Results for instances from collection
`Dispersion-QKP with strategy wgeo`

# File dispersion-qkp-wgeo_0100_005.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 100 |
| Density ($\Delta$) | 5.0 % |
| Edges ($m$) | 251 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 38,140.3 | **0.00** | 5.03 | 10.27 | **0.00** | **0.00** | **0.00** | **0.00** | 0.0 | 0.2 | 0.1 | 0.0 | **0.0** |
| 5.0 | 67,460.6 | 2.02 | 3.08 | 2.02 | **0.00** | **0.00** | **0.00** | **0.00** | 0.1 | 0.2 | 0.1 | 0.1 | 1.0 |
| 10.0 | 119,872.3 | 5.02 | 2.50 | 0.86 | **0.00** | **0.00** | **0.00** | **0.00** | 0.1 | 0.2 | 0.2 | 0.2 | **0.0** |
| 25.0 | 264,565.2 | 0.10 | 0.12 | 1.40 | **0.00** | **0.00** | **0.00** | **0.00** | 0.1 | 0.4 | 0.2 | 0.1 | 2.0 |
| 50.0 | 471,375.7 | 0.47 | 0.47 | 0.35 | **0.00** | **0.00** | **0.00** | **0.00** | 0.2 | 0.5 | 0.2 | 0.0 | **0.0** |
| 75.0 | 621,400.2 | **0.00** | 0.41 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 0.6 | 0.2 | 0.0 | 1.0 |
| 90.0 | 687,642.2 | 0.08 | 0.08 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 0.6 | 0.2 | 0.0 | **0.0** |
| 95.0 | 701,748.5 | 0.32 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 0.6 | 0.1 | 0.0 | **0.0** |
| Avg | | 1.00 | 1.46 | 1.86 | **0.00** | **0.00** | **0.00** | **0.00** | 0.2 | 0.4 | 0.2 | 0.1 | 0.5 |
| Min | | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.0 | 0.2 | 0.1 | 0.0 | **0.0** |
| Max | | 5.02 | 5.03 | 10.27 | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 0.6 | 0.2 | 0.2 | 2.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 35 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 0.3 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.1 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_0100_010.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 100 |
| Density ($\Delta$) | 10.0 % |
| Edges ($m$) | 471 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 57,117.0 | 1.35 | **0.00** | 6.30 | **0.00** | **0.00** | **0.00** | **0.00** | 0.0 | 0.2 | 0.1 | 0.1 | 1.0 |
| 5.0 | 106,422.9 | **0.00** | 1.53 | 2.00 | **0.00** | **0.00** | **0.00** | **0.00** | 0.1 | 0.2 | 0.2 | 0.2 | **0.0** |
| 10.0 | 205,559.9 | 0.59 | 0.11 | 0.11 | **0.00** | **0.00** | **0.00** | **0.00** | 0.1 | 0.2 | 0.2 | 0.1 | 1.0 |
| 25.0 | 470,964.6 | **0.00** | 0.37 | 0.58 | **0.00** | **0.00** | **0.00** | **0.00** | 0.1 | 0.3 | 0.4 | 0.1 | 1.0 |
| 50.0 | 906,817.7 | 0.37 | **0.00** | 0.19 | **0.00** | **0.00** | **0.00** | **0.00** | 0.2 | 0.5 | 0.3 | 0.4 | 2.0 |
| 75.0 | 1,290,738.3 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 0.6 | 0.2 | 0.1 | 1.0 |
| 90.0 | 1,477,953.3 | 0.50 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 0.6 | 0.2 | 0.1 | 1.0 |
| 95.0 | 1,526,199.7 | 0.26 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 0.6 | 0.2 | 0.0 | **0.0** |
| Avg | | 0.38 | 0.25 | 1.15 | **0.00** | **0.00** | **0.00** | **0.00** | 0.2 | 0.4 | 0.2 | 0.1 | 0.9 |
| Min | | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.0 | 0.2 | 0.1 | 0.0 | **0.0** |
| Max | | 1.35 | 1.53 | 6.30 | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 0.6 | 0.4 | 0.4 | 2.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 26 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 0.3 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.1 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_0100_025.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 100 |
| Density ($\Delta$) | 25.0 % |
| Edges ($m$) | 1,226 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 123,713.2 | 0.89 | 0.89 | 0.89 | **0.00** | **0.00** | **0.00** | **0.00** | 0.0 | 0.2 | 0.2 | 0.2 | 1.0 |
| 5.0 | 245,784.7 | 1.02 | 0.76 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.1 | 0.2 | 0.2 | 0.4 | 2.0 |
| 10.0 | 477,217.8 | **0.00** | **0.00** | 0.32 | **0.00** | **0.00** | **0.00** | **0.00** | 0.1 | 0.2 | 0.2 | 0.7 | 1.0 |
| 25.0 | 1,146,784.5 | 0.97 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.2 | 0.4 | 0.2 | 0.9 | 9.0 |
| 50.0 | 2,164,788.7 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.2 | 0.4 | 0.2 | 0.1 | 1.0 |
| 75.0 | 3,051,221.7 | 0.02 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 0.6 | 0.2 | 0.1 | 1.0 |
| 90.0 | 3,520,123.3 | 0.23 | 0.35 | 0.01 | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 0.6 | 0.2 | 0.4 | 4.0 |
| 95.0 | 3,662,096.9 | **0.00** | **0.00** | 0.04 | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 0.7 | 0.1 | 0.1 | **0.0** |
| Avg | | 0.39 | 0.25 | 0.16 | **0.00** | **0.00** | **0.00** | **0.00** | 0.2 | 0.4 | 0.2 | 0.4 | 2.4 |
| Min | | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.0 | 0.2 | 0.1 | 0.1 | **0.0** |
| Max | | 1.02 | 0.89 | 0.89 | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 0.7 | 0.2 | 0.9 | 9.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 17 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 0.3 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.1 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_0100_050.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 100 |
| Density ($\Delta$) | 50.0 % |
| Edges ($m$) | 2,492 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 255,249.4 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.0 | 0.2 | 0.2 | 0.5 | 1.0 |
| 5.0 | 448,743.8 | 4.28 | 0.39 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.1 | 0.2 | 0.2 | 0.6 | 4.0 |
| 10.0 | 810,400.3 | 1.20 | 0.17 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.1 | 0.2 | 0.2 | 5.1 | 12.0 |
| 25.0 | 1,980,919.5 | 0.46 | 0.10 | 0.10 | **0.00** | **0.00** | **0.00** | **0.00** | 0.2 | 0.4 | 0.5 | 3.6 | 15.0 |
| 50.0 | 3,949,444.1 | 1.01 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.2 | 0.5 | 0.2 | 1.2 | 6.0 |
| 75.0 | 5,810,921.5 | 1.16 | 0.25 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 0.5 | 0.2 | 0.7 | 5.0 |
| 90.0 | 6,802,356.0 | 0.75 | 0.56 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 0.6 | 0.2 | 0.9 | 13.0 |
| 95.0 | 7,105,637.9 | 0.01 | 0.01 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 0.6 | 0.1 | 0.6 | 3.0 |
| Avg | | 1.11 | 0.18 | 0.01 | **0.00** | **0.00** | **0.00** | **0.00** | 0.2 | 0.4 | 0.2 | 1.6 | 7.4 |
| Min | | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.0 | 0.2 | 0.1 | 0.5 | 1.0 |
| Max | | 4.28 | 0.56 | 0.10 | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 0.6 | 0.5 | 5.1 | 15.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 14 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 0.3 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.1 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_0100_075.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 100 |
| Density ($\Delta$) | 75.0 % |
| Edges ($m$) | 3,684 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 352,111.5 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.1 | 0.2 | 0.2 | 0.7 | 2.0 |
| 5.0 | 673,237.6 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.1 | 0.2 | 0.2 | 0.4 | 3.0 |
| 10.0 | 1,278,185.2 | 1.93 | 0.70 | 0.01 | **0.00** | **0.00** | **0.00** | **0.00** | 0.1 | 0.2 | 0.2 | 1.9 | 19.0 |
| 25.0 | 3,092,915.6 | 0.12 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.2 | 0.4 | 0.2 | 1.1 | 8.0 |
| 50.0 | 6,073,147.4 | 0.72 | 0.23 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.2 | 0.4 | 0.2 | 1.4 | 4.0 |
| 75.0 | 8,589,661.3 | 0.44 | 0.13 | 0.01 | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 0.5 | 0.2 | 3.3 | 27.0 |
| 90.0 | 9,990,593.6 | 0.17 | 0.17 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 0.6 | 0.2 | 2.0 | 7.0 |
| 95.0 | 10,451,536.1 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 0.6 | 0.2 | 0.4 | 3.0 |
| Avg | | 0.42 | 0.15 | 0.00 | **0.00** | **0.00** | **0.00** | **0.00** | 0.2 | 0.4 | 0.2 | 1.4 | 9.1 |
| Min | | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.1 | 0.2 | 0.2 | 0.4 | 2.0 |
| Max | | 1.93 | 0.70 | 0.01 | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 0.6 | 0.2 | 3.3 | 27.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 17 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 0.4 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.1 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_0100_100.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 100 |
| Density ($\Delta$) | 100.0 % |
| Edges ($m$) | 4,950 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 529,986.9 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.1 | 0.2 | 0.2 | 1.3 | 3.0 |
| 5.0 | 1,040,809.6 | 2.79 | 2.66 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.1 | 0.2 | 0.2 | 1.5 | 8.0 |
| 10.0 | 1,891,834.7 | 0.45 | 0.14 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.1 | 0.2 | 0.2 | 4.3 | 88.0 |
| 25.0 | 4,289,387.5 | 0.98 | 0.59 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.2 | 0.4 | 0.2 | 10.2 | 48.0 |
| 50.0 | 8,218,566.5 | 0.15 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.2 | 0.5 | 0.2 | 4.6 | 18.0 |
| 75.0 | 12,029,434.1 | 0.48 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 0.5 | 0.2 | 1.6 | 11.0 |
| 90.0 | 14,039,399.1 | 0.73 | 0.73 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 0.6 | 0.2 | 4.5 | 35.0 |
| 95.0 | 14,651,459.4 | 0.08 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 0.6 | 0.2 | 1.4 | 12.0 |
| Avg | | 0.71 | 0.52 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.2 | 0.4 | 0.2 | 3.7 | 27.9 |
| Min | | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.1 | 0.2 | 0.2 | 1.3 | 3.0 |
| Max | | 2.79 | 2.66 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 0.6 | 0.2 | 10.2 | 88.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 15 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 0.4 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.1 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_0200_005.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 200 |
| Density ($\Delta$) | 5.0 % |
| Edges ($m$) | 995 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 146,162.4 | 0.99 | 0.12 | 5.21 | **0.00** | **0.00** | **0.00** | **0.00** | 0.2 | 1.2 | 0.5 | 0.2 | 5.0 |
| 5.0 | 266,776.3 | 0.59 | 0.59 | 2.31 | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 1.7 | 0.6 | 0.2 | 2.0 |
| 10.0 | 481,767.3 | **0.00** | 0.80 | 1.17 | **0.00** | **0.00** | **0.00** | **0.00** | 0.4 | 2.2 | 0.7 | 0.1 | **0.0** |
| 25.0 | 1,032,383.2 | 0.31 | 0.17 | 0.40 | **0.00** | **0.00** | **0.00** | **0.00** | 0.7 | 3.2 | 2.2 | 0.4 | 13.0 |
| 50.0 | 1,890,439.1 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.9 | 4.1 | 1.2 | 0.2 | 8.0 |
| 75.0 | 2,561,740.8 | 0.11 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 1.2 | 4.5 | 1.1 | 0.1 | 4.0 |
| 90.0 | 2,884,872.8 | 0.09 | 0.11 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 1.3 | 4.5 | 0.7 | 0.2 | 19.0 |
| 95.0 | 2,982,533.4 | 0.10 | 0.06 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 1.4 | 4.7 | 0.5 | 0.2 | 4.0 |
| Avg | | 0.27 | 0.23 | 1.14 | **0.00** | **0.00** | **0.00** | **0.00** | 0.8 | 3.3 | 1.0 | 0.2 | 6.9 |
| Min | | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.2 | 1.2 | 0.5 | 0.1 | **0.0** |
| Max | | 0.99 | 0.80 | 5.21 | **0.00** | **0.00** | **0.00** | **0.00** | 1.4 | 4.7 | 2.2 | 0.4 | 19.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 35 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 0.6 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.1 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_0200_010.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 200 |
| Density ($\Delta$) | 10.0 % |
| Edges ($m$) | 2,014 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 205,919.5 | 0.57 | 2.17 | 1.82 | **0.00** | **0.00** | **0.00** | **0.00** | 0.2 | 1.3 | 0.7 | 0.6 | 5.0 |
| 5.0 | 387,143.6 | 0.59 | 0.17 | 0.49 | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 1.6 | 1.3 | 1.8 | 11.0 |
| 10.0 | 756,587.5 | 1.11 | 0.04 | 0.60 | **0.00** | **0.00** | **0.00** | **0.00** | 0.4 | 2.2 | 2.1 | 1.2 | 9.0 |
| 25.0 | 1,819,489.9 | 0.63 | 0.68 | 0.41 | **0.00** | **0.00** | **0.00** | **0.00** | 0.7 | 3.3 | 1.4 | 0.2 | 3.0 |
| 50.0 | 3,395,526.8 | 0.25 | 0.04 | 0.01 | **0.00** | **0.00** | **0.00** | **0.00** | 1.0 | 4.0 | 1.3 | 0.8 | 17.0 |
| 75.0 | 4,751,300.8 | 0.19 | 0.02 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 1.2 | 4.4 | 1.1 | 0.5 | 9.0 |
| 90.0 | 5,448,694.2 | 0.04 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 1.4 | 4.4 | 0.7 | 0.5 | 21.0 |
| 95.0 | 5,645,401.4 | 0.02 | 0.02 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 1.4 | 4.7 | 0.5 | 0.4 | 9.0 |
| Avg | | 0.43 | 0.39 | 0.42 | **0.00** | **0.00** | **0.00** | **0.00** | 0.8 | 3.2 | 1.1 | 0.7 | 10.5 |
| Min | | 0.02 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.2 | 1.3 | 0.5 | 0.2 | 3.0 |
| Max | | 1.11 | 2.17 | 1.82 | **0.00** | **0.00** | **0.00** | **0.00** | 1.4 | 4.7 | 2.1 | 1.8 | 21.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 33 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 0.7 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.1 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_0200_025.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 200 |
| Density ($\Delta$) | 25.0 % |
| Edges ($m$) | 4,912 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 423,393.2 | 0.62 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.2 | 1.3 | 0.5 | 2.3 | 10.0 |
| 5.0 | 816,435.9 | 0.56 | 0.60 | 0.39 | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 1.7 | 1.1 | 1.4 | 19.0 |
| 10.0 | 1,585,981.8 | 0.73 | 0.31 | 0.22 | **0.00** | **0.00** | **0.00** | **0.00** | 0.4 | 2.3 | 3.7 | 8.5 | 40.0 |
| 25.0 | 3,971,396.9 | 0.22 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.7 | 3.2 | 1.8 | 2.6 | 22.0 |
| 50.0 | 7,732,914.9 | 0.11 | 0.11 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 1.0 | 3.9 | 1.7 | 1.8 | 9.0 |
| 75.0 | 11,273,958.2 | 0.24 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 1.2 | 4.4 | 1.1 | 1.2 | 13.0 |
| 90.0 | 13,196,202.6 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 1.3 | 4.4 | 0.6 | 0.5 | 7.0 |
| 95.0 | 13,741,499.1 | 0.35 | 0.25 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 1.4 | 4.5 | 0.6 | 1.0 | 32.0 |
| Avg | | 0.35 | 0.16 | 0.08 | **0.00** | **0.00** | **0.00** | **0.00** | 0.8 | 3.2 | 1.4 | 2.4 | 19.0 |
| Min | | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.2 | 1.3 | 0.5 | 0.5 | 7.0 |
| Max | | 0.73 | 0.60 | 0.39 | **0.00** | **0.00** | **0.00** | **0.00** | 1.4 | 4.5 | 3.7 | 8.5 | 40.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 17 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 0.7 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.1 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_0200_050.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 200 |
| Density ($\Delta$) | 50.0 % |
| Edges ($m$) | 9,910 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 776,259.1 | 3.25 | **0.00** | 0.40 | **0.00** | **0.00** | **0.00** | **0.00** | 0.2 | 1.3 | 0.6 | 5.2 | 22.0 |
| 5.0 | 1,542,504.5 | 1.09 | 0.32 | 0.07 | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 1.7 | 0.6 | 6.1 | 55.0 |
| 10.0 | 3,021,738.5 | 0.06 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.5 | 2.3 | 1.1 | 10.4 | 98.0 |
| 25.0 | 7,397,481.2 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.7 | 3.2 | 1.7 | 8.9 | 60.0 |
| 50.0 | 14,569,299.9 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.09 | **0.00** | 1.0 | 4.0 | 7.5 | 19.8 | 120.0 |
| 75.0 | 21,775,525.8 | 0.14 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 1.2 | 4.3 | 0.9 | 9.7 | 120.0 |
| 90.0 | 25,605,308.3 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 1.3 | 4.4 | 0.7 | 2.7 | 39.0 |
| 95.0 | 26,758,444.1 | 0.28 | 0.28 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 1.4 | 4.5 | 0.6 | 2.1 | 24.0 |
| Avg | | 0.60 | 0.08 | 0.06 | **0.00** | **0.00** | 0.01 | **0.00** | 0.8 | 3.2 | 1.7 | 8.1 | 67.2 |
| Min | | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.2 | 1.3 | 0.6 | 2.1 | 22.0 |
| Max | | 3.25 | 0.32 | 0.40 | **0.00** | **0.00** | 0.09 | **0.00** | 1.4 | 4.5 | 7.5 | 19.8 | 120.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 16 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 0.7 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.1 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_0200_075.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 200 |
| Density ($\Delta$) | 75.0 % |
| Edges ($m$) | 14,844 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 1,295,780.2 | 0.48 | 0.48 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.2 | 1.3 | 0.6 | 5.4 | 29.0 |
| 5.0 | 2,435,088.9 | 0.84 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 1.7 | 0.6 | 17.6 | 75.0 |
| 10.0 | 4,676,319.6 | 0.19 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.5 | 2.3 | 0.8 | 15.4 | 103.0 |
| 25.0 | 11,535,176.1 | 0.19 | 0.02 | 0.02 | **0.00** | **0.00** | **0.00** | **0.00** | 0.7 | 3.2 | 0.8 | 22.3 | 120.0 |
| 50.0 | 22,470,347.1 | 0.53 | 0.11 | **0.00** | **0.00** | **0.00** | 0.04 | **0.00** | 1.0 | 3.9 | 1.1 | 21.3 | 120.0 |
| 75.0 | 32,810,498.6 | 0.32 | 0.25 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 1.2 | 4.4 | 0.8 | 14.3 | 120.0 |
| 90.0 | 38,301,995.6 | 0.49 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 1.4 | 4.3 | 0.7 | 15.3 | 120.0 |
| 95.0 | 39,956,717.1 | 0.28 | 0.28 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 1.4 | 4.7 | 0.6 | 7.9 | 120.0 |
| Avg | | 0.41 | 0.14 | 0.00 | **0.00** | **0.00** | 0.01 | **0.00** | 0.8 | 3.2 | 0.7 | 14.9 | 100.9 |
| Min | | 0.19 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.2 | 1.3 | 0.6 | 5.4 | 29.0 |
| Max | | 0.84 | 0.48 | 0.02 | **0.00** | **0.00** | 0.04 | **0.00** | 1.4 | 4.7 | 1.1 | 22.3 | 120.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 14 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 0.8 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.2 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_0200_100.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 200 |
| Density ($\Delta$) | 100.0 % |
| Edges ($m$) | 19,900 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 1,503,340.4 | 3.20 | 0.14 | 0.08 | **0.00** | **0.00** | **0.00** | **0.00** | 0.2 | 1.3 | 0.6 | 25.6 | 120.0 |
| 5.0 | 3,161,207.9 | 1.68 | 0.23 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.3 | 1.7 | 0.6 | 30.6 | 120.0 |
| 10.0 | 6,389,157.8 | 0.23 | 0.07 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.5 | 2.3 | 0.7 | 37.6 | 120.0 |
| 25.0 | 16,254,572.2 | 0.29 | 0.05 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.7 | 3.2 | 0.7 | 63.5 | 120.0 |
| 50.0 | 31,852,586.8 | 0.09 | 0.09 | **0.00** | **0.00** | **0.00** | 0.03 | **0.00** | 1.0 | 3.9 | 0.7 | 30.2 | 120.0 |
| 75.0 | 46,718,823.1 | 0.39 | **0.00** | **0.00** | **0.00** | **0.00** | 0.01 | **0.00** | 1.2 | 4.4 | 0.7 | 30.5 | 120.0 |
| 90.0 | 54,656,763.5 | 0.36 | 0.33 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 1.4 | 4.3 | 0.6 | 40.7 | 120.0 |
| 95.0 | 57,126,753.6 | 0.18 | 0.18 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 1.4 | 4.5 | 0.6 | 18.2 | 120.0 |
| Avg | | 0.80 | 0.14 | 0.01 | **0.00** | **0.00** | 0.01 | **0.00** | 0.9 | 3.2 | 0.6 | 34.6 | 120.0 |
| Min | | 0.09 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.2 | 1.3 | 0.6 | 18.2 | 120.0 |
| Max | | 3.20 | 0.33 | 0.08 | **0.00** | **0.00** | 0.03 | **0.00** | 1.4 | 4.5 | 0.7 | 63.5 | 120.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 10 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 0.8 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.2 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_0300_005.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 300 |
| Density ($\Delta$) | 5.0 % |
| Edges ($m$) | 2,311 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 243,827.0 | **0.00** | 0.89 | 3.22 | **0.00** | **0.00** | **0.00** | **0.00** | 0.5 | 5.8 | 1.8 | 0.2 | 4.0 |
| 5.0 | 456,069.3 | 0.79 | 1.12 | 1.92 | **0.00** | **0.00** | **0.00** | **0.00** | 0.7 | 7.6 | 2.4 | 0.3 | 4.0 |
| 10.0 | 871,396.1 | 0.34 | 0.79 | 1.66 | **0.00** | **0.00** | **0.00** | **0.00** | 1.1 | 9.9 | 3.3 | 0.7 | 22.0 |
| 25.0 | 1,982,381.4 | 0.45 | 0.27 | 0.32 | — | **0.00** | **0.00** | **0.01** | 1.7 | 14.1 | 120.0 | 1.3 | 21.0 |
| 50.0 | 3,784,007.6 | **0.00** | 0.12 | 0.17 | — | **0.00** | **0.00** | **0.01** | 2.5 | 16.5 | 120.0 | 0.6 | 5.0 |
| 75.0 | 5,342,038.6 | 0.03 | 0.07 | 0.02 | **0.00** | **0.00** | **0.00** | **0.00** | 3.1 | 16.8 | 6.2 | 0.4 | 21.0 |
| 90.0 | 6,136,494.3 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 3.4 | 15.7 | 1.6 | 0.2 | 5.0 |
| 95.0 | 6,334,829.4 | 0.20 | 0.16 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 3.4 | 16.0 | 1.3 | 0.4 | 55.0 |
| Avg | | 0.23 | 0.43 | 0.91 | — | **0.00** | **0.00** | **0.00** | 2.0 | 12.8 | 32.1 | 0.5 | 17.1 |
| Min | | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.5 | 5.8 | 1.3 | 0.2 | 4.0 |
| Max | | 0.79 | 1.12 | 3.22 | — | **0.00** | **0.00** | **0.01** | 3.4 | 16.8 | 120.0 | 1.3 | 55.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 24 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 1.0 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.2 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_0300_010.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 300 |
| Density ($\Delta$) | 10.0 % |
| Edges ($m$) | 4,491 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 458,676.4 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.5 | 6.0 | 1.5 | 0.3 | 4.0 |
| 5.0 | 844,525.4 | **0.00** | **0.00** | 0.05 | **0.00** | **0.00** | **0.00** | **0.00** | 0.8 | 7.9 | 2.2 | 0.9 | 36.0 |
| 10.0 | 1,556,993.5 | 0.49 | 0.44 | 0.23 | **0.00** | **0.00** | **0.00** | **0.00** | 1.1 | 10.3 | 12.9 | 4.6 | 59.0 |
| 25.0 | 3,619,800.7 | 0.36 | 0.03 | 0.05 | — | **0.00** | **0.00** | **0.01** | 1.7 | 14.0 | 120.0 | 4.1 | 117.0 |
| 50.0 | 7,002,766.4 | 0.18 | 0.10 | 0.07 | **0.00** | **0.00** | **0.00** | **0.00** | 2.5 | 16.4 | 32.5 | 2.0 | 48.0 |
| 75.0 | 10,160,390.8 | 0.01 | 0.01 | 0.01 | **0.00** | **0.00** | **0.00** | **0.00** | 3.0 | 16.1 | 5.8 | 1.1 | 115.0 |
| 90.0 | 11,857,368.3 | 0.26 | 0.26 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 3.3 | 16.2 | 2.5 | 1.4 | 120.0 |
| 95.0 | 12,374,781.3 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 3.4 | 15.5 | 1.4 | 0.2 | 1.0 |
| Avg | | 0.16 | 0.10 | 0.05 | — | **0.00** | **0.00** | **0.00** | 2.0 | 12.8 | 22.4 | 1.8 | 62.5 |
| Min | | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.5 | 6.0 | 1.4 | 0.2 | 1.0 |
| Max | | 0.49 | 0.44 | 0.23 | — | **0.00** | **0.00** | **0.01** | 3.4 | 16.4 | 120.0 | 4.6 | 120.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 35 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 1.0 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.2 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_0300_025.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 300 |
| Density ($\Delta$) | 25.0 % |
| Edges ($m$) | 11,240 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 931,558.9 | 0.50 | 0.08 | 0.11 | **0.00** | **0.00** | **0.00** | **0.00** | 0.6 | 6.3 | 3.0 | 7.6 | 35.0 |
| 5.0 | 1,853,334.4 | 0.08 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.8 | 8.1 | 4.1 | 7.8 | 66.0 |
| 10.0 | 3,664,060.9 | 0.52 | 0.26 | 0.05 | **0.00** | **0.00** | **0.00** | **0.01** | 1.1 | 10.4 | 16.7 | 14.0 | 59.0 |
| 25.0 | 9,131,039.3 | 0.17 | 0.03 | 0.03 | **0.00** | **0.00** | **0.00** | **0.01** | 1.8 | 14.2 | 17.4 | 16.6 | 120.0 |
| 50.0 | 17,810,122.9 | 0.19 | 0.05 | 0.01 | **0.00** | **0.00** | 0.03 | **0.00** | 2.5 | 16.0 | 6.7 | 11.0 | 120.0 |
| 75.0 | 25,817,371.7 | 0.01 | **0.00** | **0.00** | **0.00** | **0.00** | 0.06 | **0.00** | 3.1 | 16.4 | 2.8 | 4.2 | 120.0 |
| 90.0 | 30,166,923.7 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 3.3 | 15.5 | 1.8 | 3.1 | 109.0 |
| 95.0 | 31,466,609.4 | 0.02 | 0.01 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 3.4 | 15.8 | 1.4 | 5.8 | 97.0 |
| Avg | | 0.19 | 0.05 | 0.03 | **0.00** | **0.00** | 0.01 | **0.00** | 2.1 | 12.8 | 6.7 | 8.8 | 90.8 |
| Min | | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.6 | 6.3 | 1.4 | 3.1 | 35.0 |
| Max | | 0.52 | 0.26 | 0.11 | **0.00** | **0.00** | 0.06 | **0.01** | 3.4 | 16.4 | 17.4 | 16.6 | 120.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 21 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 1.0 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.2 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_0300_050.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 300 |
| Density ($\Delta$) | 50.0 % |
| Edges ($m$) | 22,294 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 1,785,890.6 | 0.30 | 0.11 | 0.01 | **0.00** | **0.00** | **0.00** | **0.00** | 0.6 | 6.2 | 2.5 | 73.6 | 120.0 |
| 5.0 | 3,600,198.8 | 0.70 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.8 | 8.2 | 1.5 | 38.7 | 120.0 |
| 10.0 | 6,955,208.0 | 1.06 | **0.00** | **0.00** | **0.00** | **0.00** | 0.07 | **0.00** | 1.2 | 10.6 | 6.6 | 120.7 | 120.0 |
| 25.0 | 17,494,277.6 | 0.11 | 0.04 | 0.03 | **0.00** | **0.00** | **0.00** | **0.01** | 1.8 | 14.0 | 15.4 | 76.8 | 120.0 |
| 50.0 | 35,223,495.4 | 0.45 | 0.03 | **0.00** | **0.00** | **0.00** | 0.03 | **0.00** | 2.6 | 16.4 | 3.2 | 44.3 | 120.0 |
| 75.0 | 51,060,804.8 | 0.01 | 0.01 | 0.01 | **0.00** | **0.00** | **0.00** | **0.00** | 3.1 | 16.0 | 2.2 | 24.3 | 120.0 |
| 90.0 | 59,418,082.5 | 0.31 | 0.22 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 3.4 | 15.7 | 1.7 | 24.5 | 120.0 |
| 95.0 | 61,900,195.6 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 3.4 | 15.8 | 1.4 | 7.8 | 120.0 |
| Avg | | 0.37 | 0.05 | 0.01 | **0.00** | **0.00** | 0.01 | **0.00** | 2.1 | 12.8 | 4.3 | 51.3 | 120.0 |
| Min | | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.6 | 6.2 | 1.4 | 7.8 | 120.0 |
| Max | | 1.06 | 0.22 | 0.03 | **0.00** | **0.00** | 0.07 | **0.01** | 3.4 | 16.4 | 15.4 | 120.7 | 120.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 17 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 1.1 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.2 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_0300_075.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 300 |
| Density ($\Delta$) | 75.0 % |
| Edges ($m$) | 33,661 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 2,999,792.3 | 0.36 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.6 | 6.3 | 1.4 | 25.6 | 120.0 |
| 5.0 | 5,522,693.0 | 0.72 | 0.36 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.8 | 8.2 | 1.6 | 44.2 | 120.0 |
| 10.0 | 10,622,771.9 | 0.05 | 0.04 | **0.00** | **0.00** | **0.00** | 0.02 | **0.01** | 1.1 | 10.5 | 2.5 | 113.7 | 120.0 |
| 25.0 | 26,124,846.2 | 0.14 | **0.00** | **0.00** | **0.00** | **0.00** | 0.02 | **0.01** | 1.8 | 14.0 | 3.0 | 120.7 | 120.0 |
| 50.0 | 52,283,443.2 | 0.22 | 0.02 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 2.5 | 16.2 | 2.5 | 120.3 | 120.0 |
| 75.0 | 75,852,661.7 | 0.44 | 0.22 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 3.0 | 15.9 | 1.9 | 120.3 | 120.0 |
| 90.0 | 88,637,353.5 | 0.15 | 0.05 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 3.3 | 16.1 | 1.8 | 41.5 | 120.0 |
| 95.0 | 92,604,309.4 | 0.07 | 0.07 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 3.3 | 15.4 | 1.5 | 90.2 | 120.0 |
| Avg | | 0.27 | 0.10 | **0.00** | **0.00** | **0.00** | 0.01 | **0.00** | 2.1 | 12.8 | 2.0 | 84.6 | 120.0 |
| Min | | 0.05 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.6 | 6.3 | 1.4 | 25.6 | 120.0 |
| Max | | 0.72 | 0.36 | **0.00** | **0.00** | **0.00** | 0.02 | **0.01** | 3.3 | 16.2 | 3.0 | 120.7 | 120.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 19 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 1.2 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.2 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_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 | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 3,954,022.0 | 0.19 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.6 | 6.5 | 1.4 | 14.2 | 120.0 |
| 5.0 | 7,543,680.9 | 1.16 | 0.46 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.8 | 8.7 | 1.4 | 48.9 | 120.0 |
| 10.0 | 14,538,477.6 | 0.83 | 0.02 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 1.1 | 10.6 | 1.6 | 86.3 | 120.0 |
| 25.0 | 35,493,957.2 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.03 | **0.01** | 1.8 | 14.2 | 1.7 | 54.5 | 120.0 |
| 50.0 | 68,925,411.6 | 0.28 | 0.01 | **0.00** | **0.00** | **0.00** | 0.04 | **0.01** | 2.4 | 16.1 | 2.0 | 120.3 | 120.0 |
| 75.0 | 102,263,704.4 | 0.29 | 0.06 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 3.0 | 16.1 | 1.8 | 62.1 | 120.0 |
| 90.0 | 120,661,324.4 | 0.15 | **0.00** | **0.00** | **0.00** | **0.00** | 0.01 | **0.00** | 3.2 | 15.6 | 1.5 | 44.2 | 120.0 |
| 95.0 | 125,950,486.8 | 0.03 | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 3.4 | 15.7 | 1.4 | 13.2 | 120.0 |
| Avg | | 0.37 | 0.07 | **0.00** | **0.00** | **0.00** | 0.01 | **0.00** | 2.0 | 12.9 | 1.6 | 55.5 | 120.0 |
| Min | | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | 0.6 | 6.5 | 1.4 | 13.2 | 120.0 |
| Max | | 1.16 | 0.46 | **0.00** | **0.00** | **0.00** | 0.04 | **0.01** | 3.4 | 16.1 | 2.0 | 120.3 | 120.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 18 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 1.3 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.2 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_0500_005.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 500 |
| Density ($\Delta$) | 5.0 % |
| Edges ($m$) | 6,367 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 558,061.0 | 1.76 | 1.48 | 3.88 | — | **0.00** | **0.00** | **0.01** | 1.5 | 40.5 | 120.0 | 3.6 | 35.0 |
| 5.0 | 1,128,973.8 | 0.35 | 0.08 | 0.79 | — | **0.00** | 0.08 | **0.00** | 2.4 | 54.2 | 120.0 | 2.3 | 120.0 |
| 10.0 | 2,230,939.1 | 0.39 | 0.22 | 0.42 | — | **0.00** | **0.00** | **0.01** | 3.4 | 76.1 | 120.0 | 3.8 | 120.0 |
| 25.0 | 5,452,739.2 | 0.15 | 0.12 | 0.36 | — | **0.00** | **0.00** | **0.01** | 5.7 | 110.4 | 120.0 | 2.2 | 40.0 |
| 50.0 | 10,669,402.8 | 0.06 | 0.03 | 0.06 | — | **0.00** | **0.00** | **0.01** | 8.3 | 109.3 | 120.0 | 1.1 | 58.0 |
| 75.0 | 15,422,748.8 | 0.03 | 0.03 | 0.03 | — | **0.00** | **0.00** | **0.00** | 10.3 | 109.5 | 120.0 | 1.9 | 42.0 |
| 90.0 | 17,896,753.9 | 0.04 | **0.00** | **0.00** | — | **0.00** | 0.02 | **0.00** | 11.2 | 103.1 | 120.0 | 1.0 | 120.0 |
| 95.0 | 18,573,898.0 | **0.00** | **0.00** | **0.00** | — | **0.00** | **0.00** | **0.00** | 11.8 | 94.5 | 120.0 | 0.5 | 1.0 |
| Avg | | 0.35 | 0.24 | 0.69 | — | **0.00** | 0.01 | **0.01** | 6.8 | 87.2 | 120.0 | 2.1 | 67.0 |
| Min | | **0.00** | **0.00** | **0.00** | — | **0.00** | **0.00** | **0.00** | 1.5 | 40.5 | 120.0 | 0.5 | 1.0 |
| Max | | 1.76 | 1.48 | 3.88 | — | **0.00** | 0.08 | **0.01** | 11.8 | 110.4 | 120.0 | 3.8 | 120.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 29 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 1.7 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.3 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_0500_010.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 500 |
| Density ($\Delta$) | 10.0 % |
| Edges ($m$) | 12,399 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 1,084,012.7 | 0.23 | 0.38 | 0.57 | — | **0.00** | **0.00** | **0.01** | 1.5 | 39.2 | 120.0 | 17.0 | 68.0 |
| 5.0 | 2,087,950.0 | **0.00** | 0.09 | 0.45 | — | **0.00** | **0.00** | **0.01** | 2.3 | 55.6 | 120.0 | 19.2 | 83.0 |
| 10.0 | 4,020,257.3 | 0.39 | 0.22 | 0.12 | — | **0.00** | 0.14 | **0.01** | 3.4 | 72.8 | 120.0 | 32.1 | 120.0 |
| 25.0 | 10,123,775.8 | **0.00** | 0.12 | 0.07 | — | **0.00** | **0.00** | **0.01** | 5.5 | 103.8 | 120.0 | 26.3 | 120.0 |
| 50.0 | 20,091,488.2 | 0.04 | 0.04 | 0.02 | — | **0.00** | 0.04 | **0.01** | 7.9 | 108.9 | 120.0 | 12.1 | 120.0 |
| 75.0 | 29,194,379.6 | 0.13 | 0.04 | **0.00** | — | **0.00** | 0.01 | **0.00** | 9.5 | 110.7 | 120.0 | 5.8 | 120.0 |
| 90.0 | 34,046,724.2 | 0.04 | 0.01 | **0.00** | — | **0.00** | **0.00** | **0.00** | 10.4 | 98.4 | 120.0 | 5.1 | 120.0 |
| 95.0 | 35,437,662.4 | 0.02 | **0.00** | **0.00** | — | **0.00** | **0.00** | **0.00** | 10.6 | 88.9 | 120.0 | 1.5 | 9.0 |
| Avg | | 0.11 | 0.11 | 0.15 | — | **0.00** | 0.02 | **0.01** | 6.4 | 84.8 | 120.0 | 14.9 | 95.0 |
| Min | | **0.00** | **0.00** | **0.00** | — | **0.00** | **0.00** | **0.00** | 1.5 | 39.2 | 120.0 | 1.5 | 9.0 |
| Max | | 0.39 | 0.38 | 0.57 | — | **0.00** | 0.14 | **0.01** | 10.6 | 110.7 | 120.0 | 32.1 | 120.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 26 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 1.7 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.3 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_0500_025.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 500 |
| Density ($\Delta$) | 25.0 % |
| Edges ($m$) | 31,118 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 2,581,885.1 | 0.30 | 0.24 | **0.00** | — | **0.00** | 0.50 | **0.01** | 1.7 | 42.5 | 120.0 | 22.3 | 120.0 |
| 5.0 | 5,160,148.6 | 0.41 | 0.28 | **0.00** | — | **0.00** | 0.10 | **0.00** | 2.5 | 56.6 | 120.0 | 19.9 | 120.0 |
| 10.0 | 10,016,504.2 | 0.58 | 0.12 | **0.00** | — | **0.00** | 0.06 | **0.01** | 3.5 | 73.7 | 120.0 | 91.7 | 120.0 |
| 25.0 | 24,853,019.8 | 0.08 | 0.03 | 0.03 | — | **0.00** | 0.01 | **0.01** | 5.7 | 103.2 | 120.0 | 43.4 | 120.0 |
| 50.0 | 48,993,908.6 | 0.14 | **0.00** | **0.00** | — | **0.00** | **0.00** | **0.01** | 7.9 | 108.0 | 120.0 | 67.4 | 120.0 |
| 75.0 | 72,048,838.2 | 0.24 | **0.00** | **0.00** | — | **0.00** | 0.09 | **0.00** | 9.5 | 108.5 | 120.0 | 59.2 | 120.0 |
| 90.0 | 84,301,112.3 | 0.07 | 0.05 | **0.00** | — | **0.00** | 0.02 | **0.00** | 10.2 | 97.8 | 120.0 | 9.7 | 120.0 |
| 95.0 | 87,707,536.1 | 0.02 | 0.02 | **0.00** | — | **0.00** | **0.00** | **0.00** | 10.5 | 89.6 | 120.0 | 17.9 | 120.0 |
| Avg | | 0.23 | 0.09 | 0.00 | — | **0.00** | 0.10 | **0.01** | 6.4 | 85.0 | 120.0 | 41.4 | 120.0 |
| Min | | 0.02 | **0.00** | **0.00** | — | **0.00** | **0.00** | **0.00** | 1.7 | 42.5 | 120.0 | 9.7 | 120.0 |
| Max | | 0.58 | 0.28 | 0.03 | — | **0.00** | 0.50 | **0.01** | 10.5 | 108.5 | 120.0 | 91.7 | 120.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 16 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 1.9 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.3 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_0500_050.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 500 |
| Density ($\Delta$) | 50.0 % |
| Edges ($m$) | 62,463 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 4,702,038.2 | 0.52 | 0.40 | **0.00** | — | 0.12 | **0.00** | **0.01** | 1.7 | 45.4 | 120.0 | 120.1 | 120.0 |
| 5.0 | 9,564,042.5 | 0.58 | 0.07 | **0.00** | — | 6.43 | 0.21 | **0.01** | 2.6 | 57.1 | 120.0 | 120.1 | 120.0 |
| 10.0 | 18,747,885.1 | **0.00** | **0.00** | **0.00** | — | 1.18 | 0.08 | **0.01** | 3.6 | 78.5 | 120.0 | 120.1 | 120.0 |
| 25.0 | 47,909,716.0 | 0.11 | 0.04 | **0.00** | — | 6.50 | **0.00** | **0.01** | 5.7 | 103.4 | 120.0 | 120.1 | 120.0 |
| 50.0 | 96,893,829.3 | 0.06 | **0.00** | **0.00** | — | 0.42 | 0.03 | **0.01** | 8.2 | 106.5 | 120.0 | 120.1 | 120.0 |
| 75.0 | 143,539,160.9 | 0.17 | 0.02 | **0.00** | — | **0.00** | 0.11 | **0.00** | 9.9 | 106.3 | 120.0 | 57.7 | 120.0 |
| 90.0 | 168,210,283.3 | 0.06 | 0.06 | **0.00** | — | **0.00** | 0.07 | **0.00** | 10.8 | 103.6 | 120.0 | 56.4 | 120.0 |
| 95.0 | 175,198,752.3 | 0.10 | 0.09 | **0.00** | — | **0.00** | **0.00** | **0.00** | 11.0 | 91.4 | 120.0 | 64.7 | 120.0 |
| Avg | | 0.20 | 0.08 | **0.00** | — | 1.83 | 0.06 | **0.01** | 6.7 | 86.5 | 120.0 | 97.4 | 120.0 |
| Min | | **0.00** | **0.00** | **0.00** | — | **0.00** | **0.00** | **0.00** | 1.7 | 45.4 | 120.0 | 56.4 | 120.0 |
| Max | | 0.58 | 0.40 | **0.00** | — | 6.50 | 0.21 | **0.01** | 11.0 | 106.5 | 120.0 | 120.1 | 120.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 14 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 2.2 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.3 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_0500_075.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 500 |
| Density ($\Delta$) | 75.0 % |
| Edges ($m$) | 93,428 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 7,076,592.5 | 0.58 | 0.04 | **0.00** | — | 2,418.75 | 0.04 | **0.01** | 1.7 | 42.5 | 120.0 | 120.1 | 120.0 |
| 5.0 | 14,158,194.6 | 0.10 | 0.06 | **0.00** | — | 1,612.72 | **0.00** | **0.01** | 2.4 | 56.8 | 120.0 | 120.1 | 120.0 |
| 10.0 | 28,229,742.7 | 0.11 | **0.00** | **0.00** | — | 7.32 | 0.17 | **0.01** | 3.5 | 73.8 | 120.0 | 120.1 | 120.0 |
| 25.0 | 71,497,396.7 | **0.00** | **0.00** | **0.00** | — | 5.39 | 0.10 | **0.01** | 5.6 | 103.0 | 120.0 | 120.1 | 120.0 |
| 50.0 | 145,346,118.0 | 0.32 | **0.00** | **0.00** | — | 23.63 | 0.02 | **0.01** | 7.9 | 106.3 | 120.0 | 120.1 | 120.0 |
| 75.0 | 215,222,498.9 | 0.17 | **0.00** | **0.00** | — | 0.07 | 0.16 | **0.01** | 9.4 | 108.7 | 120.0 | 120.1 | 120.0 |
| 90.0 | 252,337,180.7 | 0.18 | 0.10 | **0.00** | — | **0.00** | **0.00** | **0.00** | 10.2 | 97.2 | 120.0 | 90.5 | 120.0 |
| 95.0 | 262,959,622.5 | 0.13 | 0.13 | **0.00** | — | **0.00** | **0.00** | **0.00** | 10.4 | 89.3 | 120.0 | 95.5 | 120.0 |
| Avg | | 0.20 | 0.04 | **0.00** | — | 508.49 | 0.06 | **0.01** | 6.4 | 84.7 | 120.0 | 113.3 | 120.0 |
| Min | | **0.00** | **0.00** | **0.00** | — | **0.00** | **0.00** | **0.00** | 1.7 | 42.5 | 120.0 | 90.5 | 120.0 |
| Max | | 0.58 | 0.13 | **0.00** | — | 2,418.75 | 0.17 | **0.01** | 10.4 | 108.7 | 120.0 | 120.1 | 120.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 12 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 2.4 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.3 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_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 | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 9,398,593.9 | **0.00** | **0.00** | **0.00** | — | 3,166.00 | **0.00** | **0.01** | 1.7 | 43.2 | 120.0 | 120.1 | 120.0 |
| 5.0 | 18,962,077.3 | 0.08 | **0.00** | **0.00** | — | 1,280.97 | 0.18 | **0.01** | 2.5 | 56.4 | 120.0 | 120.1 | 120.0 |
| 10.0 | 38,360,551.2 | 0.30 | 0.07 | **0.00** | — | 644.98 | 0.04 | **0.01** | 3.6 | 73.9 | 120.0 | 120.1 | 120.0 |
| 25.0 | 96,012,175.0 | 0.01 | **0.00** | **0.00** | — | 287.33 | 0.02 | **0.01** | 5.8 | 106.0 | 120.0 | 120.1 | 120.0 |
| 50.0 | 190,519,222.4 | 0.25 | 0.02 | **0.00** | — | 106.70 | 0.13 | **0.01** | 8.3 | 109.6 | 120.0 | 120.1 | 120.0 |
| 75.0 | 281,686,636.9 | 0.16 | 0.01 | **0.00** | — | 32.76 | 0.06 | **0.00** | 9.9 | 110.6 | 120.0 | 120.1 | 120.0 |
| 90.0 | 330,405,009.5 | **0.00** | **0.00** | **0.00** | — | **0.00** | 0.19 | **0.00** | 11.2 | 98.7 | 120.0 | 86.0 | 120.0 |
| 95.0 | 344,823,907.4 | 0.06 | 0.04 | **0.00** | — | **0.00** | 0.11 | **0.00** | 11.1 | 90.0 | 120.0 | 94.9 | 120.0 |
| Avg | | 0.11 | 0.02 | **0.00** | — | 689.84 | 0.09 | **0.01** | 6.8 | 86.0 | 120.0 | 112.7 | 120.0 |
| Min | | **0.00** | **0.00** | **0.00** | — | **0.00** | **0.00** | **0.00** | 1.7 | 43.2 | 120.0 | 86.0 | 120.0 |
| Max | | 0.30 | 0.07 | **0.00** | — | 3,166.00 | 0.19 | **0.01** | 11.2 | 110.6 | 120.0 | 120.1 | 120.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 15 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 2.6 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.4 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_1000_005.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 1,000 |
| Density ($\Delta$) | 5.0 % |
| Edges ($m$) | 24,926 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 2,097,668.7 | 0.27 | 0.19 | — | — | **0.00** | 0.66 | **0.02** | 10.2 | 120.0 | 120.0 | 54.7 | 120.0 |
| 5.0 | 4,133,456.0 | 0.20 | 0.05 | — | — | **0.00** | 0.12 | **0.01** | 15.4 | 120.0 | 120.0 | 63.0 | 120.0 |
| 10.0 | 8,257,446.2 | 0.15 | 0.06 | — | — | **0.00** | 0.11 | **0.02** | 23.0 | 120.0 | 120.0 | 58.7 | 120.0 |
| 25.0 | 20,679,798.2 | 0.07 | **0.00** | — | — | **0.00** | 0.03 | **0.03** | 37.4 | 120.0 | 120.0 | 120.3 | 120.0 |
| 50.0 | 40,900,913.2 | 0.05 | 0.01 | — | — | **0.00** | 0.08 | **0.01** | 51.9 | 120.0 | 120.0 | 13.6 | 120.0 |
| 75.0 | 59,586,465.8 | 0.01 | **0.00** | — | — | **0.00** | 0.05 | **0.01** | 63.5 | 120.0 | 120.0 | 13.6 | 120.0 |
| 90.0 | 69,335,143.9 | 0.01 | **0.00** | — | — | **0.00** | **0.00** | **0.01** | 67.6 | 120.0 | 120.0 | 3.6 | 94.0 |
| 95.0 | 72,114,236.0 | 0.01 | **0.00** | — | — | **0.00** | **0.00** | **0.01** | 69.8 | 120.0 | 120.0 | 4.2 | 88.0 |
| Avg | | 0.10 | 0.04 | — | — | **0.00** | 0.13 | **0.02** | 42.4 | 120.0 | 120.0 | 41.5 | 112.8 |
| Min | | 0.01 | **0.00** | — | — | **0.00** | **0.00** | **0.01** | 10.2 | 120.0 | 120.0 | 3.6 | 88.0 |
| Max | | 0.27 | 0.19 | — | — | **0.00** | 0.66 | **0.03** | 69.8 | 120.0 | 120.0 | 120.3 | 120.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 20 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 3.6 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.5 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_1000_010.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 1,000 |
| Density ($\Delta$) | 10.0 % |
| Edges ($m$) | 49,500 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 4,094,690.2 | 0.17 | 0.15 | — | — | **0.00** | 0.28 | **0.01** | 9.8 | 120.0 | 120.0 | 85.2 | 120.0 |
| 5.0 | 8,106,253.8 | 0.08 | 0.02 | — | — | **0.00** | 0.10 | **0.01** | 14.9 | 120.0 | 120.0 | 69.9 | 120.0 |
| 10.0 | 16,208,280.2 | **0.00** | 0.03 | — | — | **0.00** | 0.03 | **0.02** | 22.5 | 120.0 | 120.0 | 80.0 | 120.0 |
| 25.0 | 39,835,229.4 | 0.02 | 0.01 | — | — | **0.00** | 0.13 | **0.02** | 35.7 | 120.0 | 120.0 | 30.3 | 120.0 |
| 50.0 | 77,902,137.5 | 0.02 | 0.01 | — | — | **0.00** | 0.02 | **0.03** | 51.1 | 120.0 | 120.0 | 121.1 | 120.0 |
| 75.0 | 114,534,934.7 | 0.01 | **0.00** | — | — | **0.00** | 0.06 | **0.01** | 61.7 | 120.0 | 120.0 | 13.1 | 120.0 |
| 90.0 | 134,305,637.5 | 0.03 | **0.00** | — | — | **0.00** | 0.09 | **0.01** | 65.6 | 120.0 | 120.0 | 13.3 | 120.0 |
| 95.0 | 140,105,204.9 | 0.09 | 0.01 | — | — | **0.00** | 0.04 | **0.01** | 66.9 | 120.0 | 120.0 | 11.0 | 120.0 |
| Avg | | 0.05 | 0.03 | — | — | **0.00** | 0.09 | **0.01** | 41.0 | 120.0 | 120.0 | 53.0 | 120.0 |
| Min | | **0.00** | **0.00** | — | — | **0.00** | 0.02 | **0.01** | 9.8 | 120.0 | 120.0 | 11.0 | 120.0 |
| Max | | 0.17 | 0.15 | — | — | **0.00** | 0.28 | **0.03** | 66.9 | 120.0 | 120.0 | 121.1 | 120.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 20 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 3.7 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.5 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_1000_025.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 1,000 |
| Density ($\Delta$) | 25.0 % |
| Edges ($m$) | 124,346 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 9,993,687.5 | 0.01 | 0.01 | — | — | 2,785.20 | **0.00** | **0.03** | 10.7 | 120.0 | 120.0 | 120.1 | 120.0 |
| 5.0 | 19,788,228.4 | **0.00** | **0.00** | — | — | 1,650.03 | 0.33 | **0.01** | 16.0 | 120.0 | 120.0 | 120.1 | 120.0 |
| 10.0 | 39,504,344.0 | 0.28 | **0.00** | — | — | 803.85 | 0.05 | **0.02** | 23.3 | 120.0 | 120.0 | 120.1 | 120.0 |
| 25.0 | 98,585,900.1 | 0.09 | **0.00** | — | — | 311.23 | 0.15 | **0.03** | 37.5 | 120.0 | 120.0 | 120.1 | 120.0 |
| 50.0 | 198,616,197.0 | 0.03 | **0.00** | — | — | 121.30 | 0.09 | **0.02** | 52.5 | 120.0 | 120.0 | 120.1 | 120.0 |
| 75.0 | 292,869,748.1 | 0.02 | **0.00** | — | — | **0.00** | 0.14 | **0.01** | 63.4 | 120.0 | 120.0 | 36.4 | 120.0 |
| 90.0 | 343,021,553.1 | 0.02 | **0.00** | — | — | **0.00** | 0.06 | **0.01** | 69.2 | 120.0 | 120.0 | 32.6 | 120.0 |
| 95.0 | 357,709,491.6 | 0.03 | **0.00** | — | — | **0.00** | 0.09 | **0.01** | 69.8 | 120.0 | 120.0 | 29.7 | 120.0 |
| Avg | | 0.06 | **0.00** | — | — | 708.95 | 0.11 | **0.02** | 42.8 | 120.0 | 120.0 | 87.4 | 120.0 |
| Min | | **0.00** | **0.00** | — | — | **0.00** | **0.00** | **0.01** | 10.7 | 120.0 | 120.0 | 29.7 | 120.0 |
| Max | | 0.28 | **0.01** | — | — | 2,785.20 | 0.33 | **0.03** | 69.8 | 120.0 | 120.0 | 120.1 | 120.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 11 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 4.5 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.6 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_1000_050.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 1,000 |
| Density ($\Delta$) | 50.0 % |
| Edges ($m$) | 250,545 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 17,884,079.9 | **0.00** | **0.00** | — | — | 2,932.39 | 0.35 | **0.03** | 10.4 | 120.0 | 120.0 | 120.4 | 120.0 |
| 5.0 | 37,062,363.1 | 0.47 | **0.00** | — | — | 1,945.77 | 0.26 | **0.01** | 15.7 | 120.0 | 120.0 | 120.3 | 120.0 |
| 10.0 | 74,779,460.4 | 0.02 | **0.00** | — | — | 856.41 | 0.31 | **0.02** | 22.1 | 120.0 | 120.0 | 120.4 | 120.0 |
| 25.0 | 192,960,369.6 | 0.13 | **0.00** | — | — | 311.42 | 0.37 | **0.03** | 36.2 | 120.0 | 120.0 | 120.3 | 120.0 |
| 50.0 | 387,058,835.1 | 0.11 | **0.00** | — | — | **0.00** | 0.37 | **0.02** | 50.2 | 120.0 | 120.0 | 120.3 | 120.0 |
| 75.0 | 574,164,632.3 | 0.05 | **0.00** | — | — | 5.02 | 0.11 | **0.01** | 60.6 | 120.0 | 120.0 | 120.6 | 120.0 |
| 90.0 | 675,290,477.1 | 0.05 | **0.00** | — | — | 3.52 | 0.15 | **0.01** | 64.9 | 120.0 | 120.0 | 120.3 | 120.0 |
| 95.0 | 704,722,770.8 | 0.06 | **0.00** | — | — | 1.84 | 0.03 | **0.01** | 65.6 | 120.0 | 120.0 | 120.3 | 120.0 |
| Avg | | 0.11 | **0.00** | — | — | 757.05 | 0.24 | **0.02** | 40.7 | 120.0 | 120.0 | 120.4 | 120.0 |
| Min | | **0.00** | **0.00** | — | — | **0.00** | 0.03 | **0.01** | 10.4 | 120.0 | 120.0 | 120.3 | 120.0 |
| Max | | 0.47 | **0.00** | — | — | 2,932.39 | 0.37 | **0.03** | 65.6 | 120.0 | 120.0 | 120.6 | 120.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 14 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 5.5 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.7 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_1000_075.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 1,000 |
| Density ($\Delta$) | 75.0 % |
| Edges ($m$) | 374,402 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 27,658,495.8 | **0.00** | **0.00** | — | — | 2,472.82 | 0.84 | **0.03** | 11.0 | 120.0 | 120.0 | 120.4 | 120.0 |
| 5.0 | 56,356,737.3 | **0.00** | **0.00** | — | — | 1,443.26 | 0.46 | **0.01** | 15.8 | 120.0 | 120.0 | 120.4 | 120.0 |
| 10.0 | 113,215,508.7 | 0.18 | **0.00** | — | — | 810.69 | 0.60 | **0.02** | 23.4 | 120.0 | 120.0 | 120.4 | 120.0 |
| 25.0 | 288,913,846.2 | 0.19 | **0.00** | — | — | 296.34 | 0.54 | **0.03** | 38.2 | 120.0 | 120.0 | 120.4 | 120.0 |
| 50.0 | 590,302,430.7 | **0.00** | **0.00** | — | — | 113.75 | 0.53 | **0.03** | 52.5 | 120.0 | 120.0 | 120.3 | 120.0 |
| 75.0 | 880,675,581.5 | 0.01 | **0.00** | — | — | 40.47 | 0.20 | **0.01** | 63.3 | 120.0 | 120.0 | 120.5 | 120.0 |
| 90.0 | 1,033,406,951.1 | 0.10 | **0.00** | — | — | 12.10 | 0.17 | **0.01** | 67.6 | 120.0 | 120.0 | 120.4 | 120.0 |
| 95.0 | 1,077,214,007.8 | 0.04 | 0.04 | — | — | 6.10 | **0.00** | **0.01** | 69.3 | 120.0 | 120.0 | 120.4 | 120.0 |
| Avg | | 0.07 | **0.01** | — | — | 649.44 | 0.42 | **0.02** | 42.6 | 120.0 | 120.0 | 120.4 | 120.0 |
| Min | | **0.00** | **0.00** | — | — | 6.10 | **0.00** | **0.01** | 11.0 | 120.0 | 120.0 | 120.3 | 120.0 |
| Max | | 0.19 | **0.04** | — | — | 2,472.82 | 0.84 | **0.03** | 69.3 | 120.0 | 120.0 | 120.5 | 120.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 15 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 6.6 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.9 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_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 | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 36,867,381.1 | 0.24 | **0.00** | — | — | 2,668.33 | 0.90 | **0.03** | 10.5 | 120.0 | 120.0 | 120.4 | 121.0 |
| 5.0 | 75,092,164.0 | 0.31 | **0.00** | — | — | 1,702.11 | 0.94 | **0.01** | 15.4 | 120.0 | 120.0 | 120.5 | 121.0 |
| 10.0 | 152,189,862.7 | 0.20 | **0.00** | — | — | 1,065.76 | 0.49 | **0.02** | 24.2 | 120.0 | 120.0 | 120.4 | 121.0 |
| 25.0 | 393,457,775.1 | **0.00** | **0.00** | — | — | 345.20 | 1.00 | **0.03** | 39.5 | 120.0 | 120.0 | 120.4 | 121.0 |
| 50.0 | 786,395,235.4 | 0.02 | **0.00** | — | — | 116.19 | 0.59 | **0.02** | 56.8 | 120.0 | 120.0 | 120.6 | 121.0 |
| 75.0 | 1,160,864,584.9 | 0.13 | **0.00** | — | — | 43.84 | 0.33 | **0.01** | 66.7 | 120.0 | 120.0 | 120.5 | 121.0 |
| 90.0 | 1,360,479,209.5 | 0.11 | **0.00** | — | — | 17.26 | 0.23 | **0.01** | 70.9 | 120.0 | 120.0 | 120.5 | 121.0 |
| 95.0 | 1,419,830,579.9 | 0.09 | **0.00** | — | — | 8.20 | 0.02 | **0.01** | 72.0 | 120.0 | 120.0 | 120.5 | 120.0 |
| Avg | | 0.14 | **0.00** | — | — | 745.86 | 0.56 | **0.02** | 44.5 | 120.0 | 120.0 | 120.5 | 120.9 |
| Min | | **0.00** | **0.00** | — | — | 8.20 | 0.02 | **0.01** | 10.5 | 120.0 | 120.0 | 120.4 | 120.0 |
| Max | | 0.31 | **0.00** | — | — | 2,668.33 | 1.00 | **0.03** | 72.0 | 120.0 | 120.0 | 120.6 | 121.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 16 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 7.8 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 1.0 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_2000_005.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 2,000 |
| Density ($\Delta$) | 5.0 % |
| Edges ($m$) | 99,390 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 8,162,301.0 | **0.00** | **0.00** | — | — | 3,386.64 | 0.16 | **0.06** | 63.8 | 120.0 | 120.0 | 120.1 | 120.0 |
| 5.0 | 16,061,052.8 | **0.00** | 0.04 | — | — | 10.19 | 0.18 | **0.04** | 99.1 | 120.0 | 120.0 | 120.1 | 120.0 |
| 10.0 | 31,862,810.5 | 0.03 | **0.00** | — | — | 4.44 | 0.25 | **0.06** | 120.0 | 120.0 | 120.0 | 120.1 | 120.0 |
| 25.0 | 79,902,717.2 | 0.01 | **0.00** | — | — | 1.95 | 0.15 | **0.10** | 120.0 | 120.0 | 120.0 | 120.1 | 120.0 |
| 50.0 | 159,101,626.8 | 0.02 | **0.00** | — | — | **0.00** | 0.12 | **0.07** | 120.1 | 120.0 | 120.0 | 26.7 | 120.0 |
| 75.0 | 233,228,426.7 | **0.00** | **0.00** | — | — | **0.00** | 0.11 | **0.07** | 120.1 | 120.0 | 120.0 | 18.7 | 120.0 |
| 90.0 | 272,100,482.5 | 0.01 | **0.00** | — | — | **0.00** | 0.09 | **0.08** | 120.1 | 120.0 | 120.0 | 18.9 | 120.0 |
| 95.0 | 283,623,035.8 | **0.00** | **0.00** | — | — | **0.00** | 0.05 | **0.08** | 120.1 | 120.0 | 120.0 | 22.1 | 120.0 |
| Avg | | 0.01 | **0.01** | — | — | 425.40 | 0.14 | **0.07** | 110.4 | 120.0 | 120.0 | 70.8 | 120.0 |
| Min | | **0.00** | **0.00** | — | — | **0.00** | 0.05 | **0.04** | 63.8 | 120.0 | 120.0 | 18.7 | 120.0 |
| Max | | **0.03** | 0.04 | — | — | 3,386.64 | 0.25 | **0.10** | 120.1 | 120.0 | 120.0 | 120.1 | 120.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 20 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 7.5 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 0.9 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_2000_010.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 2,000 |
| Density ($\Delta$) | 10.0 % |
| Edges ($m$) | 199,944 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 15,158,237.1 | 0.09 | **0.00** | — | — | 1,997.86 | 0.36 | **0.13** | 69.6 | 120.0 | 120.0 | 120.4 | 120.0 |
| 5.0 | 30,820,187.5 | 0.01 | **0.00** | — | — | 1,580.84 | 0.47 | **0.03** | 102.8 | 120.0 | 120.0 | 120.4 | 120.0 |
| 10.0 | 62,924,872.2 | 0.01 | **0.00** | — | — | 836.44 | 0.28 | **0.06** | 120.0 | 120.0 | 120.0 | 120.4 | 120.0 |
| 25.0 | 158,171,275.1 | **0.00** | **0.00** | — | — | 283.48 | 0.25 | **0.06** | 120.0 | 120.0 | 120.0 | 120.3 | 120.0 |
| 50.0 | 314,268,401.3 | 0.02 | **0.00** | — | — | 0.01 | 0.24 | **0.10** | 120.2 | 120.0 | 120.0 | 114.6 | 120.0 |
| 75.0 | 462,872,938.6 | 0.02 | **0.00** | — | — | 5.72 | 0.18 | **0.07** | 120.0 | 120.0 | 120.0 | 120.6 | 120.0 |
| 90.0 | 542,046,348.4 | 0.01 | **0.00** | — | — | 3.22 | 0.10 | **0.08** | 120.1 | 120.0 | 120.0 | 120.7 | 120.0 |
| 95.0 | 565,582,538.7 | 0.04 | **0.00** | — | — | 1.85 | 0.08 | **0.07** | 120.2 | 120.0 | 120.0 | 120.7 | 120.0 |
| Avg | | 0.02 | **0.00** | — | — | 588.68 | 0.24 | **0.08** | 111.6 | 120.0 | 120.0 | 119.8 | 120.0 |
| Min | | **0.00** | **0.00** | — | — | 0.01 | 0.08 | **0.03** | 69.6 | 120.0 | 120.0 | 114.6 | 120.0 |
| Max | | 0.09 | **0.00** | — | — | 1,997.86 | 0.47 | **0.13** | 120.2 | 120.0 | 120.0 | 120.7 | 120.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 12 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 8.2 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 1.0 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_2000_025.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 2,000 |
| Density ($\Delta$) | 25.0 % |
| Edges ($m$) | 500,305 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 37,986,132.3 | 0.06 | **0.00** | — | — | 2,327.06 | 1.54 | **0.13** | 65.3 | 120.0 | 120.0 | 121.0 | 121.0 |
| 5.0 | 76,528,469.4 | 0.23 | **0.00** | — | — | 0.27 | 0.66 | **0.03** | 97.4 | 120.0 | 120.0 | 120.3 | 121.0 |
| 10.0 | 152,682,680.5 | 0.01 | **0.00** | — | — | 44.82 | 0.74 | **0.05** | 120.0 | 120.0 | 120.0 | 121.1 | 121.0 |
| 25.0 | 379,984,618.9 | 0.01 | **0.00** | — | — | 72.94 | 0.98 | **0.10** | 120.0 | 120.0 | 120.0 | 120.4 | 121.0 |
| 50.0 | 760,656,415.4 | 0.01 | **0.00** | — | — | 0.11 | 0.82 | **0.08** | 120.0 | 120.0 | 120.0 | 120.6 | 120.0 |
| 75.0 | 1,127,172,236.1 | **0.00** | **0.00** | — | — | 5.22 | 0.29 | **0.07** | 120.0 | 120.0 | 120.0 | 120.4 | 120.0 |
| 90.0 | 1,325,660,720.7 | **0.00** | **0.00** | — | — | 3.72 | 0.22 | **0.07** | 120.1 | 120.0 | 120.0 | 120.5 | 121.0 |
| 95.0 | 1,383,523,525.9 | **0.00** | **0.00** | — | — | 2.18 | 0.08 | **0.07** | 120.1 | 120.0 | 120.0 | 120.5 | 120.0 |
| Avg | | 0.04 | **0.00** | — | — | 307.04 | 0.67 | **0.07** | 110.4 | 120.0 | 120.0 | 120.6 | 120.6 |
| Min | | **0.00** | **0.00** | — | — | 0.11 | 0.08 | **0.03** | 65.3 | 120.0 | 120.0 | 120.3 | 120.0 |
| Max | | 0.23 | **0.00** | — | — | 2,327.06 | 1.54 | **0.13** | 120.1 | 120.0 | 120.0 | 121.1 | 121.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 11 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 11.0 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 1.3 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_2000_050.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 2,000 |
| Density ($\Delta$) | 50.0 % |
| Edges ($m$) | 999,892 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 74,893,413.0 | **0.00** | **0.00** | — | — | 3,291.19 | 2.03 | **0.14** | 66.9 | 120.0 | 120.0 | 122.0 | 122.0 |
| 5.0 | 152,454,540.0 | 0.07 | **0.00** | — | — | 1,590.20 | 2.15 | **0.03** | 99.3 | 120.0 | 120.0 | 123.7 | 122.0 |
| 10.0 | 308,930,505.6 | 0.03 | **0.00** | — | — | 850.73 | 1.83 | **0.06** | 120.0 | 120.0 | 120.0 | 124.1 | 122.0 |
| 25.0 | 767,501,379.1 | 0.07 | **0.00** | — | — | 327.32 | 2.14 | **0.10** | 120.0 | 120.0 | 120.0 | 120.8 | 122.0 |
| 50.0 | 1,556,100,760.9 | 0.02 | **0.00** | — | — | 112.36 | 1.22 | **0.10** | 120.1 | 120.0 | 120.0 | 120.6 | 122.0 |
| 75.0 | 2,317,855,526.8 | **0.00** | **0.00** | — | — | 37.77 | 0.75 | **0.07** | 120.0 | 120.0 | 120.0 | 120.9 | 122.0 |
| 90.0 | 2,729,925,869.9 | **0.00** | **0.00** | — | — | 13.87 | 0.17 | **0.07** | 120.1 | 120.0 | 120.0 | 120.7 | 122.0 |
| 95.0 | 2,852,413,656.9 | 0.05 | **0.00** | — | — | 7.50 | 0.10 | **0.07** | 120.1 | 120.0 | 120.0 | 120.8 | 122.0 |
| Avg | | 0.03 | **0.00** | — | — | 778.87 | 1.30 | **0.08** | 110.8 | 120.0 | 120.0 | 121.7 | 122.0 |
| Min | | **0.00** | **0.00** | — | — | 7.50 | 0.10 | **0.03** | 66.9 | 120.0 | 120.0 | 120.6 | 122.0 |
| Max | | 0.07 | **0.00** | — | — | 3,291.19 | 2.15 | **0.14** | 120.1 | 120.0 | 120.0 | 124.1 | 122.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 12 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 15.0 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 2.0 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_2000_075.txt

| Property of graph | Value |
|---|---|
| Nodes ($n$) | 2,000 |
| Density ($\Delta$) | 75.0 % |
| Edges ($m$) | 1,499,336 |

| | | Deviation from best OFV (%) | | | | | | Running time (s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\gamma$ | Best OFV | QKBP* | RG | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 111,777,087.1 | 0.26 | **0.00** | — | — | 3,161.04 | 3.29 | **0.13** | 65.4 | 120.0 | 120.0 | 123.0 | 120.0 |
| 5.0 | 227,586,687.5 | **0.00** | **0.00** | — | — | 1,674.65 | 3.22 | **0.03** | 96.7 | 120.0 | 120.0 | 120.9 | 120.0 |
| 10.0 | 463,811,780.0 | 0.04 | **0.00** | — | — | 913.33 | 2.68 | **0.05** | 120.0 | 120.0 | 120.0 | 121.8 | 120.0 |
| 25.0 | 1,151,478,894.8 | 0.03 | **0.00** | — | — | 309.16 | 2.91 | **0.10** | 120.1 | 120.0 | 120.0 | 121.0 | 120.0 |
| 50.0 | 2,308,727,831.2 | **0.00** | **0.00** | — | — | 111.00 | 2.46 | **0.09** | 120.1 | 120.0 | 120.0 | 122.8 | 120.0 |
| 75.0 | 3,422,995,480.4 | 0.05 | **0.00** | — | — | 38.39 | 0.99 | **0.07** | 120.1 | 120.0 | 120.0 | 121.2 | 120.0 |
| 90.0 | 4,024,243,092.5 | 0.02 | **0.00** | — | — | 13.78 | 0.29 | **0.07** | 120.1 | 120.0 | 120.0 | 121.2 | 120.0 |
| 95.0 | 4,198,910,746.6 | **0.00** | **0.00** | — | — | 5.71 | 0.08 | **0.07** | 120.2 | 120.0 | 120.0 | 122.0 | 120.0 |
| Avg | | 0.05 | **0.00** | — | — | 778.38 | 1.99 | **0.08** | 110.3 | 120.0 | 120.0 | 121.7 | 120.0 |
| Min | | **0.00** | **0.00** | — | — | 5.71 | 0.08 | **0.03** | 65.4 | 120.0 | 120.0 | 120.9 | 120.0 |
| Max | | 0.26 | **0.00** | — | — | 3,161.04 | 3.29 | **0.13** | 120.2 | 120.0 | 120.0 | 123.0 | 120.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 11 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 18.8 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 2.6 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |

# File dispersion-qkp-wgeo_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 | DP | QK | Gurobi | Hexaly | QKBP* | RG | DP | QK | Gurobi | Hexaly |
| 2.5 | 146,032,229.0 | 0.25 | **0.00** | — | — | 2,910.50 | 3.90 | **0.14** | 73.5 | 120.0 | 120.0 | 121.3 | 120.0 |
| 5.0 | 298,463,595.0 | **0.00** | **0.00** | — | — | 1,848.74 | 3.28 | **0.03** | 109.3 | 120.0 | 120.0 | 122.7 | 120.0 |
| 10.0 | 610,589,901.0 | 0.04 | **0.00** | — | — | 927.61 | 3.64 | **0.06** | 120.1 | 120.0 | 120.0 | 124.1 | 120.0 |
| 25.0 | 1,552,122,124.4 | 0.03 | **0.00** | — | — | 316.28 | 3.18 | **0.11** | 120.0 | 120.0 | 120.0 | 122.5 | 120.0 |
| 50.0 | 3,108,906,506.1 | **0.00** | **0.00** | — | — | 107.83 | 2.21 | **0.08** | 120.0 | 120.0 | 120.0 | 122.7 | 120.0 |
| 75.0 | 4,618,504,994.4 | **0.00** | **0.00** | — | — | 38.83 | 1.00 | **0.07** | 120.1 | 120.0 | 120.0 | 123.4 | 120.0 |
| 90.0 | 5,435,578,205.5 | 0.02 | **0.00** | — | — | 13.26 | 0.42 | **0.07** | 120.0 | 120.0 | 120.0 | 121.3 | 120.0 |
| 95.0 | 5,676,339,787.3 | 0.01 | **0.00** | — | — | 6.57 | 0.12 | **0.07** | 120.0 | 120.0 | 120.0 | 123.0 | 120.0 |
| Avg | | 0.04 | **0.00** | — | — | 771.20 | 2.22 | **0.08** | 112.9 | 120.0 | 120.0 | 122.6 | 120.0 |
| Min | | **0.00** | **0.00** | — | — | 6.57 | 0.12 | **0.03** | 73.5 | 120.0 | 120.0 | 121.3 | 120.0 |
| Max | | 0.25 | **0.00** | — | — | 2,910.50 | 3.90 | **0.14** | 120.1 | 120.0 | 120.0 | 124.1 | 120.0 |

*The contribution in this paper

| QKBP-specific information | Value |
|---|---|
| Number of breakpoints | 12 |
| Running time in seconds for writing input file ($t^{\text{write}}$) | 24.3 |
| Running time in seconds for executing parametric cut procedure ($t^{\text{cut}}$) | 3.4 |
| Running time in seconds for reading result file ($t^{\text{read}}$) | 0.0 |