

ONLINE APPENDIX: “Assessing the Variation of Formal Military  
Alliances”

September 29, 2014

In the appendix that follows we:

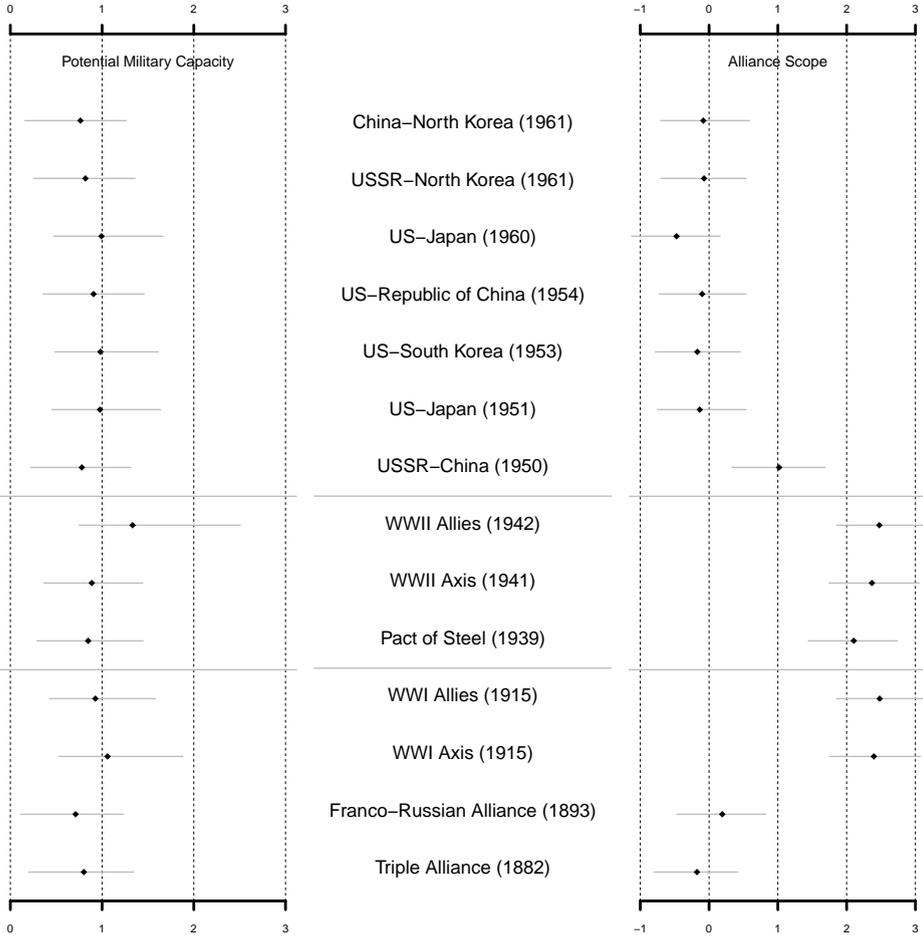
1. Discuss issues regarding case selection and the source of missing data.
2. Examine the estimates of notable alliances in the World Wars and East Asia.
3. Demonstrating variation within conventional alliance classifications
4. Discuss the measure of *potential military capacity* in more detail.
5. Summarize the factor inputs we use to construct the estimates for potential military capacity, scope, and depth.
6. Report the point estimates and posterior standard deviations for each of the alliances we analyze.

## 1 Case Selection

We estimate the characteristics of formal military alliances – excluding pure non-aggression pacts. In ATOP 3.0 there are 648 alliances formed between the year 1817 and 1999 inclusive. After merging in data from the Correlates of War, Polity 4, and Affinity data from Gartzke we are left with 619 cases. For example, for the following ATOPid's we lack the required CoW or Polity information for countries involved in the alliance: 1118 (China not a CoW system member), 1130 (No data on Parma), 1150 (Uruguay not a CoW system member), 1155 (Uruguay not a CoW system member), 1320 (Annam is not a CoW system member), 1425 (Bulgaria is not a CoW system member in 1904 - joins in 1908), 1480 (Montenegro is not a CoW system Member), and 2270 (Iraq is not a CoW system member in 1930 - joins in 1932). Dropping non-aggression pacts removes another 105 alliances – defined as  $nagatop==1$  &  $consultatop==0$  &  $neutatop==0$  &  $offenseatop==0$  &  $defenseatop==0$  – to leave 513 cases. Dropping alliances for which data is missing yields 492 cases.

## 2 Alliances in the World Wars and East Asia

To further explore the face validity of our estimates, we compare alliances involved in World War I, World War II, and the post-WWII alliances in East Asia for which we have strong priors regarding their relative ranking in each dimension. Figure 1 plots the estimated potential military capacity (left graph) and scope (right graph) of relevant alliances in ascending temporal order.



**Figure 1: SELECTED ALLIANCE SCORES** Estimated Strength and Scope for alliances involved in World War I, World War II, and post-WWII East Asian security in terms of the potential military capacity (left) and the scope of the alliance (right) are plotted. The points denote estimate in each dimension for each alliance and the lines show 95% regions of highest posterior density for the selected alliances.

Consider first the alliances that were involved in World War II, which are plotted in the middle of Figure 1. One of the strongest alliances in terms of potential military capacity is

the alliance formed between the Allies in 1942. Notice that the Tripartite Alliance signed by the Axis powers in 1940, which was targeted by the Allied Pact, is estimated to possess less military capacity, but about the same scope as the alliance formed by the Allies during World War II. This is reassuring given that it is a multilateral defensive pact signed during World War II between countries whose combined capabilities are not as great as the Allied powers. Additionally, the terms of the defensive obligation are conditional upon one of the signatories being attacked by a party not involved in World War II at the time the alliance was signed. The antecedent for this defensive pact was the 1939 Pact of Steel between Germany and Italy. As an unconditional pledge to undertake shared offensive and defensive military campaigns, it is also on par with the Allied Pact in the scope of its agreement terms. The 1940 Tripartite Pact was replaced by a more aggressive agreement, which, like the Allied Pact, is also a wartime alliance containing similar terms. In Figure 1, it is in approximately the same position in the second dimension as the Allied Pact, indicating the similarity in terms of the scope of the obligations between the opposing World War II alliances. Like the Allied Pact, the three signatories to the Tripartite Alliance pledged to use all means, offensive and defensive, to pursue the war.

The estimated strength of the alliances involved in World War I reported in the bottom of Figure 1 also comport with prior expectations. There is parity in the prewar alliances in both the potential military capacity and the scope of the commitment which is consistent with Snyder's (1997) claim that the 1893 Franco-Russia alliance was motivated by a desire on the part of both France and Russia to gain parity of strength with the growing power of the 1882 Triple Alliance between Germany, Italy, and Austria-Hungary. The terms of the wartime treaty signed by France, Russia, the United Kingdom, and Italy is also similar to the opposing declaration agreed to by Germany, Austria-Hungary, and Bulgaria, but the addition of the United Kingdom and Italy to the alliance with France and Russia shifted the signatory strength significantly in favor of the Allies. The estimated equivalence of the opposing alliance systems in WWI and WWII is reassuring given its consistency with the claim that opposing continental alliances are especially prone to balance each other (Levy and Thompson 2010).

The estimates of post-WWII deterrent alliances in Asia are also consistent with expectations. The 1950 USSR-China alliance, the 1951 US-Japan alliance, the 1961 USSR-North Korea, and the 1961 China-North Korea alliance all obligate alliance partners to defend each other if a fellow ally is attacked. By comparison, the other three East Asian alliances in Figure 1 – 1953 US-South Korea, 1954 US-Republic of China, 1960 US-Japan – contain provisions that enable alliance members to escape their defensive obligations if there is war.<sup>1</sup> In our measure, the former alliances are all estimated to have stronger treaty terms than the latter three. However, although these differences comport with our prior expectations, they are statistically indistinguishable.

Another feature of interest in Figure 1 is the parity in potential military capacity between rival alliances. Comparing the 1950 USSR-China alliance to the 1951 US-Japan alliance, for example, we see that the potential military capacity of each alliance is approximately the same. The US-South Korea alliance was signed after the Korean War to deter North Korea, China, and the USSR. The potential military capacity of the US-South Korea alliance is within the confidence interval of the USSR-China alliance. The 1954 US-ROC alliance was signed during the first Taiwan Strait Crisis. It was also designed to deter China and the USSR while also restraining Chiang Kaishek. Its relatively limited scope of military obligations compared to the 1950 alliance between the USSR and China reflects the US's motivation to restrain its alliance partner even though the alliances are roughly equivalent in potential military capacity.

The parity of the East Asian alliances remained consistent even as the schism between China and the Soviet Union grew during the early 1960s. During this period, China and North Korea formed a separate alliance, as did the USSR and North Korea – both of which were more restricted in scope relative to the 1950 agreement. The US and Japan also renewed and revised the terms of their alliance in 1960. The similarity in scope and potential military capacity between the 1960 US-Japan alliance, the 1953 US-South Korea alliance, the 1961 USSR-North Korea alliance, and the 1961 China-North Korea alliance is consistent with claims that some alliances may be designed to balance threats (Morgenthau 1948; Waltz 1979).

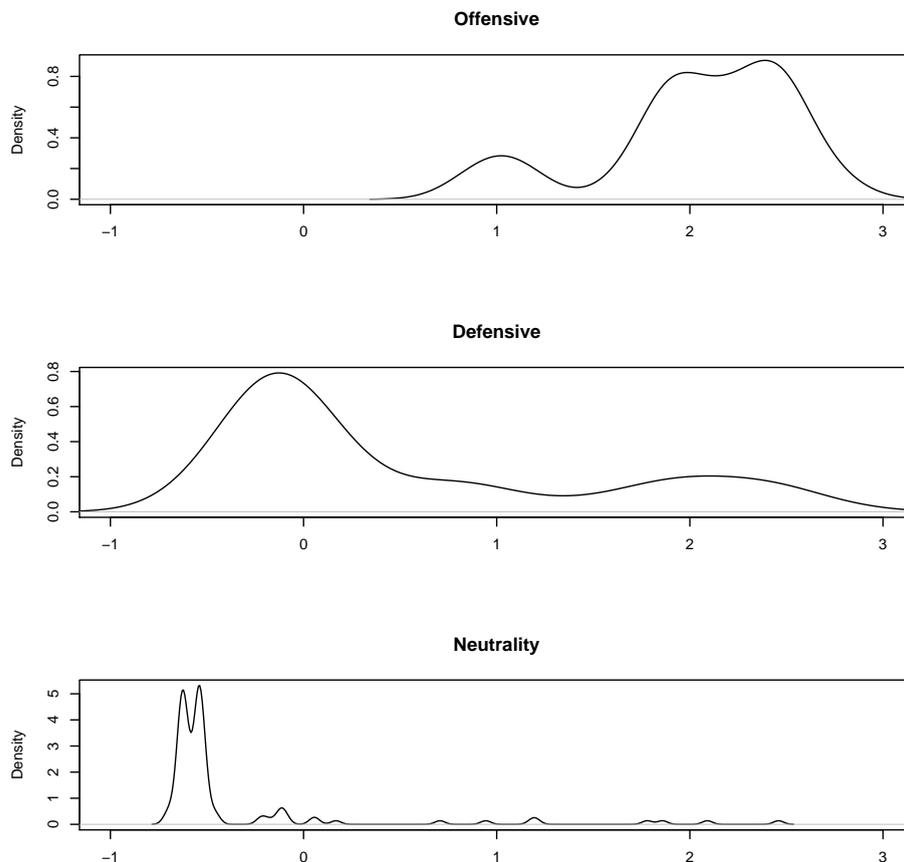
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<sup>1</sup>See Benson 2012 for a case study analysis of these East Asian alliances.

### 3 Demonstrating Variation within Conventional Alliance Classifications

In the absence of our measure we would be unable to provide a nuanced exploration of why signatories form an alliance with a particular set of features. For example, if we were interested in exploring the extent to which signatories formed an alliance that was more expansive in scope, we would be forced to define scope by either choosing a particular feature of an alliance or else trying to combine various measures according to some pre-specified functional form (e.g., creating an additive index). Both are problematic. If, for example, we were to use the conventional categorization of alliance types as offensive, defensive, or neutrality to proxy for the scope of an alliance we would miss a considerable amount of variation within each classification. To demonstrate this, we show that our recovered estimates of scope identify a great deal of variation within conventional categories. Figure 2 graphs the density of our alliance estimates for scope for each alliance categorized as “offensive,” “defensive,” or “neutrality,” and it reveals considerable variation in each classification.

It is true that the scope of the alliances are sensibly ordered, but it is also true that there are some defensive alliances that are estimated to be more expansive than some offensive alliances and neutrality alliances that are more expansive than both. Some of this is a result of the categorizations being non-exclusive, but this non-exclusivity also creates a difficulty for analyzing the variation in the absence of the measurement model we provide. How, for example, should scholars account for the fact that an alliance can be every combination of these three characteristics, for a total of  $2^3 = 8$  different combinations and how should the resulting nominal measure with 8 different values be analyzed statistically? The variation evident in Figure 2 captures variation that existing measures cannot easily characterize. In contrast, our statistical measurement model provides a principled manner for estimating a parsimonious and continuous measure of alliance characteristics that reflects the variation in all of the measures that are thought to be related to the underlying concept of interest.



**Figure 2:** DISTRIBUTION OF TREATY STRENGTH BY ALLIANCE TYPE, 1815-2000  
Distribution of Scope dimension estimates by ATOP categorization.

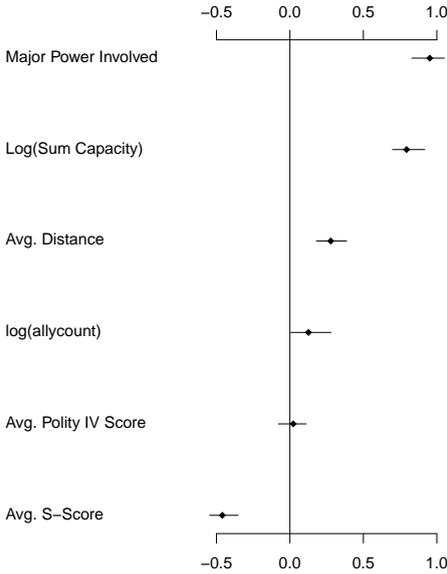
## 4 A Closer Look: Potential Military Capacity

In addition to the estimated factor loadings reported in the text, we can also examine the correlation between our estimate and the component parts. As section 2 discusses, an advantage of a latent variable approach is that we can estimate a measure that reflects the characteristics of multiple measures rather than be forced to rely on a single proxy variable. As a result, our measure allows for variation for any given value of any particular measure.

Figure 3 reports the relationship of variables that are assumed to structure the potential military capacity of an alliance. Recall that while we defined the dimensions by assuming that each of the included variables is related to a particular dimension, nothing is assumed about how each variable structures the recovered dimension. It is of interest to see therefore which

measures are most related to the recovered dimensions.

Reassuringly, Figure 3 reveals that the logged total military capacity of the signatories is the strongest determinant of potential military capacity and that the estimated capacity is also increasing in whether a major power signs and the number of signatories (logged). The positive relationship between potential military capacity and the average distance between signatories may appear odd, but it highlights the fact that our estimates are based on the variation that we observe in the set of alliances that are formed rather than a hypothesized ideal. As a consequence, if major powers possess the most military capacity and if they are distributed around the globe, then alliances between major powers and great military capacity will also contain signatories that are more distant relative to the multitude of pacts that exist between contiguous countries who are not major powers. This relationship will then induce the positive relationship graphed in Figure 3.



**Figure 3:** DIMENSION 1 FACTOR LOADINGS: “POTENTIAL MILITARY CAPACITY”: Circles denote posterior mean, and lines denote 95% HPD regions.

A strength of a Bayesian latent variable model is that we can also assess the precision of these estimated relationships. For example, while we can be confident that the log of

the summed military capacity of the involved signatories is positively related to the latent dimension we recover in the first dimension, there is no obvious relationship between the average Polity IV score of alliance signatories (*Avg. Polity IV*).

## 5 Factors Used to Estimate Scope, Depth, and Potential Military Capacity

| <b>Scope of Obligations:</b>   |  |   |
|--|--|---|
| The breadth of circumstances under which partners are obligated to commit military action or non-action as described in the alliance agreement |  |   |
| <b>Input Name</b>  | <b>Condition of Military Action or Non-Action</b>  | <b>Coding Rule</b>  |
| Offensive  | Promises military action even if no attack on an alliance member   | Coded as 1 if ATOP offense==1, 0 otherwise  |
| Defensive  | Promises military action if an attack on an alliance member  | Coded as 1 if ATOP defense==1, 0 otherwise  |
| Neutrality   | Promise not to support an adversary militarily if there is a conflict between an alliance member and the adversary                       | Coded as 1 if ATOP neutral==1, 0 otherwise  |
| Consultation   | Promises to consult with one or more alliance members if there is a crisis that might become militarized                                 | Coded as 1 if ATOP consul==1, 0 otherwise   |
| War Environment Conditions   | Promises military action (offensive or defensive) if there is a specific adversary, location, ongoing conflict, or number of adversaries | Coded as 1 if ATOP defcoadv, defcoloc, defcocon, defconum, offcoadv, offcoloc, offcocon, offconum==1; otherwise 0 |
| Non-Compliance Conditions  | Promises military action (offensive or defensive) if there is non-compliance with certain demands  | Coded as 1 if ATOP defcodem, offcodem==1, otherwise 0   |
| Non-Provocation Conditions   | Promises military action defensive (offensive not applicable) if one of the partners is attacked without provocation                     | Coded as 1 if ATOP defconpr==1, otherwise 0   |
| War Environment Conditions for Non-  | Promises neutrality or consultation if there is a specific adversary, location, ongoing conflict, number of                              | Coded as 1 if ATOP neucoadv, neucoloc, neucocon, neuconum, neucoatt, concoadv, concoloc, concocon==1; otherwise 0 |

|   |  |  |
|---|--|--|
| Military Actions                                    | adversaries, or an attack  |  |
| Non-Compliance Conditions for Non-Military Actions  | Promises neutrality (consultation not applicable) if there is non-compliance with certain demands                                  | Coded as 1 if ATOP neucoDEM==1, otherwise 0                              |
| Non-Provocation Conditions for Non-Military Actions | Promises neutrality (consultation not applicable) if one of the partners is attacked without provocation                           | Coded as 1 if ATOP neuconpr==1, otherwise 0                              |
| Request Consultation                                | Promises that consultation is only required if requested by an alliance member   | Coded as 1 if concoreq==1, otherwise 0                                   |
| Other Conditions                                    | Promises military or non-military action if any other condition not specified in other variables occurs                            | Coded as 1 if ATOP olimob==1, otherwise 0                                |
| Specific Length                                     | Promises military action or non-action only during specific time period  | Coded as 1 if ATOP speclgth==1, otherwise 0                              |
| Conditional length                                  | Promises military action or non-action if a specified condition doesn't end the agreement  | Coded as 1 if ATOP speclgth==2, otherwise 0                              |
| Renunciation Allowed                                | Promises military action or non-action if no party renounces the agreement with advance notice                                     | Coded as 1 if ATOP renounce==1, otherwise 0                              |
| Renunciation Prohibited                             | Promises military action or non-action even if a party wishes to renounce the agreement  | Coded as 1 if ATOP renounce==2, otherwise 0                              |
| Renunciation Conditional                            | Promises military action or non action as long as another member does not take aggressive action that makes renunciation allowable | Coded as 1 if ATOP renounce==3, otherwise 0                              |
| Compellent  | Promises military action to change the status quo  | Coded as 1 if an alliance member makes a compellent promise, otherwise 0 |

|   |  |  |
|---|--|--|
| Deterrent   | Promises military action to secure the status quo  | Coded as 1 if an alliance member makes a deterrent promise, otherwise 0  |
| Deterministic   | Promises military action (compellent or deterrent) without options for flexible or probabilistic escape  | Coded as 1 if an agreement contains non-flexible or non-probabilistic obligation to provide compellent or deterrent military support, 0 otherwise  |
| Unconditional   | Promises military action (compellent or deterrent) without without conditions on <i>casus foederis</i>   | Coded as 1 if an agreement requires compellent or deterrent military support without any conditions for <i>casus foederis</i> , 0 otherwise  |
| <b>Depth of Commitments:</b><br>The degree to which the agreement imposes costs on alliance members |  |  |
| <b>Input Name</b>   | <b>Description</b>   | <b>Coding Rule</b>   |
| Military Contact  | Requires contact between members during peacetime  | Coded as 1 if ATOP milcon==2, otherwise 0  |
| Common Defense Policy   | Requires alliance members to conduct a common defense policy including common doctrine, coordination of training and procurement, joint planning, etc. | Coded as 1 if ATOP milcon==3, otherwise 0  |
| Integrated Command  | Requires integrated military command during peacetime as well as wartime   | Coded as 1 if ATOP intcom==1, otherwise 0  |
| Military Aid  | Requires any members to provide each other military aid.   | Follows ATOP coding. Coded as 0 if no provisions for mil aid, 1 if general or unspecified military assistance, 2 if grants or loans, 3 if military training and/or transfer of technology, 4 if both grants or loans and mil training and/or technology.<br><br><i>Should we leave this coded as an ordinal variable or break apart?</i>                           |
| Military Basing   | Requires joint troop placements.   | Follows ATOP coding. Coded as 0 if no provisions for basing, 1 if joint placements on neutral territory, 2 if all members can station troops in other members' territory or use others' military facilities, 3 if one or more states can station troops in another's territory but promises not reciprocal.<br><br><i>Should we leave this coded as an ordinal</i> |

|  |  |  |
|--|--|--|
|  |  | <i>variable, break apart, code as 1 if &gt;0, or change the order?</i>   |
| Specific Contribution  | Agreement specifies any details about the levels of contributions to be made by any ally or how the costs of the alliance will be divided. | Coded as 1 if ATOP contrib==1, otherwise 0   |
| Organization   | Requires the creation of any organization  | Follows ATOP coding. Coded as 0 if no organizations are created, 1 if regular meetings required, 2 if named organization and regular mtgs required, 3 if stand-alone organization with permanent bureaucracy is included |
| Economic Aid   | Requires provision of economic aid   | <i>Maybe change this to dummy variable. Code as 1 if ATOP ecaid&gt;0</i>   |
| Secret   | Requires secrecy   | Follows ATOP coding. Coded as 0 if public alliance, 1 if only some articles are secret, 2 if entire treaty is secret   |
| <b>Potential Military Capacity:</b><br>The total adjusted potential military power or strength of an alliance based on the characteristics of the alliance members |  |  |
| <b>Input Name</b>  | <b>Description</b>   | <b>Coding Rule</b>   |
| Capabilities   | Aggregate capabilities of all alliance members   | Log of summed CINC (v3.02) scores of all alliance members (Singer, Bremer, and Stuckey 1972)   |
| Major Power  | Includes at least one major power among the alliance members   | Coded as 1 if any member of the alliance is a major power (Correlates of War v2011)  |
| Distance   | Distance between alliance members  | Mean capital-to-capital distance between all pairs of alliance members (Eugene, Bennett and Stam 2000)   |
| Ally count   | Total number of alliance members   | Logged count of total number of alliance members (ATOP, Leeds et al 2002)  |
| sglo   | Similarity of alliance members' alliance portfolios  | Mean s-scores for all pairs of alliance members (Signorino and Ritter, 1999)   |
| Polity   | Regime type of alliance members  | Mean Polity IV scores of all alliance members (Marshall, Jaggers, and Gurr 2002)   |

## **Alliance Point Estimates**

The tables on the following pages report the ATOP identification number for every alliance formed between 1816-2000 for which we possess the requisite characteristics in order to measure the scope, depth, and potential military capacity of the alliance. The alliances are listed by ATOP id in ascending order and the estimated score is listed at the time of formation for each alliance on each of the three dimensions – scope, depth, and potential military capacity – at the time of formation.

These will also be made publicly available in electronic format (along with the code required to reproduce them).

| <b>ATOP ID</b> | <b>Potential Military Capacity</b> | <b>Depth</b> | <b>Scope</b> |
|----------------|------------------------------------|--------------|--------------|
| 1040           | -0.96                              | 1.54         | 2.74         |
| 1045           | 1.00                               | -0.49        | -0.54        |
| 1050           | 0.66                               | 1.08         | 0.19         |
| 1055           | 0.81                               | -0.48        | 2.69         |
| 1060           | 0.79                               | -0.51        | 1.45         |
| 1065           | 0.83                               | -0.57        | 2.25         |
| 1070           | -1.02                              | 0.02         | 2.16         |
| 1075           | 0.76                               | -0.07        | -0.45        |
| 1080           | 0.75                               | -0.48        | -0.57        |
| 1085           | 0.75                               | -0.48        | 0.99         |
| 1090           | 0.72                               | -0.49        | 0.82         |
| 1095           | 0.84                               | -0.53        | -0.27        |
| 1100           | 0.92                               | 0.04         | 1.41         |
| 1110           | 1.03                               | -0.49        | 2.84         |
| 1115           | 0.92                               | -0.51        | -0.55        |
| 1120           | 0.95                               | 0.03         | 1.52         |
| 1125           | 0.65                               | 0.91         | 0.04         |
| 1135           | 0.66                               | -0.01        | 0.75         |
| 1145           | 0.71                               | 0.01         | 2.17         |
| 1160           | 0.92                               | 0.41         | -0.23        |
| 1165           | 0.82                               | -0.49        | 2.25         |
| 1170           | 0.80                               | 0.01         | 2.28         |
| 1175           | 0.69                               | 0.40         | 1.58         |
| 1180           | 0.93                               | 0.33         | 1.82         |
| 1185           | 0.76                               | -0.45        | -0.55        |
| 1190           | 0.92                               | -0.48        | 0.02         |
| 1195           | 0.93                               | -0.50        | 0.86         |
| 1200           | -1.33                              | -0.48        | -0.54        |
| 1205           | -1.17                              | -0.47        | 0.71         |
| 1210           | 0.79                               | 1.07         | 1.05         |
| 1215           | 0.88                               | -0.57        | -0.63        |
| 1220           | -1.30                              | 0.35         | -0.12        |
| 1225           | 0.88                               | -0.51        | 2.61         |
| 1230           | 0.66                               | -0.05        | 2.33         |
| 1235           | -1.39                              | -0.49        | -0.09        |
| 1240           | -1.44                              | -0.36        | 0.76         |
| 1245           | 0.73                               | 0.13         | 2.55         |
| 1255           | -1.19                              | 0.57         | 2.40         |
| 1260           | -1.27                              | 0.02         | 1.89         |
| 1265           | 0.71                               | -0.57        | 2.62         |
| 1270           | 0.74                               | -0.55        | -0.62        |
| 1275           | 0.62                               | -0.53        | 1.63         |

|      |       |       |       |
|------|-------|-------|-------|
| 1280 | 0.60  | -0.56 | 1.65  |
| 1285 | 0.61  | -0.51 | 2.17  |
| 1287 | 0.62  | 1.09  | 2.18  |
| 1295 | 0.83  | -0.51 | 1.18  |
| 1300 | 0.81  | -0.48 | 1.21  |
| 1305 | -1.36 | -0.56 | -0.09 |
| 1310 | 0.74  | -0.05 | 0.19  |
| 1315 | 0.91  | -0.49 | -0.61 |
| 1325 | 0.80  | -0.54 | -0.54 |
| 1330 | 0.77  | 0.41  | 1.43  |
| 1335 | 0.69  | -0.56 | 0.17  |
| 1340 | 0.84  | -0.52 | -0.51 |
| 1345 | 0.60  | -0.48 | -0.63 |
| 1350 | 0.80  | -0.44 | -0.18 |
| 1355 | 0.80  | -0.57 | -0.35 |
| 1360 | 0.91  | -0.52 | -0.57 |
| 1365 | 0.90  | -0.55 | -0.56 |
| 1370 | 0.75  | -0.57 | -0.51 |
| 1375 | 0.90  | -0.56 | 1.97  |
| 1380 | 0.77  | -0.56 | -0.56 |
| 1385 | 0.71  | 0.42  | 0.19  |
| 1390 | -1.06 | 0.41  | 2.46  |
| 1395 | 0.75  | 0.35  | 1.08  |
| 1400 | 0.71  | -0.54 | 0.76  |
| 1410 | 0.61  | -0.52 | -0.56 |
| 1415 | 0.82  | -0.26 | 1.78  |
| 1420 | 0.71  | -0.54 | -0.46 |
| 1430 | 0.66  | -0.55 | -0.55 |
| 1435 | 0.77  | -0.56 | -0.45 |
| 1440 | 0.77  | -0.05 | 0.26  |
| 1445 | 0.85  | -0.45 | -0.55 |
| 1450 | -1.27 | 0.11  | -0.55 |
| 1455 | 0.89  | -0.48 | -0.54 |
| 1460 | 0.78  | -0.55 | -0.57 |
| 1465 | 0.85  | -0.52 | -0.55 |
| 1467 | -1.42 | -0.37 | -0.53 |
| 1470 | -1.27 | -0.05 | 1.86  |
| 1475 | -1.25 | -0.54 | 0.06  |
| 1485 | 0.77  | -0.49 | -0.56 |
| 1490 | -1.20 | 0.53  | 2.09  |
| 2005 | 0.74  | -0.57 | 1.07  |
| 2010 | -1.08 | -0.55 | 0.05  |
| 2012 | 0.67  | -0.55 | -0.14 |

|      |       |       |       |
|------|-------|-------|-------|
| 2013 | 0.76  | -0.55 | -0.15 |
| 2015 | 0.92  | -0.49 | -0.57 |
| 2020 | 0.74  | -0.23 | -0.09 |
| 2025 | 1.06  | 0.23  | 2.40  |
| 2030 | 0.93  | 1.63  | 2.48  |
| 2035 | 0.85  | -0.48 | -0.06 |
| 2040 | 1.06  | 2.07  | 2.54  |
| 2045 | 0.75  | 0.66  | 2.39  |
| 2050 | -1.06 | -0.49 | -0.14 |
| 2055 | 0.69  | 2.64  | 0.20  |
| 2060 | 0.65  | 1.74  | 0.13  |
| 2070 | -1.05 | -0.51 | -0.24 |
| 2075 | -1.19 | 0.68  | 0.20  |
| 2080 | -1.11 | -0.47 | -0.15 |
| 2085 | -1.14 | -0.48 | -0.14 |
| 2090 | -1.25 | -0.35 | -0.51 |
| 2095 | 1.06  | -0.51 | -0.56 |
| 2100 | -1.12 | -0.48 | -0.50 |
| 2110 | -1.20 | -0.05 | -0.44 |
| 2115 | 0.66  | -0.46 | -0.64 |
| 2120 | 0.77  | -0.52 | -0.57 |
| 2125 | 0.67  | -0.49 | -0.58 |
| 2130 | 0.95  | -0.48 | -0.08 |
| 2135 | 0.74  | -0.48 | -0.06 |
| 2140 | 0.72  | -0.50 | -0.06 |
| 2145 | 0.65  | -0.53 | -0.55 |
| 2150 | 0.78  | -0.51 | -0.55 |
| 2155 | -1.18 | -0.48 | -0.54 |
| 2160 | 0.71  | -0.18 | -0.56 |
| 2165 | 0.65  | 0.32  | -0.55 |
| 2170 | 0.67  | -0.52 | -0.55 |
| 2175 | 0.63  | -0.49 | -0.59 |
| 2185 | 0.67  | -0.50 | -0.52 |
| 2195 | 0.80  | -0.48 | -0.54 |
| 2200 | 0.83  | -0.16 | -0.55 |
| 2205 | 0.72  | -0.52 | -0.32 |
| 2210 | -1.11 | -0.50 | -0.63 |
| 2218 | -1.07 | 0.85  | -0.56 |
| 2220 | 0.72  | -0.18 | -0.55 |
| 2230 | 0.71  | -0.17 | -0.63 |
| 2235 | -1.15 | -0.16 | -0.55 |
| 2245 | -1.20 | -0.17 | -0.53 |
| 2250 | -1.15 | -0.51 | -0.58 |

|      |       |       |       |
|------|-------|-------|-------|
| 2260 | 0.73  | -0.18 | -0.53 |
| 2275 | -1.15 | -0.18 | -0.53 |
| 2280 | 0.80  | -0.14 | -0.60 |
| 2295 | 0.80  | -0.17 | -0.60 |
| 2300 | 0.87  | -0.16 | -0.59 |
| 2302 | -0.99 | -0.02 | -0.58 |
| 2305 | 0.78  | -0.50 | -0.58 |
| 2315 | -1.10 | -0.20 | -0.54 |
| 2330 | -0.93 | -0.49 | 0.07  |
| 2335 | 0.71  | -0.49 | -0.57 |
| 2340 | -1.39 | -0.23 | -0.60 |
| 2345 | -1.23 | -0.33 | -0.58 |
| 2350 | 0.66  | -0.49 | -0.55 |
| 2355 | 0.80  | -0.47 | -0.56 |
| 2360 | 0.92  | -0.50 | -0.11 |
| 2365 | 0.86  | -0.52 | -0.10 |
| 2370 | 0.79  | -0.51 | -0.14 |
| 2375 | -1.18 | -0.02 | -0.61 |
| 2380 | 0.81  | -0.25 | -0.58 |
| 2385 | 0.67  | 2.43  | -0.16 |
| 2395 | 0.98  | -0.18 | -0.61 |
| 2405 | 0.59  | -0.52 | -0.62 |
| 2410 | -0.96 | -0.49 | -0.62 |
| 2415 | 0.83  | -0.52 | -0.55 |
| 2420 | 1.04  | -0.49 | 0.26  |
| 2430 | 0.81  | -0.50 | -0.58 |
| 2435 | -0.99 | -0.51 | -0.57 |
| 2440 | 0.72  | -0.29 | 0.06  |
| 2445 | 0.85  | 0.28  | 2.10  |
| 2450 | 0.81  | -0.51 | -0.54 |
| 2455 | 0.83  | -0.48 | -0.55 |
| 2460 | 0.82  | -0.50 | -0.54 |
| 2465 | 0.61  | -0.48 | 0.99  |
| 2470 | 0.97  | -0.51 | -0.54 |
| 2475 | 0.79  | 1.20  | 0.20  |
| 2480 | 0.80  | 1.21  | 0.21  |
| 2485 | 0.84  | 1.20  | 0.19  |
| 2490 | 0.90  | -0.49 | 0.94  |
| 2505 | 0.78  | -0.47 | -0.61 |
| 2510 | 0.78  | -0.48 | -0.54 |
| 2515 | 1.05  | -0.18 | 0.20  |
| 2520 | 0.79  | -0.50 | -0.53 |
| 2525 | 0.86  | -0.48 | -0.54 |

|      |       |       |       |
|------|-------|-------|-------|
| 2535 | 0.83  | -0.49 | 2.46  |
| 2540 | 0.89  | -0.47 | 2.37  |
| 2545 | 0.70  | -0.48 | 2.20  |
| 2550 | 1.33  | -0.46 | 2.48  |
| 2555 | 0.86  | 0.42  | -0.16 |
| 2560 | 0.77  | 2.17  | -0.12 |
| 2563 | 0.74  | -0.47 | 2.44  |
| 2565 | -1.07 | 1.66  | -0.59 |
| 2570 | 0.73  | 0.38  | 2.46  |
| 2571 | 1.03  | 0.37  | 2.44  |
| 2575 | 0.81  | -0.38 | 2.38  |
| 2580 | 0.81  | 2.06  | 2.50  |
| 3005 | 1.09  | -0.50 | 2.35  |
| 3010 | 1.20  | -0.50 | -0.41 |
| 3015 | -0.98 | 0.46  | -0.68 |
| 3020 | 0.73  | -0.49 | 2.46  |
| 3025 | 0.72  | -0.48 | 2.45  |
| 3030 | 0.77  | 0.94  | 2.55  |
| 3035 | -1.09 | -0.51 | 0.94  |
| 3040 | 0.73  | 2.66  | -0.17 |
| 3045 | -1.13 | -0.50 | 1.90  |
| 3050 | -1.21 | -0.51 | -0.07 |
| 3055 | 0.79  | -0.50 | 1.93  |
| 3060 | -0.92 | -0.46 | 1.91  |
| 3065 | -1.26 | 0.28  | -0.48 |
| 3075 | 1.28  | -0.30 | -0.20 |
| 3080 | 0.88  | 0.82  | -0.33 |
| 3085 | -1.03 | -0.35 | -0.17 |
| 3090 | -1.04 | -0.47 | -0.16 |
| 3095 | -1.02 | -0.48 | 1.81  |
| 3100 | -1.13 | -0.51 | -0.16 |
| 3105 | -1.14 | -0.37 | -0.17 |
| 3110 | -1.12 | -0.50 | -0.17 |
| 3115 | 0.82  | -0.51 | 1.91  |
| 3120 | 0.81  | -0.51 | 1.89  |
| 3125 | 0.83  | 3.62  | -0.43 |
| 3130 | 0.94  | 0.21  | 0.03  |
| 3135 | 0.81  | -0.48 | 1.90  |
| 3140 | 0.84  | -0.48 | -0.16 |
| 3145 | -1.06 | -0.50 | 1.92  |
| 3150 | 1.27  | 0.50  | 0.11  |
| 3155 | -0.98 | -0.49 | 0.20  |
| 3160 | -0.98 | -0.51 | 1.89  |

|      |       |       |       |
|------|-------|-------|-------|
| 3165 | -1.15 | -0.52 | 1.89  |
| 3170 | -1.06 | -0.48 | 1.91  |
| 3175 | -1.03 | -0.48 | 1.90  |
| 3180 | 1.17  | -0.18 | 0.11  |
| 3185 | -1.14 | -0.51 | 1.89  |
| 3200 | 0.78  | -0.31 | 1.02  |
| 3205 | -0.97 | 1.66  | -0.17 |
| 3210 | 1.06  | -0.47 | -0.18 |
| 3215 | 1.08  | -0.15 | -0.18 |
| 3220 | 0.98  | 1.23  | -0.14 |
| 3230 | -0.97 | 0.11  | -0.58 |
| 3235 | 0.76  | 2.19  | 0.67  |
| 3240 | 0.98  | 0.40  | -0.17 |
| 3245 | 0.78  | 2.55  | 0.75  |
| 3255 | -1.03 | -0.49 | -0.57 |
| 3260 | 1.19  | -0.17 | -0.18 |
| 3265 | 0.81  | -0.50 | -0.56 |
| 3270 | 0.91  | 0.42  | -0.10 |
| 3275 | 0.99  | -0.18 | -0.57 |
| 3280 | 0.87  | 2.08  | -0.34 |
| 3285 | 1.09  | 0.92  | -0.17 |
| 3290 | 0.92  | 2.39  | -0.08 |
| 3295 | 0.78  | -0.35 | -0.58 |
| 3300 | -1.04 | 3.39  | -0.17 |
| 3305 | -1.10 | 2.80  | -0.15 |
| 3310 | -1.06 | 2.82  | -0.17 |
| 3315 | 0.73  | -0.52 | -0.58 |
| 3322 | 0.81  | -0.48 | 2.46  |
| 3325 | -1.46 | -0.48 | -0.16 |
| 3330 | 0.77  | 2.01  | 0.83  |
| 3340 | -1.32 | 1.72  | 2.11  |
| 3345 | -1.23 | 1.79  | 2.10  |
| 3350 | -1.19 | -0.49 | -0.08 |
| 3355 | 1.06  | 0.03  | -0.46 |
| 3360 | 0.98  | 0.06  | -0.46 |
| 3365 | 1.08  | 0.02  | -0.45 |
| 3370 | 1.07  | 0.05  | -0.59 |
| 3375 | 0.99  | 0.70  | -0.47 |
| 3385 | 0.66  | 2.92  | -0.30 |
| 3390 | 0.82  | 2.85  | -0.22 |
| 3395 | 0.85  | 2.35  | -0.22 |
| 3400 | -0.90 | 3.70  | -0.16 |
| 3405 | 0.89  | 0.39  | 0.71  |

|      |       |       |       |
|------|-------|-------|-------|
| 3410 | 0.78  | 4.10  | -0.22 |
| 3423 | 0.82  | 0.72  | -0.16 |
| 3430 | -1.24 | -0.01 | -0.14 |
| 3435 | 0.74  | 1.72  | -0.59 |
| 3440 | 0.82  | -0.48 | -0.07 |
| 3445 | 0.76  | -0.34 | -0.08 |
| 3455 | -0.93 | 0.01  | -0.16 |
| 3460 | 1.29  | -0.50 | -0.55 |
| 3470 | 0.71  | 1.46  | -0.58 |
| 3475 | 0.75  | 1.27  | -0.58 |
| 3480 | 1.03  | 2.80  | -0.34 |
| 3490 | -1.18 | 0.80  | -0.17 |
| 3500 | 0.77  | -0.48 | 0.08  |
| 3505 | 0.75  | 2.12  | 0.67  |
| 3520 | 0.70  | -0.48 | 0.18  |
| 3525 | -1.33 | 1.19  | 0.77  |
| 3535 | 0.88  | -0.49 | 0.77  |
| 3540 | -0.96 | -0.53 | 0.19  |
| 3545 | -0.96 | -0.44 | 0.21  |
| 3550 | -0.98 | -0.52 | -0.07 |
| 3555 | -0.96 | -0.51 | -0.09 |
| 3560 | 0.86  | -0.48 | -0.15 |
| 3565 | -1.02 | -0.47 | -0.07 |
| 3570 | -0.97 | 0.99  | -0.16 |
| 3575 | -1.03 | -0.45 | -0.17 |
| 3580 | 0.84  | -0.53 | -0.16 |
| 3585 | 0.81  | 1.61  | -0.58 |
| 3590 | -1.24 | 0.12  | 0.63  |
| 3595 | -1.05 | -0.48 | -0.06 |
| 3600 | -1.01 | -0.48 | -0.06 |
| 3605 | -1.05 | -0.49 | -0.07 |
| 3610 | -1.01 | -0.45 | -0.07 |
| 3620 | -1.15 | -0.48 | -0.17 |
| 3625 | 0.70  | -0.46 | -0.16 |
| 3630 | 0.70  | -0.49 | -0.15 |
| 3635 | 0.84  | 2.91  | -0.50 |
| 3642 | 0.88  | -0.34 | -0.57 |
| 3645 | -1.11 | -0.49 | -0.05 |
| 3650 | -1.18 | -0.49 | -0.08 |
| 3665 | 1.04  | -0.34 | -0.58 |
| 3670 | 0.90  | 0.84  | -0.58 |
| 3675 | 0.91  | -0.34 | -0.61 |
| 3680 | -1.11 | -0.47 | -0.08 |

|      |       |       |       |
|------|-------|-------|-------|
| 3685 | -0.88 | -0.35 | -0.61 |
| 3690 | 0.85  | -0.37 | -0.56 |
| 3695 | -1.07 | -0.50 | -0.08 |
| 3730 | 0.79  | 2.53  | -0.38 |
| 3735 | 0.98  | 0.71  | -0.56 |
| 3745 | 0.88  | -0.49 | -0.16 |
| 3750 | 0.94  | 3.55  | 0.18  |
| 3758 | -1.08 | 0.29  | -0.15 |
| 3760 | 0.99  | -0.30 | -0.57 |
| 3765 | 0.94  | -0.36 | -0.57 |
| 3770 | -1.09 | -0.49 | -0.16 |
| 3775 | 0.88  | -0.35 | -0.59 |
| 3780 | -1.02 | -0.47 | -0.17 |
| 3785 | -1.02 | 0.43  | -0.47 |
| 3790 | 0.69  | 1.61  | -0.10 |
| 3795 | 0.85  | 1.33  | -0.22 |
| 3800 | -1.08 | -0.48 | -0.16 |
| 3805 | -1.05 | -0.48 | -0.15 |
| 3807 | -0.98 | -0.49 | -0.06 |
| 3820 | -1.15 | -0.34 | -0.58 |
| 3825 | 0.79  | -0.48 | -0.55 |
| 3830 | 0.63  | 0.73  | -0.36 |
| 3835 | 0.79  | -0.35 | -0.58 |
| 3840 | 0.75  | -0.35 | -0.58 |
| 3845 | -0.96 | -0.37 | -0.55 |
| 3855 | 0.92  | -0.31 | -0.58 |
| 3860 | -1.29 | 0.38  | -0.07 |
| 3863 | -1.22 | 1.08  | 2.10  |
| 3865 | -0.97 | -0.02 | -0.46 |
| 3870 | -1.06 | -0.35 | -0.56 |
| 3875 | -1.07 | -0.36 | -0.58 |
| 3880 | 0.86  | -0.34 | -0.57 |
| 3890 | 0.80  | -0.35 | -0.56 |
| 3895 | -0.85 | 0.44  | -0.11 |
| 3905 | -1.10 | -0.49 | -0.58 |
| 3910 | 0.78  | -0.50 | -0.70 |
| 3915 | -1.15 | -0.50 | -0.58 |
| 3920 | -1.18 | -0.35 | -0.58 |
| 3925 | 0.88  | 0.25  | 0.78  |
| 3930 | -1.49 | 1.81  | 2.11  |
| 3955 | -1.06 | -0.18 | -0.53 |
| 3960 | -1.13 | -0.02 | -0.16 |
| 3963 | -1.23 | -0.18 | -0.12 |

|      |       |       |       |
|------|-------|-------|-------|
| 3970 | -1.07 | -0.35 | -0.58 |
| 3995 | -1.00 | -0.03 | -0.16 |
| 4005 | 0.87  | 0.15  | -0.58 |
| 4010 | 0.92  | -0.35 | -0.63 |
| 4015 | 0.93  | -0.34 | -0.63 |
| 4020 | -0.78 | 0.75  | -0.10 |
| 4025 | 0.76  | -0.33 | -0.65 |
| 4030 | -1.11 | 1.32  | -0.44 |
| 4035 | 0.77  | -0.30 | -0.58 |
| 4045 | -0.85 | 0.12  | -0.57 |
| 4050 | -0.86 | -0.21 | -0.65 |
| 4060 | 0.73  | 0.13  | -0.66 |
| 4065 | -0.89 | -0.51 | -0.63 |
| 4070 | 0.77  | 0.10  | -0.65 |
| 4075 | -0.96 | -0.33 | -0.58 |
| 4080 | -1.03 | 0.14  | -0.57 |
| 4085 | -1.03 | -0.34 | -0.69 |
| 4090 | 0.75  | -0.48 | -0.57 |
| 4095 | -0.84 | -0.33 | -0.56 |
| 4100 | -0.86 | -0.33 | -0.57 |
| 4105 | 0.75  | -0.33 | -0.65 |
| 4110 | -0.97 | -0.52 | -0.71 |
| 4120 | -0.92 | -0.35 | -0.64 |
| 4130 | 0.81  | 0.86  | -0.64 |
| 4135 | -0.89 | -0.36 | -0.65 |
| 4145 | 0.73  | -0.48 | -0.63 |
| 4150 | -1.11 | -0.04 | -0.62 |
| 4155 | -0.90 | 0.13  | -0.56 |
| 4160 | -0.93 | 0.14  | -0.58 |
| 4165 | 0.76  | -0.34 | -0.57 |
| 4170 | 0.86  | -0.35 | -0.57 |
| 4180 | 0.73  | 0.12  | -0.67 |
| 4185 | 0.79  | -0.33 | -0.57 |
| 4190 | -1.03 | 0.13  | -0.64 |
| 4195 | -1.07 | -0.19 | -0.58 |
| 4200 | 0.77  | -0.48 | -0.59 |
| 4205 | -0.82 | -0.33 | -0.57 |
| 4210 | -0.92 | -0.33 | -0.62 |
| 4215 | 0.72  | 0.14  | -0.64 |
| 4220 | 0.97  | 0.68  | -0.19 |
| 4225 | -0.93 | -0.33 | -0.63 |
| 4230 | 0.75  | -0.51 | -0.61 |
| 4235 | 0.73  | 0.64  | -0.24 |

|      |       |       |       |
|------|-------|-------|-------|
| 4240 | 0.84  | 0.11  | -0.64 |
| 4245 | 0.74  | 0.74  | 0.65  |
| 4250 | -0.93 | -0.53 | -0.65 |
| 4255 | 0.75  | 1.34  | -0.22 |
| 4260 | 0.79  | 0.11  | -0.58 |
| 4270 | 0.91  | -0.52 | -0.55 |
| 4275 | -1.05 | -0.34 | -0.64 |
| 4280 | -1.07 | -0.49 | -0.62 |
| 4285 | -1.06 | -0.49 | -0.63 |
| 4290 | -1.12 | -0.46 | -0.54 |
| 4295 | -1.24 | -0.32 | 1.02  |
| 4300 | 0.74  | 0.75  | -0.24 |
| 4305 | 0.73  | -0.51 | -0.63 |
| 4310 | -1.20 | -0.34 | -0.55 |
| 4315 | -1.21 | -0.31 | -0.55 |
| 4320 | -1.20 | -0.34 | -0.55 |
| 4325 | -1.20 | -0.51 | -0.66 |
| 4330 | 0.76  | 0.15  | -0.60 |
| 4340 | -0.97 | -0.33 | -0.58 |
| 4345 | -0.98 | -0.34 | -0.53 |
| 4350 | -0.88 | 0.17  | -0.57 |
| 4370 | -1.17 | -0.35 | -0.44 |
| 4380 | -1.19 | -0.36 | -0.65 |
| 4400 | 0.97  | 1.08  | -0.44 |
| 4405 | -1.05 | -0.49 | -0.65 |
| 4410 | 0.67  | -0.04 | -0.67 |
| 4415 | 0.80  | -0.36 | -0.58 |
| 4420 | 0.68  | -0.34 | -0.65 |
| 4425 | -1.31 | -0.20 | -0.58 |
| 4430 | -1.23 | -0.01 | -0.54 |
| 4435 | -1.09 | -0.48 | -0.57 |
| 4440 | 0.67  | -0.04 | -0.66 |
| 4445 | 0.69  | 0.14  | -0.57 |
| 4455 | -1.09 | -0.50 | -0.63 |
| 4460 | -1.12 | -0.49 | -0.66 |
| 4465 | -0.96 | 0.15  | -0.59 |
| 4470 | 0.69  | 2.86  | -0.21 |
| 4475 | 0.76  | -0.47 | -0.56 |
| 4480 | -0.93 | -0.30 | -0.57 |
| 4485 | 0.77  | -0.50 | -0.55 |
| 4490 | -1.04 | -0.32 | -0.64 |
| 4500 | 0.70  | -0.28 | -0.65 |
| 4505 | 0.70  | -0.32 | -0.64 |

|      |       |       |       |
|------|-------|-------|-------|
| 4510 | -1.15 | -0.50 | -0.64 |
| 4515 | -1.17 | -0.17 | -0.63 |
| 4525 | 0.73  | 0.11  | -0.58 |
| 4535 | 0.69  | 0.12  | -0.60 |
| 4540 | 0.63  | 0.11  | -0.61 |
| 4545 | -1.11 | -0.35 | -0.65 |
| 4550 | -1.04 | -0.49 | -0.07 |
| 4555 | -1.24 | -0.48 | -0.57 |
| 4560 | 0.63  | 1.34  | -0.55 |
| 4565 | -1.23 | -0.15 | -0.59 |
| 4570 | 0.72  | -0.33 | -0.59 |
| 4575 | -1.18 | -0.31 | -0.62 |
| 4580 | 0.63  | 0.14  | -0.60 |
| 4590 | -1.23 | -0.51 | -0.65 |
| 4595 | 0.63  | 0.13  | -0.59 |
| 4600 | -1.04 | -0.31 | -0.58 |
| 4605 | 0.67  | -0.48 | -0.59 |
| 4610 | -1.18 | -0.48 | -0.57 |
| 4615 | -1.02 | -0.50 | -0.64 |
| 4625 | -1.03 | -0.37 | -0.56 |
| 4630 | -1.21 | -0.49 | -0.65 |
| 4635 | 0.75  | 0.26  | -0.55 |
| 4640 | -1.26 | -0.14 | -0.53 |
| 4645 | -1.30 | -0.48 | -0.57 |
| 4650 | -1.19 | -0.47 | -0.63 |
| 4655 | -1.22 | -0.32 | -0.66 |
| 4660 | 0.59  | 0.14  | -0.66 |
| 4670 | -1.18 | -0.45 | -0.53 |
| 4675 | 0.73  | -0.33 | -0.55 |
| 4680 | -1.14 | -0.34 | -0.66 |
| 4685 | -1.29 | -0.50 | -0.62 |
| 4690 | -1.17 | -0.49 | -0.58 |
| 4705 | -1.16 | -0.33 | -0.64 |
| 4710 | -0.94 | -0.32 | -0.57 |
| 4715 | -1.00 | -0.50 | -0.64 |
| 4720 | -1.17 | -0.36 | -0.63 |
| 4730 | -1.00 | -0.17 | -0.65 |
| 4740 | -0.90 | -0.16 | -0.65 |
| 4760 | -0.91 | -0.48 | -0.58 |
| 4770 | -1.23 | -0.50 | -0.62 |
| 4775 | -0.97 | -0.32 | -0.58 |
| 4780 | -1.17 | -0.50 | -0.67 |
| 4785 | -1.10 | 0.28  | -0.57 |

|      |       |       |       |
|------|-------|-------|-------|
| 4790 | -1.12 | -0.50 | -0.65 |
| 4795 | -1.35 | -0.51 | -0.58 |
| 4815 | -1.05 | -0.37 | -0.53 |
| 4820 | -1.15 | -0.50 | -0.69 |
| 4825 | -1.08 | -0.50 | -0.64 |
| 4830 | -1.03 | -0.02 | -0.63 |
| 4835 | -1.15 | -0.44 | -0.64 |
| 4850 | -0.86 | -0.35 | -0.58 |
| 4855 | -0.92 | -0.51 | -0.57 |
| 4860 | -1.23 | -0.50 | -0.64 |
| 4865 | 0.59  | 1.09  | 0.62  |
| 4875 | 0.63  | -0.32 | -0.65 |
| 4880 | -1.09 | -0.19 | -0.58 |
| 4885 | 0.62  | -0.47 | -0.65 |
| 4890 | 0.60  | 1.17  | 0.68  |
| 4900 | -1.17 | -0.50 | 0.68  |
| 4905 | -1.11 | -0.46 | -0.57 |
| 4930 | -1.34 | -0.49 | -0.56 |
| 4940 | 0.62  | -0.51 | -0.57 |
| 4945 | -0.92 | 1.12  | 0.76  |