0 | 8.2 | 74.0 |
| 75.0 | 239,021.0 | 0.03 | 0.04 | **0.00** | — | 19.84 | — | **0.00** | **0.00** | **0.01** | 6.3 | 4.4 | 120.0 | 67.3 | 120.0 | 0.7 | 20.0 |
| Avg | | 0.54 | 0.30 | 0.01 | — | 63.22 | — | **0.00** | **0.00** | **0.01** | 3.3 | 6.4 | 120.0 | 54.4 | 120.0 | 5.1 | 52.8 |
| Min | | 0.03 | **0.00** | **0.00** | — | 19.84 | — | **0.00** | **0.00** | **0.00** | 1.0 | 4.4 | 120.0 | 24.7 | 120.0 | 0.7 | 20.0 |
| Max | | 2.03 | 1.25 | 0.03 | — | 94.02 | — | **0.00** | **0.00** | **0.01** | 6.3 | 9.3 | 120.0 | 82.6 | 120.0 | 13.3 | 120.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
| --- | --- |
| Number of breakpoints | 17 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 0.0108 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.0310 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0098 |

# File dispersion-qkp-ran_0500_010.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 500 |
| Density ($\Delta$) | 10.0 % |
| Edges ($m$) | 12,209 |

| | | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 16,261.0 | 1.09 | 0.48 | **0.00** | — | 97.27 | — | **0.00** | **0.00** | **0.01** | 1.1 | 2.0 | 120.0 | 23.2 | 120.0 | 2.2 | 54.0 |
| 5.0 | 32,331.0 | **0.00** | 0.20 | **0.00** | — | 167.80 | — | **0.00** | **0.00** | **0.00** | 1.6 | 2.5 | 120.0 | 29.8 | 120.0 | 5.6 | 120.0 |
| 10.0 | 63,785.0 | 0.15 | 0.02 | **0.00** | — | 140.63 | — | **0.00** | **0.00** | **0.01** | 2.3 | 6.5 | 120.0 | 48.2 | 120.0 | 14.5 | 120.0 |
| 25.0 | 158,584.0 | 0.17 | 0.03 | **0.00** | — | 113.46 | — | **0.00** | 0.04 | **0.01** | 3.7 | 10.0 | 120.0 | 74.4 | 120.0 | 19.9 | 120.0 |
| 50.0 | 315,622.0 | 0.01 | 0.01 | **0.00** | — | 69.97 | — | **0.00** | 0.13 | **0.01** | 5.2 | 6.1 | 120.0 | 63.6 | 120.0 | 22.7 | 120.0 |
| 75.0 | 472,153.0 | 0.17 | 0.08 | **0.00** | — | 23.59 | — | **0.00** | 0.01 | **0.01** | 6.2 | 3.6 | 120.0 | 65.6 | 120.0 | 6.3 | 120.0 |
| Avg | | 0.26 | 0.14 | **0.00** | — | 102.12 | — | **0.00** | 0.03 | **0.01** | 3.4 | 5.1 | 120.0 | 50.8 | 120.0 | 11.9 | 109.0 |
| Min | | **0.00** | 0.01 | **0.00** | — | 23.59 | — | **0.00** | **0.00** | **0.00** | 1.1 | 2.0 | 120.0 | 23.2 | 120.0 | 2.2 | 54.0 |
| Max | | 1.09 | 0.48 | **0.00** | — | 167.80 | — | **0.00** | 0.13 | **0.01** | 6.2 | 10.0 | 120.0 | 74.4 | 120.0 | 22.7 | 120.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 7 |
| Running time in seconds for writing input file ($t^{\mathrm{write}}$) | 0.0190 |
| Running time in seconds for executing parametric cut procedure ($t^{\mathrm{cut}}$) | 0.0310 |
| Running time in seconds for reading result file ($t^{\mathrm{read}}$) | 0.0088 |

# File dispersion-qkp-ran_0500_025.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 500 |
| Density ($\Delta$) | 25.0 % |
| Edges ($m$) | 31,106 |

| | | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 39,184.0 | 0.88 | 0.05 | **0.00** | — | 250.80 | — | **0.00** | **0.00** | **0.01** | 1.1 | 2.5 | 120.0 | 23.3 | 120.0 | 61.7 | 120.0 |
| 5.0 | 78,151.0 | 0.29 | 0.14 | **0.00** | — | 248.62 | — | **0.00** | 0.05 | **0.00** | 1.6 | 2.3 | 120.0 | 32.0 | 120.0 | 121.7 | 120.0 |
| 10.0 | 155,502.0 | 0.64 | 0.06 | **0.00** | — | 248.38 | — | **0.00** | 0.13 | **0.01** | 2.3 | 9.9 | 120.0 | 48.0 | 120.0 | 121.2 | 120.0 |
| 25.0 | 398,658.0 | 0.01 | 0.01 | **0.00** | — | 207.07 | — | 0.16 | 0.55 | **0.01** | 3.7 | 12.4 | 120.0 | 73.7 | 120.0 | 121.4 | 120.0 |
| 50.0 | 793,730.0 | 0.02 | **0.00** | **0.00** | — | 91.09 | — | **0.00** | 1.22 | **0.01** | 5.3 | 8.0 | 120.0 | 50.5 | 120.0 | 98.6 | 120.0 |
| 75.0 | 1,186,716.0 | 0.22 | 0.17 | **0.00** | — | 28.36 | — | **0.00** | 1.18 | **0.01** | 7.1 | 4.6 | 120.0 | 60.9 | 120.0 | 120.7 | 120.0 |
| Avg | | 0.34 | 0.07 | **0.00** | — | 179.05 | — | 0.03 | 0.52 | **0.01** | 3.5 | 6.6 | 120.0 | 48.1 | 120.0 | 107.5 | 120.0 |
| Min | | 0.01 | **0.00** | **0.00** | — | 28.36 | — | **0.00** | **0.00** | **0.00** | 1.1 | 2.3 | 120.0 | 23.3 | 120.0 | 61.7 | 120.0 |
| Max | | 0.88 | 0.17 | **0.00** | — | 250.80 | — | 0.16 | 1.22 | **0.01** | 7.1 | 12.4 | 120.0 | 73.7 | 120.0 | 121.7 | 120.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 4 |
| Running time in seconds for writing input file ($t^{\mathrm{write}}$) | 0.0514 |
| Running time in seconds for executing parametric cut procedure ($t^{\mathrm{cut}}$) | 0.0310 |
| Running time in seconds for reading result file ($t^{\mathrm{read}}$) | 0.0088 |

# File dispersion-qkp-ran_0500_050.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 500 |
| Density ($\Delta$) | 50.0 % |
| Edges ($m$) | 62,245 |

| | | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 77,779.0 | 0.23 | 0.11 | **0.00** | — | 509.74 | — | **0.00** | 0.72 | **0.01** | 1.2 | 2.0 | 120.0 | 20.2 | 120.0 | 120.1 | 120.0 |
| 5.0 | 156,534.0 | 0.47 | 0.21 | **0.00** | — | 487.52 | — | **0.00** | 1.08 | **0.00** | 1.6 | 3.0 | 120.0 | 30.5 | 120.0 | 120.1 | 120.0 |
| 10.0 | 311,998.0 | 0.55 | 0.30 | **0.00** | — | 385.77 | — | **0.00** | 2.07 | **0.01** | 2.4 | 11.4 | 120.0 | 48.4 | 120.0 | 120.1 | 120.0 |
| 25.0 | 786,402.0 | 0.09 | **0.00** | **0.00** | — | 208.25 | — | 0.06 | 1.50 | **0.01** | 3.8 | 10.6 | 120.0 | 62.2 | 120.0 | 120.1 | 120.0 |
| 50.0 | 1,573,273.0 | 0.01 | **0.00** | **0.00** | — | 93.46 | — | 0.42 | 1.85 | **0.01** | 5.3 | 5.7 | 120.0 | 46.3 | 120.0 | 120.9 | 120.0 |
| 75.0 | 2,356,905.0 | 0.08 | 0.03 | **0.00** | — | 28.67 | — | **0.00** | 1.31 | **0.01** | 6.4 | 3.8 | 120.0 | 60.8 | 120.0 | 120.1 | 120.0 |
| Avg | | 0.24 | 0.11 | **0.00** | — | 285.57 | — | 0.08 | 1.42 | **0.01** | 3.5 | 6.1 | 120.0 | 44.7 | 120.0 | 120.2 | 120.0 |
| Min | | 0.01 | **0.00** | **0.00** | — | 28.67 | — | **0.00** | 0.72 | **0.00** | 1.2 | 2.0 | 120.0 | 20.2 | 120.0 | 120.1 | 120.0 |
| Max | | 0.55 | 0.30 | **0.00** | — | 509.74 | — | 0.42 | 2.07 | **0.01** | 6.4 | 11.4 | 120.0 | 62.2 | 120.0 | 120.9 | 120.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 2 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 0.0956 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.0320 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0096 |

# File dispersion-qkp-ran_0500_075.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 500 |
| Density ($\Delta$) | 75.0 % |
| Edges ($m$) | 93,766 |

| $\gamma$ | Best OFV | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 116,130.0 | 0.63 | 0.27 | **0.00** | — | 891.29 | — | 1,696.29 | 1.61 | **0.01** | 1.2 | 2.3 | 120.0 | 18.4 | 120.0 | 120.1 | 120.0 |
| 5.0 | 230,759.0 | 0.81 | 0.46 | **0.00** | — | 698.28 | — | 941.90 | 2.54 | **0.00** | 1.7 | 2.6 | 120.0 | 26.5 | 120.0 | 120.1 | 120.0 |
| 10.0 | 463,541.0 | **0.00** | 0.00 | **0.00** | — | 503.80 | — | 595.38 | 3.19 | **0.01** | 2.4 | 11.5 | 120.0 | 43.9 | 120.0 | 120.1 | 120.0 |
| 25.0 | 1,176,546.0 | 0.28 | 0.16 | **0.00** | — | 236.56 | — | 297.49 | 2.22 | **0.01** | 3.9 | 9.9 | 120.0 | 57.8 | 120.0 | 120.1 | 120.0 |
| 50.0 | 2,362,127.0 | 0.07 | 0.03 | **0.00** | — | 92.14 | — | 96.56 | 1.86 | **0.01** | 5.3 | 6.0 | 120.0 | 47.5 | 120.0 | 120.0 | 120.0 |
| 75.0 | 3,550,258.0 | 0.18 | 0.16 | **0.00** | — | 28.19 | — | 32.09 | 2.02 | **0.01** | 6.7 | 3.9 | 120.0 | 61.3 | 120.0 | 120.1 | 120.0 |
| Avg | | 0.33 | 0.18 | **0.00** | — | 408.38 | — | 609.95 | 2.24 | **0.01** | 3.5 | 6.0 | 120.0 | 42.6 | 120.0 | 120.1 | 120.0 |
| Min | | **0.00** | **0.00** | **0.00** | — | 28.19 | — | 32.09 | 1.61 | **0.00** | 1.2 | 2.3 | 120.0 | 18.4 | 120.0 | 120.0 | 120.0 |
| Max | | 0.81 | 0.46 | **0.00** | — | 891.29 | — | 1,696.29 | 3.19 | **0.01** | 6.7 | 11.5 | 120.0 | 61.3 | 120.0 | 120.1 | 120.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 2 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 0.1517 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.0310 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0092 |

# File dispersion-qkp-ran_0500_100.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 500 |
| Density ($\Delta$) | 100.0 % |
| Edges ($m$) | 124,750 |

| | | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 150,817.0 | 0.78 | 0.39 | **0.00** | — | 855.69 | — | 2,721.65 | 2.07 | **0.01** | 1.2 | 2.3 | 120.0 | 18.5 | 120.0 | 120.1 | 120.0 |
| 5.0 | 300,321.0 | 0.41 | 0.31 | **0.00** | — | 703.32 | — | 1,282.25 | 3.03 | **0.00** | 1.6 | 2.8 | 120.0 | 29.1 | 120.0 | 120.1 | 120.0 |
| 10.0 | 610,941.0 | 0.10 | 0.02 | **0.00** | — | 508.53 | — | 619.77 | 4.14 | **0.01** | 2.4 | 11.8 | 120.0 | 42.6 | 120.0 | 120.1 | 120.0 |
| 25.0 | 1,554,549.0 | 0.24 | 0.17 | **0.00** | — | 238.09 | — | 264.18 | 4.08 | **0.01** | 3.8 | 9.5 | 120.0 | 65.0 | 120.0 | 120.1 | 120.0 |
| 50.0 | 3,126,790.0 | 0.14 | 0.09 | **0.00** | — | 91.11 | — | 98.41 | 3.35 | **0.01** | 5.4 | 6.1 | 120.0 | 48.0 | 120.0 | 120.1 | 120.0 |
| 75.0 | 4,711,040.0 | 0.12 | 0.10 | **0.00** | — | 27.74 | — | 27.96 | 2.87 | **0.01** | 7.2 | 4.0 | 120.0 | 60.3 | 120.0 | 120.1 | 120.0 |
| Avg | | 0.30 | 0.18 | **0.00** | — | 404.08 | — | 835.70 | 3.26 | **0.01** | 3.6 | 6.1 | 120.0 | 43.9 | 120.0 | 120.1 | 120.0 |
| Min | | 0.10 | 0.02 | **0.00** | — | 27.74 | — | 27.96 | 2.07 | **0.00** | 1.2 | 2.3 | 120.0 | 18.5 | 120.0 | 120.1 | 120.0 |
| Max | | 0.78 | 0.39 | **0.00** | — | 855.69 | — | 2,721.65 | 4.14 | **0.01** | 7.2 | 11.8 | 120.0 | 65.0 | 120.0 | 120.1 | 120.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 1 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 0.1955 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.0470 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0091 |

# File dispersion-qkp-ran_1000_005.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 1,000 |
| Density ($\Delta$) | 5.0 % |
| Edges ($m$) | 25,021 |

| | | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 33,256.0 | 0.01 | 0.01 | **0.00** | — | — | — | **0.00** | 0.10 | **0.01** | 7.5 | 9.6 | 120.0 | 120.0 | 120.0 | 38.9 | 120.0 |
| 5.0 | 65,442.0 | 0.27 | 0.18 | 0.03 | — | — | — | **0.00** | 0.08 | **0.01** | 11.0 | 7.7 | 120.0 | 120.0 | 120.0 | 43.0 | 120.0 |
| 10.0 | 129,928.0 | 0.10 | 0.11 | **0.00** | — | — | — | **0.00** | 0.05 | **0.01** | 15.6 | 12.6 | 120.0 | 120.0 | 120.0 | 67.5 | 120.0 |
| 25.0 | 325,211.0 | 0.07 | 0.02 | **0.00** | — | — | — | **0.00** | 0.12 | **0.02** | 25.0 | 22.4 | 120.0 | 120.0 | 120.0 | 52.4 | 120.0 |
| 50.0 | 649,525.0 | 0.06 | 0.03 | **0.00** | — | — | — | **0.00** | 0.28 | **0.02** | 34.6 | 10.1 | 120.0 | 120.0 | 120.0 | 14.1 | 120.0 |
| 75.0 | 965,530.0 | 0.10 | 0.01 | **0.00** | — | — | — | **0.00** | 0.25 | **0.02** | 41.0 | 9.1 | 120.0 | 120.0 | 120.0 | 8.4 | 120.0 |
| Avg | | 0.10 | 0.06 | 0.01 | — | — | — | **0.00** | 0.15 | **0.02** | 22.4 | 11.9 | 120.0 | 120.0 | 120.0 | 37.4 | 120.0 |
| Min | | 0.01 | 0.01 | **0.00** | — | — | — | **0.00** | 0.05 | **0.01** | 7.5 | 7.7 | 120.0 | 120.0 | 120.0 | 8.4 | 120.0 |
| Max | | 0.27 | 0.18 | 0.03 | — | — | — | **0.00** | 0.28 | **0.02** | 41.0 | 22.4 | 120.0 | 120.0 | 120.0 | 67.5 | 120.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 10 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 0.0420 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.0790 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0107 |

# File dispersion-qkp-ran_1000_010.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 1,000 |
| Density ($\Delta$) | 10.0 % |
| Edges ($m$) | 50,076 |

| | | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 63,961.0 | 0.10 | 0.03 | 0.03 | — | — | — | **0.00** | 0.07 | **0.02** | 7.8 | 6.4 | 120.0 | 120.0 | 120.0 | 120.5 | 120.0 |
| 5.0 | 129,640.0 | 0.15 | 0.05 | **0.00** | — | — | — | **0.00** | 0.17 | **0.01** | 11.4 | 10.8 | 120.0 | 120.0 | 120.0 | 75.9 | 120.0 |
| 10.0 | 260,427.0 | 0.05 | 0.10 | **0.00** | — | — | — | **0.00** | 0.35 | **0.01** | 16.4 | 18.0 | 120.0 | 120.0 | 120.0 | 63.1 | 120.0 |
| 25.0 | 646,371.0 | 0.04 | 0.01 | **0.00** | — | — | — | **0.00** | 0.52 | **0.02** | 26.4 | 21.0 | 120.0 | 120.0 | 120.0 | 97.6 | 120.0 |
| 50.0 | 1,283,391.0 | 0.02 | **0.00** | **0.00** | — | — | — | **0.00** | 1.03 | **0.02** | 37.5 | 10.8 | 120.0 | 120.0 | 120.0 | 66.6 | 120.0 |
| 75.0 | 1,916,564.0 | 0.07 | 0.03 | **0.00** | — | — | — | **0.00** | 0.78 | **0.02** | 40.7 | 9.4 | 120.0 | 120.0 | 120.0 | 83.6 | 120.0 |
| Avg | | 0.07 | 0.04 | 0.01 | — | — | — | **0.00** | 0.49 | **0.02** | 23.4 | 12.7 | 120.0 | 120.0 | 120.0 | 84.5 | 120.0 |
| Min | | 0.02 | **0.00** | **0.00** | — | — | — | **0.00** | 0.07 | **0.01** | 7.8 | 6.4 | 120.0 | 120.0 | 120.0 | 63.1 | 120.0 |
| Max | | 0.15 | 0.10 | 0.03 | — | — | — | **0.00** | 1.03 | **0.02** | 40.7 | 21.0 | 120.0 | 120.0 | 120.0 | 120.5 | 120.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 5 |
| Running time in seconds for writing input file ($t^{\mathrm{write}}$) | 0.0821 |
| Running time in seconds for executing parametric cut procedure ($t^{\mathrm{cut}}$) | 0.0780 |
| Running time in seconds for reading result file ($t^{\mathrm{read}}$) | 0.0106 |

# File dispersion-qkp-ran_1000_025.txt

| Property of graph | Value |
| --- | --- |
| Nodes $(n)$ | 1,000 |
| Density $(\Delta)$ | 25.0 % |
| Edges $(m)$ | 124,511 |

| | | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| $\gamma$ | Best OFV | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 150,301.0 | 0.18 | 0.17 | **0.00** | — | — | — | 3,028.66 | 0.45 | **0.02** | 7.9 | 10.9 | 120.0 | 120.0 | 120.0 | 120.1 | 120.0 |
| 5.0 | 306,205.0 | **0.00** | 0.02 | **0.00** | — | — | — | 1,708.55 | 0.88 | **0.01** | 11.6 | 8.8 | 120.0 | 120.0 | 120.0 | 120.1 | 120.0 |
| 10.0 | 620,198.0 | 0.18 | 0.02 | **0.00** | — | — | — | 867.20 | 1.23 | **0.01** | 16.2 | 24.5 | 120.0 | 120.0 | 120.0 | 120.1 | 120.0 |
| 25.0 | 1,563,255.0 | 0.10 | **0.00** | **0.00** | — | — | — | 282.97 | 1.45 | **0.02** | 25.2 | 23.2 | 120.0 | 120.0 | 120.0 | 120.1 | 120.0 |
| 50.0 | 3,125,929.0 | 0.01 | 0.01 | **0.00** | — | — | — | 99.86 | 1.74 | **0.02** | 34.5 | 10.2 | 120.0 | 120.0 | 120.0 | 120.1 | 120.0 |
| 75.0 | 4,720,097.0 | 0.14 | **0.00** | **0.00** | — | — | — | 31.59 | 1.46 | **0.02** | 40.9 | 9.1 | 120.0 | 120.0 | 120.0 | 120.1 | 120.0 |
| Avg | | 0.10 | 0.04 | **0.00** | — | — | — | 1,003.14 | 1.20 | **0.02** | 22.7 | 14.5 | 120.0 | 120.0 | 120.0 | 120.1 | 120.0 |
| Min | | **0.00** | **0.00** | **0.00** | — | — | — | 31.59 | 0.45 | **0.01** | 7.9 | 8.8 | 120.0 | 120.0 | 120.0 | 120.1 | 120.0 |
| Max | | 0.18 | 0.17 | **0.00** | — | — | — | 3,028.66 | 1.74 | **0.02** | 40.9 | 24.5 | 120.0 | 120.0 | 120.0 | 120.1 | 120.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
| --- | --- |
| Number of breakpoints | 3 |
| Running time in seconds for writing input file ($t^{\mathrm{write}}$) | 0.2049 |
| Running time in seconds for executing parametric cut procedure ($t^{\mathrm{cut}}$) | 0.0780 |
| Running time in seconds for reading result file ($t^{\mathrm{read}}$) | 0.0106 |

# File dispersion-qkp-ran_1000_050.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 1,000 |
| Density ($\Delta$) | 50.0 % |
| Edges ($m$) | 249,725 |

| | | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 297,648.0 | 0.20 | 0.05 | **0.00** | — | — | — | 1,625.60 | 2.64 | **0.03** | 8.1 | 11.7 | 120.0 | 120.0 | 120.0 | 120.3 | 120.0 |
| 5.0 | 604,276.0 | 0.50 | 0.37 | **0.00** | — | — | — | 1,061.78 | 2.14 | **0.01** | 11.8 | 12.1 | 120.0 | 120.0 | 120.0 | 120.5 | 120.0 |
| 10.0 | 1,226,691.0 | 0.21 | 0.11 | **0.00** | — | — | — | 630.36 | 2.83 | **0.01** | 16.8 | 23.1 | 120.0 | 120.0 | 120.0 | 120.3 | 120.0 |
| 25.0 | 3,124,211.0 | 0.36 | **0.00** | **0.00** | — | — | — | 256.24 | 2.73 | **0.02** | 26.4 | 27.9 | 120.0 | 120.0 | 120.0 | 120.3 | 120.0 |
| 50.0 | 6,260,333.0 | 0.03 | **0.00** | **0.00** | — | — | — | 84.98 | 2.87 | **0.02** | 36.2 | 10.6 | 120.0 | 120.0 | 120.0 | 120.3 | 120.0 |
| 75.0 | 9,404,648.0 | **0.00** | **0.00** | **0.00** | — | — | — | 29.26 | 2.20 | **0.02** | 42.9 | 9.4 | 120.0 | 120.0 | 120.0 | 120.3 | 120.0 |
| Avg | | 0.22 | 0.09 | **0.00** | — | — | — | 614.70 | 2.57 | **0.02** | 23.7 | 15.8 | 120.0 | 120.0 | 120.0 | 120.3 | 120.0 |
| Min | | **0.00** | **0.00** | **0.00** | — | — | — | 29.26 | 2.14 | **0.01** | 8.1 | 9.4 | 120.0 | 120.0 | 120.0 | 120.3 | 120.0 |
| Max | | 0.50 | 0.37 | **0.00** | — | — | — | 1,625.60 | 2.87 | **0.03** | 42.9 | 27.9 | 120.0 | 120.0 | 120.0 | 120.5 | 120.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 2 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 0.4041 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.1100 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0110 |

# File dispersion-qkp-ran_1000_075.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 1,000 |
| Density ($\Delta$) | 75.0 % |
| Edges ($m$) | 374,743 |

| | | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 441,500.0 | 0.87 | 0.57 | **0.00** | — | — | — | 2,350.46 | 3.76 | **0.02** | 8.1 | 7.8 | 120.0 | 120.0 | 120.0 | 120.4 | 120.0 |
| 5.0 | 902,627.0 | 0.63 | 0.04 | **0.00** | — | — | — | 1,420.55 | 2.17 | **0.01** | 11.6 | 7.7 | 120.0 | 120.0 | 120.0 | 120.4 | 120.0 |
| 10.0 | 1,848,201.0 | 0.55 | **0.00** | **0.00** | — | — | — | 726.49 | 4.16 | **0.01** | 16.4 | 33.4 | 120.0 | 120.0 | 120.0 | 120.5 | 120.0 |
| 25.0 | 4,709,920.0 | 0.04 | 0.02 | **0.00** | — | — | — | 288.73 | 3.72 | **0.02** | 26.0 | 24.3 | 120.0 | 120.0 | 120.0 | 120.4 | 120.0 |
| 50.0 | 9,403,076.0 | 0.09 | 0.07 | **0.00** | — | — | — | 113.98 | 3.44 | **0.02** | 35.5 | 11.4 | 120.0 | 120.0 | 120.0 | 120.4 | 120.0 |
| 75.0 | 14,141,901.0 | 0.02 | **0.00** | **0.00** | — | — | — | 40.58 | 3.07 | **0.02** | 42.2 | 9.4 | 120.0 | 120.0 | 120.0 | 120.4 | 120.0 |
| Avg | | 0.37 | 0.12 | **0.00** | — | — | — | 823.46 | 3.39 | **0.02** | 23.3 | 15.7 | 120.0 | 120.0 | 120.0 | 120.4 | 120.0 |
| Min | | 0.02 | **0.00** | **0.00** | — | — | — | 40.58 | 2.17 | **0.01** | 8.1 | 7.7 | 120.0 | 120.0 | 120.0 | 120.4 | 120.0 |
| Max | | 0.87 | 0.57 | **0.00** | — | — | — | 2,350.46 | 4.16 | **0.02** | 42.2 | 33.4 | 120.0 | 120.0 | 120.0 | 120.5 | 120.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 2 |
| Running time in seconds for writing input file ($t^{\mathrm{write}}$) | 0.6039 |
| Running time in seconds for executing parametric cut procedure ($t^{\mathrm{cut}}$) | 0.1400 |
| Running time in seconds for reading result file ($t^{\mathrm{read}}$) | 0.0107 |

# File dispersion-qkp-ran_1000_100.txt

| Property of graph | Value |
| --- | --- |
| Nodes ($n$) | 1,000 |
| Density ($\Delta$) | 100.0 % |
| Edges ($m$) | 499,500 |

| | | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| $\gamma$ | Best OFV | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 594,758.0 | **0.00** | 0.00 | **0.00** | — | — | — | 1,997.47 | 4.25 | **0.02** | 8.0 | 12.5 | 120.0 | 120.0 | 120.0 | 120.5 | 120.0 |
| 5.0 | 1,202,265.0 | 0.16 | 0.08 | **0.00** | — | — | — | 1,339.87 | 4.64 | **0.01** | 11.7 | 10.5 | 120.0 | 120.0 | 120.0 | 120.9 | 121.0 |
| 10.0 | 2,448,419.0 | 0.06 | 0.04 | **0.00** | — | — | — | 843.59 | 4.34 | **0.01** | 16.5 | 24.3 | 120.0 | 120.0 | 120.0 | 120.9 | 120.0 |
| 25.0 | 6,267,974.0 | 0.08 | 0.05 | **0.00** | — | — | — | 297.49 | 4.76 | **0.02** | 26.1 | 24.7 | 120.0 | 120.0 | 120.0 | 122.7 | 120.0 |
| 50.0 | 12,513,115.0 | 0.10 | 0.09 | **0.00** | — | — | — | 99.38 | 4.77 | **0.02** | 36.0 | 14.3 | 120.0 | 120.0 | 120.0 | 123.0 | 120.0 |
| 75.0 | 18,829,315.0 | 0.05 | 0.04 | **0.00** | — | — | — | 35.93 | 3.20 | **0.02** | 42.2 | 10.3 | 120.0 | 120.0 | 120.0 | 124.0 | 121.0 |
| Avg | | 0.07 | 0.05 | **0.00** | — | — | — | 768.96 | 4.33 | **0.02** | 23.4 | 16.1 | 120.0 | 120.0 | 120.0 | 122.0 | 120.3 |
| Min | | **0.00** | **0.00** | **0.00** | — | — | — | 35.93 | 3.20 | **0.01** | 8.0 | 10.3 | 120.0 | 120.0 | 120.0 | 120.5 | 120.0 |
| Max | | 0.16 | 0.09 | **0.00** | — | — | — | 1,997.47 | 4.77 | **0.02** | 42.2 | 24.7 | 120.0 | 120.0 | 120.0 | 124.0 | 121.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
| --- | --- |
| Number of breakpoints | 2 |
| Running time in seconds for writing input file ($t^{\mathrm{write}}$) | 0.8067 |
| Running time in seconds for executing parametric cut procedure ($t^{\mathrm{cut}}$) | 0.1410 |
| Running time in seconds for reading result file ($t^{\mathrm{read}}$) | 0.0109 |

# File dispersion-qkp-ran_2000_005.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 2,000 |
| Density ($\Delta$) | 5.0 % |
| Edges ($m$) | 99,945 |

| | | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 128,068.0 | 0.15 | 0.15 | **0.00** | — | — | — | 2,258.09 | 0.63 | **0.05** | 53.2 | 34.9 | 120.0 | 120.0 | 120.0 | 120.1 | 120.0 |
| 5.0 | 256,310.0 | 0.09 | 0.03 | **0.00** | — | — | — | 0.04 | 0.35 | **0.03** | 76.9 | 36.8 | 120.0 | 120.0 | 120.0 | 120.1 | 120.0 |
| 10.0 | 514,479.0 | 0.03 | 0.01 | **0.00** | — | — | — | 45.26 | 0.42 | **0.05** | 113.4 | 33.9 | 120.0 | 120.0 | 120.0 | 120.1 | 120.0 |
| 25.0 | 1,271,703.0 | 0.04 | 0.01 | **0.00** | — | — | — | 1.91 | 0.32 | **0.09** | 120.0 | 66.0 | 120.0 | 120.0 | 120.0 | 120.1 | 120.0 |
| 50.0 | 2,542,191.0 | **0.00** | 0.01 | **0.00** | — | — | — | 14.59 | 0.67 | **0.10** | 120.0 | 37.2 | 120.0 | 120.0 | 120.0 | 120.1 | 120.0 |
| 75.0 | 3,799,896.0 | **0.00** | **0.00** | **0.00** | — | — | — | 0.71 | 0.81 | **0.09** | 120.1 | 35.4 | 120.0 | 120.0 | 120.0 | 120.1 | 120.0 |
| Avg | | 0.05 | 0.04 | **0.00** | — | — | — | 386.77 | 0.53 | **0.07** | 100.6 | 40.7 | 120.0 | 120.0 | 120.0 | 120.1 | 120.0 |
| Min | | **0.00** | **0.00** | **0.00** | — | — | — | 0.04 | 0.32 | **0.03** | 53.2 | 33.9 | 120.0 | 120.0 | 120.0 | 120.1 | 120.0 |
| Max | | 0.15 | 0.15 | **0.00** | — | — | — | 2,258.09 | 0.81 | **0.10** | 120.1 | 66.0 | 120.0 | 120.0 | 120.0 | 120.1 | 120.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 7 |
| Running time in seconds for writing input file ($t^{\mathrm{write}}$) | 0.1679 |
| Running time in seconds for executing parametric cut procedure ($t^{\mathrm{cut}}$) | 0.1870 |
| Running time in seconds for reading result file ($t^{\mathrm{read}}$) | 0.0133 |

# File dispersion-qkp-ran_2000_010.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 2,000 |
| Density ($\Delta$) | 10.0 % |
| Edges ($m$) | 199,950 |

| | | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 252,271.0 | 0.08 | **0.00** | **0.00** | — | — | — | 2.27 | 0.46 | **0.12** | 52.6 | 35.1 | 120.0 | 120.0 | 120.0 | 120.2 | 120.0 |
| 5.0 | 505,979.0 | 0.17 | 0.01 | **0.00** | — | — | — | 1.96 | 0.97 | **0.03** | 77.6 | 31.9 | 120.0 | 120.0 | 120.0 | 120.3 | 120.0 |
| 10.0 | 1,013,767.0 | 0.04 | **0.00** | **0.00** | — | — | — | 44.86 | 0.95 | **0.05** | 114.2 | 63.6 | 120.0 | 120.0 | 120.0 | 120.4 | 120.0 |
| 25.0 | 2,525,326.0 | 0.05 | 0.01 | **0.00** | — | — | — | 69.24 | 1.23 | **0.09** | 120.1 | 59.7 | 120.0 | 120.0 | 120.0 | 120.5 | 120.0 |
| 50.0 | 5,054,155.0 | 0.09 | **0.00** | **0.00** | — | — | — | 43.14 | 1.70 | **0.10** | 120.0 | 40.1 | 120.0 | 120.0 | 120.0 | 120.5 | 120.0 |
| 75.0 | 7,584,175.0 | 0.06 | **0.00** | **0.00** | — | — | — | 0.01 | 1.20 | **0.10** | 120.1 | 35.9 | 120.0 | 120.0 | 120.0 | 107.8 | 120.0 |
| Avg | | 0.08 | 0.00 | **0.00** | — | — | — | 26.91 | 1.08 | **0.08** | 100.8 | 44.4 | 120.0 | 120.0 | 120.0 | 118.3 | 120.0 |
| Min | | 0.04 | **0.00** | **0.00** | — | — | — | 0.01 | 0.46 | **0.03** | 52.6 | 31.9 | 120.0 | 120.0 | 120.0 | 107.8 | 120.0 |
| Max | | 0.17 | 0.01 | **0.00** | — | — | — | 69.24 | 1.70 | **0.12** | 120.1 | 63.6 | 120.0 | 120.0 | 120.0 | 120.5 | 120.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 3 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 0.3258 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.2030 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0128 |

# File dispersion-qkp-ran_2000_025.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 2,000 |
| Density ($\Delta$) | 25.0 % |
| Edges ($m$) | 499,746 |

| | | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 614,086.0 | 0.33 | 0.05 | **0.00** | — | — | — | 3,418.11 | 2.48 | **0.12** | 54.5 | 35.9 | 120.0 | 120.0 | 120.0 | 125.3 | 120.0 |
| 5.0 | 1,230,942.0 | 0.23 | 0.11 | **0.00** | — | — | — | 1,754.44 | 2.74 | **0.03** | 79.4 | 30.4 | 120.0 | 120.0 | 120.0 | 121.1 | 121.0 |
| 10.0 | 2,489,364.0 | **0.00** | **0.00** | **0.00** | — | — | — | 920.82 | 2.98 | **0.05** | 116.6 | 72.7 | 120.0 | 120.0 | 120.0 | 120.4 | 121.0 |
| 25.0 | 6,242,222.0 | 0.01 | **0.00** | **0.00** | — | — | — | 296.34 | 3.90 | **0.09** | 120.1 | 75.6 | 120.0 | 120.0 | 120.0 | 120.5 | 120.0 |
| 50.0 | 12,531,065.0 | 0.12 | **0.00** | **0.00** | — | — | — | 95.74 | 3.52 | **0.10** | 120.0 | 42.0 | 120.0 | 120.0 | 120.0 | 121.3 | 120.0 |
| 75.0 | 18,862,349.0 | 0.02 | 0.01 | **0.00** | — | — | — | 36.14 | 2.26 | **0.11** | 120.1 | 38.1 | 120.0 | 120.0 | 120.0 | 120.5 | 121.0 |
| Avg | | 0.12 | 0.03 | **0.00** | — | — | — | 1,086.93 | 2.98 | **0.08** | 101.8 | 49.1 | 120.0 | 120.0 | 120.0 | 121.5 | 120.5 |
| Min | | **0.00** | **0.00** | **0.00** | — | — | — | 36.14 | 2.26 | **0.03** | 54.5 | 30.4 | 120.0 | 120.0 | 120.0 | 120.4 | 120.0 |
| Max | | 0.33 | 0.11 | **0.00** | — | — | — | 3,418.11 | 3.90 | **0.12** | 120.1 | 75.6 | 120.0 | 120.0 | 120.0 | 125.3 | 121.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 3 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 0.8244 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.2650 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0122 |

# File dispersion-qkp-ran_2000_050.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 2,000 |
| Density ($\Delta$) | 50.0 % |
| Edges ($m$) | 999,153 |

| | | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 1,209,791.0 | 0.30 | 0.12 | **0.00** | — | — | — | 3,464.92 | 4.20 | **0.12** | 55.6 | 35.9 | 120.0 | 120.0 | 120.0 | 120.6 | 122.0 |
| 5.0 | 2,453,162.0 | **0.00** | **0.00** | 0.01 | — | — | — | 1,734.03 | 4.21 | **0.03** | 80.2 | 32.1 | 120.0 | 120.0 | 120.0 | 121.5 | 122.0 |
| 10.0 | 4,968,199.0 | 0.07 | 0.03 | **0.00** | — | — | — | 808.27 | 5.14 | **0.05** | 115.8 | 65.9 | 120.0 | 120.0 | 120.0 | 120.7 | 122.0 |
| 25.0 | 12,457,575.0 | 0.07 | 0.05 | **0.00** | — | — | — | 288.37 | 6.37 | **0.09** | 120.1 | 76.0 | 120.0 | 120.0 | 120.0 | 121.7 | 122.0 |
| 50.0 | 25,021,352.0 | **0.00** | **0.00** | **0.00** | — | — | — | 98.72 | 6.21 | **0.10** | 120.1 | 49.8 | 120.0 | 120.0 | 120.0 | 121.0 | 122.0 |
| 75.0 | 37,655,302.0 | 0.04 | 0.03 | **0.00** | — | — | — | 33.40 | 2.98 | **0.11** | 120.0 | 35.5 | 120.0 | 120.0 | 120.0 | 121.1 | 122.0 |
| Avg | | 0.08 | 0.04 | **0.00** | — | — | — | 1,071.28 | 4.85 | **0.08** | 102.0 | 49.2 | 120.0 | 120.0 | 120.0 | 121.1 | 122.0 |
| Min | | **0.00** | **0.00** | **0.00** | — | — | — | 33.40 | 2.98 | **0.03** | 55.6 | 32.1 | 120.0 | 120.0 | 120.0 | 120.6 | 122.0 |
| Max | | 0.30 | 0.12 | **0.01** | — | — | — | 3,464.92 | 6.37 | **0.12** | 120.1 | 76.0 | 120.0 | 120.0 | 120.0 | 121.7 | 122.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 2 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 1.6280 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.3590 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0130 |

# File dispersion-qkp-ran_2000_075.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 2,000 |
| Density ($\Delta$) | 75.0 % |
| Edges ($m$) | 1,498,911 |

| | | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 1,803,144.0 | 0.03 | **0.00** | **0.00** | — | — | — | 2,996.11 | 7.52 | **0.12** | 54.4 | 40.9 | 120.0 | 120.0 | 120.0 | 121.4 | 120.0 |
| 5.0 | 3,668,519.0 | 0.21 | 0.14 | **0.00** | — | — | — | 1,562.15 | 5.42 | **0.03** | 79.1 | 42.0 | 120.0 | 120.0 | 120.0 | 121.5 | 120.0 |
| 10.0 | 7,440,967.0 | 0.12 | 0.10 | **0.00** | — | — | — | 859.15 | 6.87 | **0.05** | 117.8 | 71.1 | 120.0 | 120.0 | 120.0 | 122.2 | 120.0 |
| 25.0 | 18,680,254.0 | 0.17 | 0.16 | **0.00** | — | — | — | 290.36 | 7.78 | **0.09** | 120.1 | 53.3 | 120.0 | 120.0 | 120.0 | 121.2 | 120.0 |
| 50.0 | 37,536,130.0 | 0.04 | 0.03 | **0.00** | — | — | — | 97.04 | 7.36 | **0.10** | 120.1 | 45.5 | 120.0 | 120.0 | 120.0 | 121.5 | 120.0 |
| 75.0 | 56,431,631.0 | **0.00** | **0.00** | **0.00** | — | — | — | 32.49 | 3.73 | **0.11** | 120.0 | 40.7 | 120.0 | 120.0 | 120.0 | 121.2 | 120.0 |
| Avg | | 0.10 | 0.07 | **0.00** | — | — | — | 972.88 | 6.45 | **0.08** | 101.9 | 48.9 | 120.0 | 120.0 | 120.0 | 121.5 | 120.0 |
| Min | | **0.00** | **0.00** | **0.00** | — | — | — | 32.49 | 3.73 | **0.03** | 54.4 | 40.7 | 120.0 | 120.0 | 120.0 | 121.2 | 120.0 |
| Max | | 0.21 | 0.16 | **0.00** | — | — | — | 2,996.11 | 7.78 | **0.12** | 120.1 | 71.1 | 120.0 | 120.0 | 120.0 | 122.2 | 120.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 2 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 2.4491 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.4680 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0129 |

# File dispersion-qkp-ran_2000_100.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 2,000 |
| Density ($\Delta$) | 100.0 % |
| Edges ($m$) | 1,999,000 |

| | | Deviation from best OFV (%) | | | | | | | | Running time (s) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly | **QKBP** | RG | IHEA | LDP | DP | QK | Gurobi | Hexaly |
| 2.5 | 2,408,954.0 | 0.15 | 0.10 | **0.00** | — | — | — | 2,903.46 | 8.58 | **0.12** | 56.0 | 38.7 | 120.0 | 120.0 | 120.0 | 121.6 | 120.0 |
| 5.0 | 4,877,288.0 | 0.16 | 0.13 | **0.00** | — | — | — | 1,850.02 | 11.21 | **0.03** | 81.6 | 68.0 | 120.0 | 120.0 | 120.0 | 122.3 | 120.0 |
| 10.0 | 9,893,808.0 | 0.12 | 0.11 | **0.00** | — | — | — | 860.83 | 9.06 | **0.05** | 118.0 | 63.9 | 120.0 | 120.0 | 120.0 | 122.3 | 120.0 |
| 25.0 | 24,896,630.0 | 0.02 | 0.01 | **0.00** | — | — | — | 295.91 | 9.65 | **0.09** | 120.0 | 70.4 | 120.0 | 120.0 | 120.0 | 121.0 | 120.0 |
| 50.0 | 50,005,296.0 | 0.05 | 0.04 | **0.00** | — | — | — | 95.75 | 7.94 | **0.10** | 120.0 | 52.8 | 120.0 | 120.0 | 120.0 | 121.6 | 120.0 |
| 75.0 | 75,261,939.0 | 0.01 | **0.00** | **0.00** | — | — | — | 31.63 | 4.32 | **0.11** | 120.1 | 38.6 | 120.0 | 120.0 | 120.0 | 121.8 | 120.0 |
| Avg | | 0.09 | 0.07 | **0.00** | — | — | — | 1,006.27 | 8.46 | **0.08** | 102.6 | 55.4 | 120.0 | 120.0 | 120.0 | 121.8 | 120.0 |
| Min | | 0.01 | **0.00** | **0.00** | — | — | — | 31.63 | 4.32 | **0.03** | 56.0 | 38.6 | 120.0 | 120.0 | 120.0 | 121.0 | 120.0 |
| Max | | 0.16 | 0.13 | **0.00** | — | — | — | 2,903.46 | 11.21 | **0.12** | 120.1 | 70.4 | 120.0 | 120.0 | 120.0 | 122.3 | 120.0 |

**QKBP** is the contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 1 |
| Running time in seconds for writing input file ($t^{\mathrm{write}}$) | 3.3078 |
| Running time in seconds for executing parametric cut procedure ($t^{\mathrm{cut}}$) | 0.5470 |
| Running time in seconds for reading result file ($t^{\mathrm{read}}$) | 0.0121 |