# Appendix of Local Search for Integer Quadratic Programming


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## Appendix A: Detailed Calculation of Inequality Exploration Move Operator

In this section, we discuss the inequality exploration in different situations. For any $x_j \in \mathcal{S}$ and its associated constraint:

$$con_i = H(i, x_j) \cdot x_j + I(i, x_j) \leq c_i.$$

$$\Theta(x_j) = W \cdot x_j^2 + K(x_j) \cdot x_j.$$

$$\xi = \frac{K(x_j)}{-2W}$$

The feasible domain of $x_j$ in $con_i$ is denoted as $\mathcal{D}$ , $\mathcal{D}$ is :

$$\mathcal{D} = \begin{cases} [x_0, +\infty] & \text{if } A = 0, \alpha(H(I, x_j)) < 0, \\ [-\infty, x_0] & \text{if } A = 0, \alpha(H(I, x_j)) > 0, \\ [x_1, x_2] & \text{if } A > 0, \Delta \neq 0 \\ [-\infty, x_1] \cup [x_2, +\infty] & \text{if } A < 0, \Delta \neq 0, \end{cases} \tag{1}$$

We determine a candidate value $x^{\min}$ based on the specified conditions $\text{con}_i$ and $\theta(x_j)$, where $x^{\min}$ is the value in $\mathcal{D}$ that minimizes $\Theta(x)$ (more detailed calculations of $x^{\min}$ are provided in the appendix). This candidate value $x^{\min}$ is then used to find the nearest feasible integer within the domain $\mathcal{D}$ to apply the $iem(x_j, \text{con}_i, \alpha)$ operator. Specifically, $x^{\min}$ is calculated by these four forms of:

### I. Linear constraint, Linear objective function

If $con_i$ is a Linear constraint with $\alpha(H(I, x_j)) = 0$ and $\Theta(x_j)$ is a linear objective function with $W = 0$. $x_{min}$ is:

$$x_{min} = \begin{cases} x_0, & \text{if } D = [x_0, +\infty], \alpha(K(I, x_j)) < 0 \\ x_0, & \text{if } D = [-\infty, x_0], \alpha(K(I, x_j)) < 0 \\ \alpha(x_j), & \text{otherwise.} \end{cases} \tag{2}$$

### II. Quadratic constraint, Linear objective function

If $con_i$ is a Quadratic constraint with $\alpha(H(I, x_j)) \neq 0$ and $\Theta(x_j)$ is a linear objective function with $W = 0$. $x_{min}$ is:

$$x_{min} = \begin{cases} x_2, & \text{if } D = [x_1, x_2] \text{ and } \alpha(K(I, x_j)) < 0, \\ x_1, & \text{if } D = [x_1, x_2] \text{ and } \alpha(K(I, x_j)) > 0, \\ \alpha(x_j), & \text{otherwise.} \end{cases} \tag{3}$$

### III. Linear constraint, Quadratic objective function

If $con_i$ is a Linear constraint with $\alpha(H(I, x_j)) = 0$ and $\Theta(x_j)$ is a Quadratic objective function with $W \neq 0$. $x_{min}$ is:

$$x_{min} = \begin{cases} x_0, & \text{if } D = [x_0, +\infty], W > 0, \xi \leq x_0, \\ \xi, & \text{if } D = [x_0, +\infty], W > 0, \xi > x_0, \\ \xi, & \text{if } D = [-\infty, x_0], W > 0, \xi \leq x_0 \\ x_0, & \text{if } D = [-\infty, x_0], W > 0, \xi > x_0 \\ \alpha(x_j), & \text{otherwise.} \end{cases} \tag{4}$$

### IV. Quadratic constraint, Quadratic objective function

If $con_i$ is a Quadratic constraint with $\alpha(H(I, x_j)) \neq 0$ and $\Theta(x_j)$ is a Quadratic objective function with $W \neq 0$.

If $D = [-\infty, x_1] \cup [x_2, +\infty]$, $x_{min}$ is:

$$x_{min} = \begin{cases} \xi, & \text{if } W > 0, \xi < x_1 \text{ or } \xi > x_2, \\ x_1, & \text{if } W > 0, x_1 \leq \xi \leq x_2, |x_1 - \xi| \leq |x_2 - x_i| \\ x_2, & \text{if } W > 0, x_1 \leq \xi \leq x_2, |x_1 - \xi| > |x_2 - x_i| \\ \alpha(x_j), & \text{otherwise.} \end{cases} \tag{5}$$

if $D = [x_1, x_2]$, $x_{min}$ is

$$x_{min} = \begin{cases} x_1, & \text{if } W > 0, \xi < x_1 \\ x_2, & \text{if } W > 0, \xi > x_1 \\ \xi, & \text{if } W > 0, x_1 \leq \xi \leq x_2 \\ x_1, & \text{if } W < 0, x_1 \leq \xi \leq x_2, |x_1 - \xi| > |x_2 - x_i| \\ x_2, & \text{if } W < 0, x_1 \leq \xi \leq x_2, |x_1 - \xi| \leq |x_2 - x_i| \\ x_1, & \text{if } W < 0, \xi > x_2 \\ x_2, & \text{if } W < 0, \xi < x_1 \\ \alpha(x_j), & \text{otherwise.} \end{cases} \tag{6}$$

## Appendix B: Repetitive running with randomness

For each instance, we calculated the average best-found objective function value (*AVG*) and the standard deviation (*STD*) of the best-found solutions obtained from the 10 different seeds. The coefficient of variation(*COV*) for each instance is determined by *AVG*/*STD*, with a lower value indicating greater stability. The experimental results are summarized in Table 1.

The results of LS-IQCQP under different seed settings is in Table 2, and we compare the number of win and feas instances with state-of-the-art IQP solvers using the average result over 20 runs under different seed settings in Table 4.

Table 1: Experiment of LS-IQCQP using different seeds, where *#NRGV* represents the number of instances within each range of the *COV*.

| Time Limit | $\#NRGV$ | | | |
|---|---|---|---|---|
| | [0,0.01] | [0.01,0.1] | [0.1,0.5] | [0.5,+$\infty$] |
| 10 Seconds | **133** | 48 | 29 | 11 |
| 60 Seconds | **129** | 54 | 25 | 13 |
| 300 Seconds | **124** | 53 | 29 | 15 |

Table 2: Results of LS-IQCQP under different seed settings. Default seed 0 is used by LS-IQCQP.

| seed settings | *LS-IQCQP:10s* #feas | *LS-IQCQP:10s* #win | *LS-IQCQP:60s* #feas | *LS-IQCQP:60s* #win | *LS-IQCQP:300s* #feas | *LS-IQCQP:300s* #win |
|---|---|---|---|---|---|---|
| Seed: 0 | 221 | 177 | 221 | 176 | 221 | 178 |
| Seed: 1 | 221 | 175 | 221 | 174 | 221 | 180 |
| Seed: 2 | 221 | 177 | 221 | 177 | 221 | 181 |
| Seed: 3 | 221 | 180 | 221 | 174 | 221 | 175 |
| Seed: 4 | 221 | 179 | 221 | 175 | 221 | 172 |
| Seed: 5 | 221 | 173 | 221 | 178 | 221 | 177 |
| Seed: 6 | 221 | 179 | 221 | 177 | 221 | 175 |
| Seed: 7 | 221 | 172 | 221 | 175 | 221 | 180 |
| Seed: 8 | 221 | 178 | 221 | 171 | 221 | 180 |
| Seed: 9 | 221 | 175 | 221 | 172 | 221 | 174 |
| Seed: 10 | 221 | 177 | 221 | 171 | 221 | 176 |
| Seed: 11 | 221 | 175 | 221 | 174 | 221 | 180 |
| Seed: 12 | 221 | 177 | 221 | 177 | 221 | 181 |
| Seed: 13 | 221 | 180 | 221 | 174 | 221 | 175 |
| Seed: 14 | 221 | 179 | 221 | 175 | 221 | 172 |
| Seed: 15 | 221 | 173 | 221 | 178 | 221 | 177 |
| Seed: 16 | 221 | 179 | 221 | 177 | 221 | 175 |
| Seed: 17 | 221 | 172 | 221 | 175 | 221 | 180 |
| Seed: 18 | 221 | 178 | 221 | 171 | 221 | 180 |
| Seed: 19 | 221 | 175 | 221 | 172 | 221 | 174 |

## Appendix C: Complete results of Sensitivity analysis on the parameters

We tested the algorithm with various parameter settings, as detailed in Table 3.

Table 3: Results of LS-IQCQP under different parameter settings. P27 is the parameters ultimately used by LS-IQCQP.

| Parameter settings | $t$ | $\zeta$ | Total #win (10s) | Total #win (60s) | Total #win (300s) |
|---|---|---|---|---|---|
| P0 | 10 | 10 | 170 | 172 | 175 |
| P1 | 10 | 50 | 157 | 154 | 158 |
| P2 | 10 | 80 | 158 | 153 | 162 |
| P3 | 10 | 100 | 153 | 153 | 160 |
| P4 | 10 | 200 | 152 | 160 | 156 |
| P5 | 10 | 300 | 158 | 151 | 159 |
| P6 | 10 | 500 | 169 | 172 | 169 |
| P7 | 10 | 1000 | 175 | 173 | 177 |
| P8 | 50 | 10 | 169 | 166 | 170 |
| P9 | 50 | 50 | 175 | 178 | 178 |
| P10 | 50 | 80 | 181 | 173 | 175 |
| P11 | 50 | 100 | 180 | 180 | 180 |
| P12 | 50 | 200 | 175 | 177 | 174 |
| P13 | 50 | 300 | 174 | 180 | 176 |
| P14 | 50 | 500 | 168 | 175 | 172 |
| P15 | 50 | 1000 | 174 | 174 | 172 |
| P16 | 80 | 10 | 172 | 166 | 171 |
| P17 | 80 | 50 | 178 | 172 | 173 |
| P18 | 80 | 80 | 178 | 174 | 175 |
| P19 | 80 | 100 | 172 | 177 | 174 |
| P20 | 80 | 200 | 177 | 176 | 177 |
| P21 | 80 | 300 | 179 | 177 | 178 |
| P22 | 80 | 500 | 173 | 175 | 171 |
| P23 | 80 | 1000 | 174 | 170 | 173 |
| P24 | 100 | 10 | 169 | 171 | 172 |
| P25 | 100 | 50 | 179 | 175 | 177 |
| P26 | 100 | 80 | 175 | 171 | 180 |
| **P27** | **100** | **100** | **177** | **176** | **178** |
| P28 | 100 | 200 | 180 | 175 | 176 |
| P29 | 100 | 300 | 173 | 175 | 182 |
| P30 | 100 | 500 | 169 | 166 | 174 |
| P31 | 100 | 1000 | 175 | 175 | 170 |
| P32 | 200 | 10 | 173 | 172 | 172 |
| P33 | 200 | 50 | 181 | 176 | 173 |
| P34 | 200 | 80 | 176 | 179 | 180 |
| P35 | 200 | 100 | 173 | 178 | 175 |
| P36 | 200 | 200 | 179 | 173 | 175 |
| P37 | 200 | 300 | 178 | 172 | 173 |
| P38 | 200 | 500 | 173 | 167 | 173 |
| P39 | 200 | 1000 | 176 | 170 | 177 |
| P40 | 300 | 10 | 167 | 175 | 169 |
| P41 | 300 | 50 | 179 | 178 | 174 |
| P42 | 300 | 80 | 173 | 176 | 182 |
| P43 | 300 | 100 | 179 | 178 | 179 |
| P44 | 300 | 200 | 179 | 174 | 179 |
| P45 | 300 | 300 | 177 | 177 | 176 |
| P46 | 300 | 500 | 176 | 170 | 176 |
| P47 | 300 | 1000 | 168 | 168 | 177 |
| P48 | 500 | 10 | 170 | 175 | 168 |
| P49 | 500 | 50 | 177 | 176 | 175 |
| P50 | 500 | 80 | 169 | 177 | 176 |
| P51 | 500 | 100 | 172 | 176 | 175 |
| P52 | 500 | 200 | 175 | 169 | 171 |
| P53 | 500 | 300 | 174 | 177 | 178 |
| P54 | 500 | 500 | 171 | 174 | 169 |
| P55 | 500 | 1000 | 167 | 169 | 168 |
| P56 | 1000 | 10 | 171 | 170 | 172 |
| P57 | 1000 | 50 | 171 | 173 | 174 |
| P58 | 1000 | 80 | 170 | 167 | 175 |
| P59 | 1000 | 100 | 172 | 175 | 174 |
| P60 | 1000 | 200 | 169 | 167 | 175 |
| P61 | 1000 | 300 | 175 | 171 | 175 |
| P62 | 1000 | 500 | 171 | 167 | 176 |
| P63 | 1000 | 1000 | 172 | 175 | 175 |

| Benchmark | Category | *#inst* | *Gurobi_exact* | | *Gurobi_heur* | | *SCIP* | | *Cplex* | | *Knitro* | | *LS-IQCQP* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | *#feas* | *#win* | *#feas* | *#win* | *#feas* | *#win* | *#feas* | *#win* | *#feas* | *#win* | *#feas* | *#win* |
| **Time Limit 10 Seconds** | | | | | | | | | | | | | | |
| QP | QUBO | 23 | **23** | 8 | **23** | 14 | **23** | 1 | **23** | 3 | **23** | 0 | **23** | **16** |
| | LCQP | 99 | **99** | 56 | **99** | 73 | 87 | 23 | **99** | 30 | 80 | 10 | **99** | **73** |
| | QCLP | 10 | **10** | 1 | **10** | 2 | **10** | 1 | 9 | 2 | **10** | 2 | **10** | **7** |
| | QCQP | 5 | **5** | 0 | **5** | 1 | **5** | 0 | 4 | 0 | **5** | 0 | **5** | **5** |
| | QUBO | 19 | **19** | 6 | **19** | **13** | **19** | 2 | **19** | 2 | **19** | 0 | **19** | 9 |
| | LCQP | 52 | **52** | 46 | **52** | **51** | 46 | 45 | **52** | 45 | 45 | 21 | **52** | **51** |
| | QCLP | 2 | **2** | **2** | **2** | **2** | **2** | **2** | **2** | **2** | **2** | **2** | **2** | **2** |
| | QCQP | 11 | **11** | **11** | **11** | **11** | **11** | **11** | **11** | **11** | **11** | **11** | **11** | **11** |
| Total | | 221 | **221** | 130 | **221** | 167 | 203 | 85 | 220 | 95 | 195 | 46 | **221** | **175** |
| **Time Limit 60 Seconds** | | | | | | | | | | | | | | |
| QP | QUBO | 23 | **23** | 11 | **23** | 10 | **23** | 2 | **23** | 5 | **23** | 0 | **23** | **18** |
| | LCQP | 99 | **99** | 64 | **99** | **74** | 98 | 26 | **99** | 37 | 87 | 12 | **99** | **74** |
| | QCLP | 10 | **10** | 1 | **10** | **5** | **10** | 1 | **10** | 3 | **10** | 3 | **10** | 4 |
| | QCQP | 5 | **5** | 1 | **5** | 1 | **5** | 0 | **5** | 0 | **5** | 0 | **5** | **5** |
| | QUBO | 19 | **19** | 10 | **19** | **14** | **19** | 2 | **19** | 3 | **19** | 0 | **19** | 10 |
| | LCQP | 52 | **52** | 46 | **52** | **52** | **52** | 45 | **52** | 45 | **45** | 21 | **52** | 51 |
| | QCLP | 2 | **2** | **2** | **2** | **2** | **2** | **2** | **2** | **2** | **2** | **2** | **2** | **2** |
| | QCQP | 11 | **11** | **11** | **11** | **11** | **11** | **11** | **11** | **11** | **11** | **11** | **11** | **11** |
| Total | | 221 | **221** | 146 | **221** | 169 | 220 | 89 | **221** | 106 | 202 | 49 | **221** | **175** |
| **Time Limit 300 Seconds** | | | | | | | | | | | | | | |
| QP | QUBO | 23 | **23** | 14 | **23** | 10 | **23** | 5 | **23** | 9 | **23** | 0 | **23** | **17** |
| | LCQP | 99 | **99** | 73 | **99** | **77** | **99** | 30 | **99** | 42 | 88 | 15 | **99** | 76 |
| | QCLP | 10 | **10** | 2 | **10** | **6** | **10** | 1 | **10** | 3 | **10** | 5 | **10** | **6** |
| | QCQP | 5 | **5** | 1 | **5** | 3 | **5** | 0 | **5** | 0 | **5** | 0 | **5** | **5** |
| | QUBO | 19 | **19** | 12 | **19** | **16** | **19** | 5 | **19** | 8 | **19** | 0 | **19** | 10 |
| | LCQP | 52 | **52** | 46 | **52** | **52** | **52** | 45 | **52** | 45 | 46 | 21 | **52** | 50 |
| | QCLP | 2 | **2** | **2** | **2** | **2** | **2** | **2** | **2** | **2** | **2** | **2** | **2** | **2** |
| | QCQP | 11 | **11** | **11** | **11** | **11** | **11** | **11** | **11** | **11** | **11** | **11** | **11** | **11** |
| Total | | 221 | **221** | 161 | **221** | **177** | **221** | 99 | **221** | 120 | 203 | 54 | **221** | **177** |

Table 4: Comparison of the number of #win and #feas instances with state-of-the-art IQP solvers using the average result over 20 under different seed settings.

| Instance name | variable count | constraint count |
|---|---|---|
| QP_9048.lp | 202 | 1 |
| QP_9030.lp | 10000 | 5000 |
| QP_7164.lp | 420 | 225 |
| QP_7159.lp | 364 | 196 |
| QP_7154.lp | 312 | 169 |
| QP_7149.lp | 264 | 144 |
| QP_7144.lp | 220 | 121 |
| QP_7139.lp | 180 | 100 |
| QP_7127.lp | 1000 | 50 |
| QP_6941.lp | 2203 | 315 |
| QP_6799.lp | 2075 | 297 |
| QP_6764.lp | 2071 | 297 |
| QP_6757.lp | 2046 | 297 |
| QP_6647.lp | 627 | 33 |
| QP_6597.lp | 600 | 60 |
| QP_6487.lp | 618 | 309 |
| QP_6324.lp | 640 | 16 |
| QP_5980.lp | 150 | 8381 |
| QP_5971.lp | 150 | 5587 |
| QP_5962.lp | 150 | 2793 |
| QP_5944.lp | 100 | 2475 |
| QP_5935.lp | 100 | 1237 |
| QP_5922.lp | 500 | 0 |
| QP_5909.lp | 250 | 0 |
| QP_5882.lp | 150 | 0 |
| QP_5881.lp | 120 | 0 |
| QP_5875.lp | 200 | 0 |
| QP_5755.lp | 400 | 0 |
| QP_5725.lp | 343 | 0 |
| QP_5721.lp | 300 | 0 |
| QP_3980.lp | 235 | 48 |
| QP_3931.lp | 316 | 80 |
| QP_3923.lp | 395 | 80 |
| QP_3913.lp | 300 | 61 |
| QP_3883.lp | 182 | 1456 |
| QP_3877.lp | 630 | 0 |
| QP_3865.lp | 525 | 50 |
| QP_3860.lp | 435 | 8120 |
| QP_3852.lp | 231 | 0 |
| QP_3850.lp | 1225 | 0 |
| QP_3841.lp | 300 | 4600 |
| QP_3838.lp | 780 | 0 |
| QP_3834.lp | 50 | 1 |
| QP_3832.lp | 561 | 0 |
| QP_3822.lp | 861 | 0 |
| QP_3815.lp | 192 | 64 |
| QP_3803.lp | 190 | 2280 |
| QP_3780.lp | 168 | 72 |
| QP_3775.lp | 180 | 60 |
| QP_3772.lp | 380 | 4560 |
| QP_3762.lp | 90 | 480 |
| QP_3757.lp | 552 | 8096 |
| QP_3752.lp | 462 | 6160 |
| QP_3751.lp | 150 | 50 |
| QP_3750.lp | 210 | 70 |
| QP_3745.lp | 325 | 0 |
| QP_3738.lp | 435 | 0 |
| QP_3714.lp | 120 | 40 |
| QP_3709.lp | 600 | 50 |

Table 5: Instances detail

| Instance name | variable count | constraint count |
|---|---|---|
| QP_3706.lp | 703 | 0 |
| QP_3705.lp | 378 | 0 |
| QP_3703.lp | 225 | 30 |
| QP_3693.lp | 1128 | 0 |
| QP_3650.lp | 946 | 0 |
| QP_3642.lp | 1035 | 0 |
| QP_3614.lp | 210 | 44 |
| QP_3587.lp | 240 | 46 |
| QP_3584.lp | 528 | 10912 |
| QP_3565.lp | 276 | 0 |
| QP_3562.lp | 63 | 42 |
| QP_3506.lp | 496 | 0 |
| QP_3413.lp | 400 | 40 |
| QP_3402.lp | 144 | 24 |
| QP_3380.lp | 8904 | 823 |
| QP_3361.lp | 1024 | 64 |
| QP_3347.lp | 676 | 52 |
| QP_3307.lp | 256 | 32 |
| QP_2957.lp | 484 | 44 |
| QP_2880.lp | 625 | 50 |
| QP_2733.lp | 324 | 36 |
| QP_2512.lp | 100 | 20 |
| QP_2492.lp | 196 | 28 |
| QP_2359.lp | 306 | 3264 |
| QP_2357.lp | 240 | 2240 |
| QP_2315.lp | 595 | 13090 |
| QP_2096.lp | 300 | 6925 |
| QP_2087.lp | 276 | 6096 |
| QP_2085.lp | 253 | 5336 |
| QP_2077.lp | 231 | 4642 |
| QP_2073.lp | 210 | 4011 |
| QP_2067.lp | 190 | 3440 |
| QP_2060.lp | 171 | 2926 |
| QP_2055.lp | 153 | 2466 |
| QP_2047.lp | 136 | 2057 |
| QP_2036.lp | 324 | 324 |
| QP_2029.lp | 299 | 299 |
| QP_2022.lp | 275 | 275 |
| QP_2017.lp | 252 | 252 |
| QP_1976.lp | 152 | 152 |
| QP_10074.lp | 75 | 10 |
| QP_10073.lp | 75 | 6 |
| QP_10072.lp | 75 | 10 |
| QP_10071.lp | 200 | 11 |
| QP_10070.lp | 200 | 11 |
| QP_10069.lp | 200 | 10 |
| QP_10068.lp | 200 | 11 |
| QP_10067.lp | 200 | 5 |
| QP_10066.lp | 200 | 11 |
| QP_10065.lp | 200 | 11 |
| QP_10064.lp | 200 | 11 |
| QP_10063.lp | 200 | 5 |
| QP_10062.lp | 200 | 10 |
| QP_10061.lp | 200 | 5 |
| QP_10060.lp | 200 | 10 |
| QP_10059.lp | 200 | 10 |
| QP_10058.lp | 200 | 11 |
| QP_10057.lp | 200 | 11 |
| QP_10056.lp | 175 | 5 |

Table 6: Instances detail

| Instance name | variable count | constraint count |
|---|---|---|
| QP_10055.lp | 175 | 5 |
| QP_10054.lp | 175 | 11 |
| QP_10053.lp | 150 | 10 |
| QP_10052.lp | 150 | 6 |
| QP_10051.lp | 150 | 10 |
| QP_10050.lp | 150 | 5 |
| QP_10049.lp | 150 | 10 |
| QP_10048.lp | 150 | 5 |
| QP_10047.lp | 150 | 10 |
| QP_10046.lp | 150 | 6 |
| QP_10045.lp | 150 | 10 |
| QP_10044.lp | 150 | 6 |
| QP_10043.lp | 150 | 10 |
| QP_10042.lp | 125 | 5 |
| QP_10041.lp | 125 | 6 |
| QP_10040.lp | 125 | 6 |
| QP_0752.lp | 250 | 1 |
| QP_0633.lp | 75 | 1 |
| QP_0067.lp | 80 | 1 |
| _st_testph4.lp | 3 | 10 |
| _st_testgr3.lp | 20 | 20 |
| _st_testgr1.lp | 10 | 5 |
| _st_test8.lp | 24 | 20 |
| _st_test6.lp | 10 | 5 |
| _st_test5.lp | 10 | 11 |
| _st_test4.lp | 6 | 5 |
| _st_test3.lp | 13 | 10 |
| _st_test2.lp | 6 | 2 |
| _st_test1.lp | 5 | 1 |
| _st_miqp3.lp | 2 | 1 |
| _st_miqp2.lp | 4 | 3 |
| _st_miqp1.lp | 5 | 1 |
| _prob03.lp | 2 | 1 |
| _prob02.lp | 6 | 8 |
| _pb351575.lp | 525 | 50 |
| _pb351555.lp | 525 | 50 |
| _pb351535.lp | 525 | 50 |
| _pb302075.lp | 600 | 50 |
| _pb302055.lp | 600 | 50 |
| _pb302035.lp | 600 | 50 |
| _nvs24.lp | 10 | 10 |
| _nvs23.lp | 9 | 9 |
| _nvs19.lp | 8 | 8 |
| _nvs18.lp | 6 | 6 |
| _nvs17.lp | 7 | 7 |
| _nvs15.lp | 4 | 1 |
| _nvs13.lp | 5 | 5 |
| _nvs12.lp | 4 | 4 |
| _nvs11.lp | 3 | 3 |
| _nvs10.lp | 2 | 2 |
| _nvs03.lp | 3 | 2 |

Table 7: Instances detail

| Instance name | variable count | constraint count |
|---|---|---|
| _Graphpart_3pm-0334-0334.lp | 108 | 36 |
| _Graphpart_3pm-0333-0333.lp | 81 | 27 |
| _Graphpart_3pm-0244-0244.lp | 96 | 32 |
| _Graphpart_3pm-0234-0234.lp | 72 | 24 |
| _Graphpart_3g-0444-0444.lp | 192 | 64 |
| _Graphpart_3g-0344-0344.lp | 144 | 48 |
| _Graphpart_3g-0334-0334.lp | 108 | 36 |
| _Graphpart_3g-0333-0333.lp | 81 | 27 |
| _Graphpart_3g-0244-0244.lp | 96 | 32 |
| _Graphpart_3g-0234-0234.lp | 72 | 24 |
| _Graphpart_2pm-0099-0999.lp | 243 | 81 |
| _Graphpart_2pm-0088-0888.lp | 192 | 64 |
| _Graphpart_2pm-0077-0777.lp | 147 | 49 |
| _Graphpart_2pm-0066-0066.lp | 108 | 36 |
| _Graphpart_2pm-0055-0055.lp | 75 | 25 |
| _Graphpart_2pm-0044-0044.lp | 48 | 16 |
| _Graphpart_2g-1010-0824.lp | 300 | 100 |
| _Graphpart_2g-0099-9211.lp | 243 | 81 |
| _Graphpart_2g-0088-0088.lp | 192 | 64 |
| _Graphpart_2g-0077-0077.lp | 147 | 49 |
| _Graphpart_2g-0066-0066.lp | 108 | 36 |
| _Graphpart_2g-0055-0062.lp | 75 | 25 |
| _Graphpart_2g-0044-1601.lp | 48 | 16 |
| _crossdock_15x8.lp | 240 | 46 |
| _chimera_selby-c8-onc8-02.lp | 507 | 0 |
| _chimera_selby-c8-onc8-01.lp | 507 | 0 |
| _chimera_selby-c16-02.lp | 2031 | 0 |
| _chimera_selby-c16-01.lp | 2031 | 0 |
| _chimera_rfr-02.lp | 2032 | 0 |
| _chimera_rfr-01.lp | 2032 | 0 |
| _chimera_mis-02.lp | 2032 | 0 |
| _chimera_mis-01.lp | 2032 | 0 |
| _chimera_mgw-c8-507-onc8-02.lp | 508 | 0 |
| _chimera_mgw-c8-507-onc8-01.lp | 508 | 0 |
| _chimera_mgw-c8-439-onc8-002.lp | 440 | 0 |
| _chimera_mgw-c8-439-onc8-001.lp | 440 | 0 |
| _chimera_mgw-c16-2031-02.lp | 2032 | 0 |
| _chimera_mgw-c16-2031-01.lp | 2032 | 0 |
| _chimera_lga-02.lp | 964 | 0 |
| _chimera_lga-01.lp | 1120 | 0 |
| _chimera_k64maxcut-02.lp | 1145 | 0 |
| _chimera_k64maxcut-01.lp | 1101 | 0 |
| _chimera_k64ising-01.lp | 1192 | 0 |
| _ball_mk4_15.lp | 30 | 1 |
| _ball_mk4_10.lp | 20 | 1 |
| _ball_mk4_05.lp | 10 | 1 |
| _ball_mk3_30.lp | 30 | 1 |
| _ball_mk3_20.lp | 20 | 1 |
| _ball_mk3_10.lp | 10 | 1 |
| _ball_mk2_30.lp | 30 | 1 |
| _ball_mk2_10.lp | 10 | 1 |

Table 8: Instances detail