



# Full wwPDB X-ray Structure Validation Report ⓘ

Sep 25, 2023 – 11:04 AM EDT

PDB ID : 5VVK  
Title : Cas1-Cas2 bound to full-site mimic  
Authors : Wright, A.V.; Knott, G.J.; Doxzen, K.D.; Doudna, J.A.  
Deposited on : 2017-05-19  
Resolution : 2.90 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Xtriage (Phenix) : 1.13  
EDS : 2.35.1  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.35.1

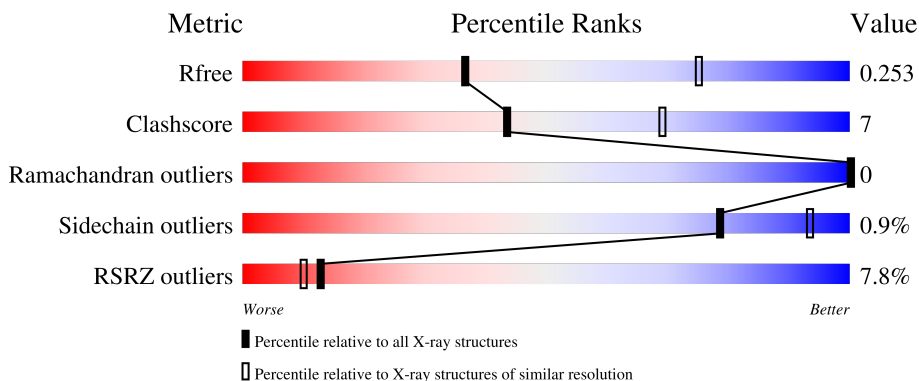
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.90 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



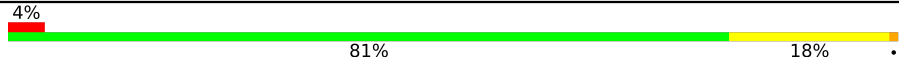


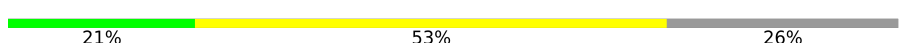

| Metric                | Whole archive<br>(#Entries) | Similar resolution<br>(#Entries, resolution range(Å)) |
|-----------------------|-----------------------------|---|
| $R_{free}$            | 130704                      | 1957 (2.90-2.90)                                      |
| Clashscore            | 141614                      | 2172 (2.90-2.90)                                      |
| Ramachandran outliers | 138981                      | 2115 (2.90-2.90)                                      |
| Sidechain outliers    | 138945                      | 2117 (2.90-2.90)                                      |
| RSRZ outliers         | 127900                      | 1906 (2.90-2.90)                                      |

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions  $\leq 5\%$ . The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

| Mol | Chain | Length | Quality of chain    |
|-----|-------|--------|---------------------|
| 1   | A     | 308    | <br>11% 76% 10% 14% |
| 1   | B     | 308    | <br>11% 72% 13% 15% |
| 1   | C     | 308    | <br>5% 72% 14% 13%  |
| 1   | D     | 308    | <br>5% 76% 13% 12%  |
| 2   | E     | 94     | <br>6% 83% 17%      |

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| Mol | Chain | Length | Quality of chain  |
|-----|-------|--------|---|
| 2   | F     | 94     |  <p>4% 81% 18%</p>  |
| 3   | G     | 11     |  <p>64% 36%</p>     |
| 4   | H     | 11     |  <p>36% 64%</p>     |
| 5   | J     | 58     |  <p>21% 53% 26%</p> |
| 6   | K     | 58     |  <p>34% 40% 26%</p> |

## 2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 11896 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called CRISPR-associated endonuclease Cas1.

| Mol | Chain | Residues | Atoms         |           |          |          |        | ZeroOcc | AltConf | Trace |
|-----|-------|----------|---------------|-----------|----------|----------|--------|---------|---------|-------|
|     |       |          | Total         | C         | N        | O        | S      |         |         |       |
| 1   | A     | 266      | Total<br>2045 | C<br>1306 | N<br>363 | O<br>369 | S<br>7 | 0       | 0       | 0     |
| 1   | B     | 263      | Total<br>2017 | C<br>1290 | N<br>361 | O<br>359 | S<br>7 | 0       | 0       | 0     |
| 1   | C     | 267      | Total<br>2052 | C<br>1311 | N<br>364 | O<br>370 | S<br>7 | 0       | 0       | 0     |
| 1   | D     | 272      | Total<br>2096 | C<br>1340 | N<br>372 | O<br>377 | S<br>7 | 0       | 0       | 0     |

There are 12 discrepancies between the modelled and reference sequences:

| Chain | Residue | Modelled | Actual | Comment        | Reference  |
|-------|---------|----------|--------|----------------|------------|
| A     | -2      | SER      | -      | expression tag | UNP Q46896 |
| A     | -1      | PHE      | -      | expression tag | UNP Q46896 |
| A     | 0       | THR      | -      | expression tag | UNP Q46896 |
| B     | -2      | SER      | -      | expression tag | UNP Q46896 |
| B     | -1      | PHE      | -      | expression tag | UNP Q46896 |
| B     | 0       | THR      | -      | expression tag | UNP Q46896 |
| C     | -2      | SER      | -      | expression tag | UNP Q46896 |
| C     | -1      | PHE      | -      | expression tag | UNP Q46896 |
| C     | 0       | THR      | -      | expression tag | UNP Q46896 |
| D     | -2      | SER      | -      | expression tag | UNP Q46896 |
| D     | -1      | PHE      | -      | expression tag | UNP Q46896 |
| D     | 0       | THR      | -      | expression tag | UNP Q46896 |

- Molecule 2 is a protein called CRISPR-associated endoribonuclease Cas2.

| Mol | Chain | Residues | Atoms        |          |          |          |        | ZeroOcc | AltConf | Trace |
|-----|-------|----------|--------------|----------|----------|----------|--------|---------|---------|-------|
|     |       |          | Total        | C        | N        | O        | S      |         |         |       |
| 2   | E     | 94       | Total<br>739 | C<br>475 | N<br>128 | O<br>132 | S<br>4 | 0       | 0       | 0     |
| 2   | F     | 94       | Total<br>739 | C<br>475 | N<br>128 | O<br>132 | S<br>4 | 0       | 0       | 0     |

- Molecule 3 is a DNA chain called DNA (5'-D(\*GP\*CP\*CP\*CP\*CP\*AP\*GP\*TP\*AP\*GP\*C)-3').

| Mol | Chain | Residues | Atoms |     |    |    |    | ZeroOcc | AltConf | Trace |
|-----|-------|----------|-------|-----|----|----|----|---------|---------|-------|
|     |       |          | Total | C   | N  | O  | P  |         |         |       |
| 3   | G     | 11       | 220   | 105 | 42 | 63 | 10 | 0       | 0       | 0     |

- Molecule 4 is a DNA chain called DNA (5'-D(\*GP\*AP\*CP\*CP\*AP\*CP\*CP\*AP\*GP\*TP\*G)-3').

| Mol | Chain | Residues | Atoms |     |    |    |    | ZeroOcc | AltConf | Trace |
|-----|-------|----------|-------|-----|----|----|----|---------|---------|-------|
|     |       |          | Total | C   | N  | O  | P  |         |         |       |
| 4   | H     | 11       | 222   | 106 | 44 | 62 | 10 | 0       | 0       | 0     |

- Molecule 5 is a DNA chain called DNA (58-MER).

| Mol | Chain | Residues | Atoms |     |     |     |    | ZeroOcc | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|----|---------|---------|-------|
|     |       |          | Total | C   | N   | O   | P  |         |         |       |
| 5   | J     | 43       | 883   | 421 | 164 | 256 | 42 | 0       | 0       | 0     |

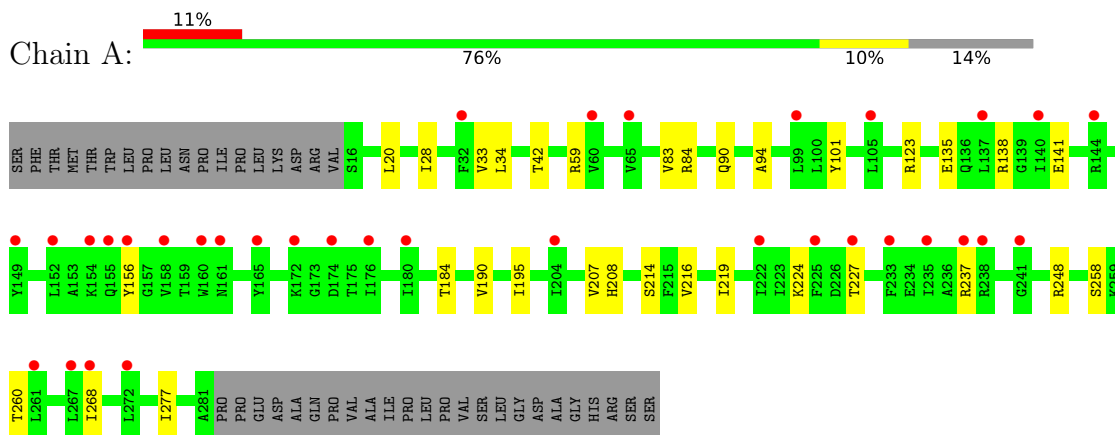
- Molecule 6 is a DNA chain called DNA (58-MER).

| Mol | Chain | Residues | Atoms |     |     |     |    | ZeroOcc | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|----|---------|---------|-------|
|     |       |          | Total | C   | N   | O   | P  |         |         |       |
| 6   | K     | 43       | 883   | 419 | 166 | 256 | 42 | 0       | 0       | 0     |

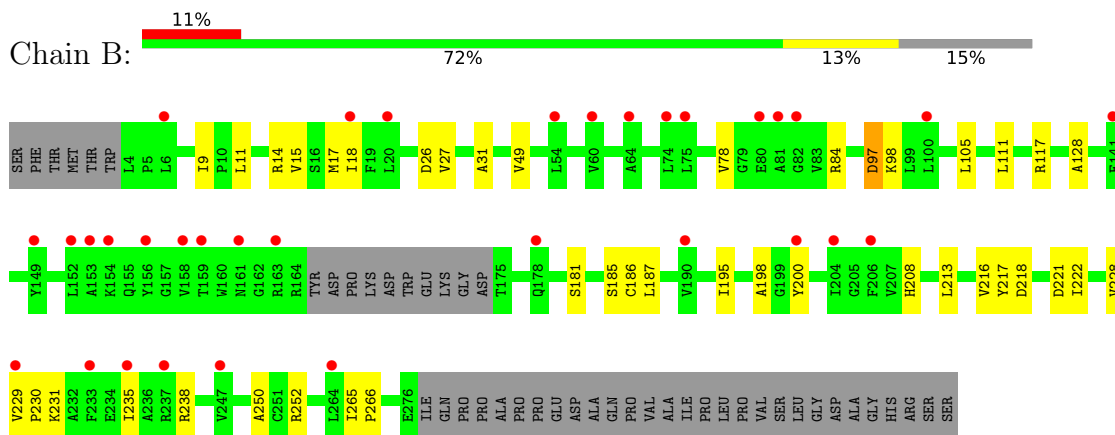
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ( $RSRZ > 2$ ). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

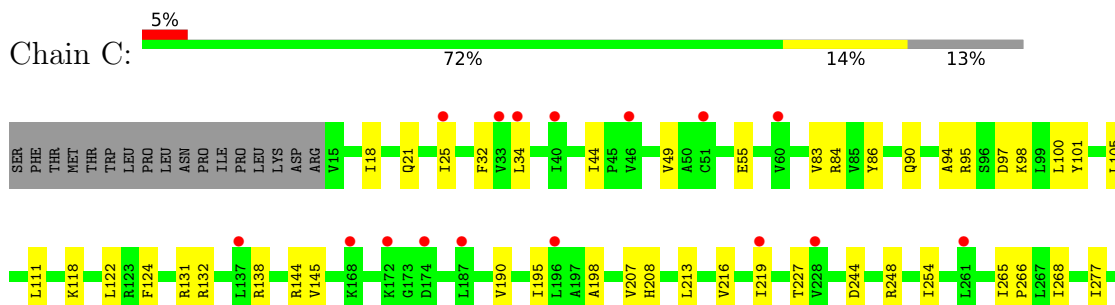
- Molecule 1: CRISPR-associated endonuclease Cas1



- Molecule 1: CRISPR-associated endonuclease Cas1



- Molecule 1: CRISPR-associated endonuclease Cas1



A281  
 PRO  
 PRO  
 GLU  
 MET  
 ASP  
 ALA  
 GLN  
 PRO  
 VAL  
 VAL  
 ALA  
 ILE  
 ILE  
 PRO  
 LEU  
 LEU  
 PRO  
 VAL  
 SER  
 LEU  
 LEU  
 GLY  
 ASP  
 ALA  
 GLY  
 HIS  
 HIS  
 ARG  
 SER  
 SER

- Molecule 1: CRISPR-associated endonuclease Cas1

Chain D: 5% 76% 13% 12%

SER PHE THR MET THR ASP ALA GLN PRO VAL VAL ALA ILE ILE PRO LEU LEU PRO VAL SER LEU LEU GLY ASP ALA GLY HIS HIS ARG SER SER

E141 K154 V158 T159 W160 R163 E171 LYS G173 I176 C186 V190 I195 G199 Y200 V207 H208 L213 D218 I222 F233 R238 R245 R252 T260 A274 G275 E276 ILE GLN PRO PRO PRO PRO PRO PRO G11 ASP ALA GLN PRO

VAL ALA ILE PRO LEU VAL SER LEU GLY ASP ALA GLY HIS ARG SER SER

- Molecule 2: CRISPR-associated endoribonuclease Cas2

Chain E: 6% 83% 17%

M1 S2 M3 L4 V7 R16 G17 R18 E25 V26 V30 V32 I39 Q46 V57 M58 A59 M60 E65 F70 D84 G85 L86 R87 L88 V94

- Molecule 2: CRISPR-associated endoribonuclease Cas2

Chain F: 4% 81% 18%

M1 V7 M10 L15 R16 G17 R18 I21 E25 V26 V30 V32 M42 Q46 L50 V57 M58 F70 R78 L86 R87 L88 V94

- Molecule 3: DNA (5'-D(\*GP\*CP\*CP\*CP\*AP\*GP\*TP\*AP\*GP\*C)-3')

Chain G: 64% 36%

G1 C5 A6 G7 T8 A9 G10 C11

- Molecule 4: DNA (5'-D(\*GP\*AP\*CP\*CP\*AP\*CP\*CP\*AP\*GP\*TP\*G)-3')

Chain H: 36% 64%

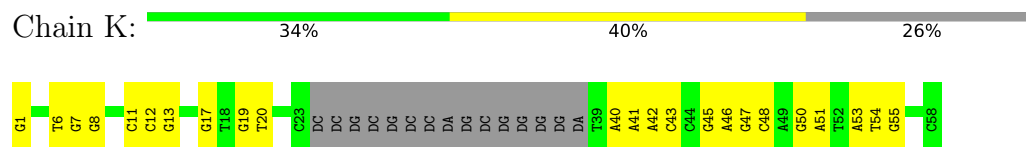
G1 A2 C3 T4 A5 C6 C7 A8 G9 T10 G11

- Molecule 5: DNA (58-MER)

Chain J: 21% 53% 26%

C1 A2 C3 T4 G5 G6 T7 G8 G9 T10 T11 C12 C13 C14 G17 G18 T21 A22 D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 D12 D13 D14 D15 D16 D17 D18 D19 D20 D21 D22 G38 G39 A40 A41 A42 C42 A43 C44 T45 C46 T47 A48 A49 G50 G51 A51 T52 T55 A56 A57 A58

## ● Molecule 6: DNA (58-MER)





## 4 Data and refinement statistics

| Property  | Value   | Source           |
|---|---|------------------|
| Space group   | P 1 21 1  | Depositor        |
| Cell constants<br>a, b, c, $\alpha$ , $\beta$ , $\gamma$                | 74.90Å 197.61Å 95.34Å<br>90.00° 112.70° 90.00°              | Depositor        |
| Resolution (Å)  | 98.81 – 2.90<br>98.81 – 2.76                                | Depositor<br>EDS |
| % Data completeness<br>(in resolution range)                            | 99.8 (98.81-2.90)<br>98.1 (98.81-2.76)                      | Depositor<br>EDS |
| $R_{merge}$   | 0.15  | Depositor        |
| $R_{sym}$   | (Not available)   | Depositor        |
| $\langle I/\sigma(I) \rangle$ <sup>1</sup>                              | 1.14 (at 2.77Å)   | Xtrriage         |
| Refinement program  | PHENIX 1.11.1   | Depositor        |
| R, $R_{free}$   | 0.217 , 0.254<br>0.216 , 0.253                              | Depositor<br>DCC |
| $R_{free}$ test set   | 3349 reflections (5.19%)                                    | wwPDB-VP         |
| Wilson B-factor (Å <sup>2</sup> )                                       | 72.3  | Xtrriage         |
| Anisotropy  | 0.708   | Xtrriage         |
| Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> ) | 0.34 , 67.1   | EDS              |
| L-test for twinning <sup>2</sup>  | $\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$ | Xtrriage         |
| Estimated twinning fraction   | 0.023 for h,-k,-h-l   | Xtrriage         |
| $F_o, F_c$ correlation  | 0.95  | EDS              |
| Total number of atoms   | 11896   | wwPDB-VP         |
| Average B, all atoms (Å <sup>2</sup> )                                  | 101.0   | wwPDB-VP         |

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.98% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

## 5 Model quality i

### 5.1 Standard geometry i

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 5$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

| Mol | Chain | Bond lengths |         | Bond angles |         |
|-----|-------|--------------|---------|-------------|---------|
|     |       | RMSZ         | # Z  >5 | RMSZ        | # Z  >5 |
| 1   | A     | 0.24         | 0/2085  | 0.39        | 0/2827  |
| 1   | B     | 0.24         | 0/2053  | 0.39        | 0/2782  |
| 1   | C     | 0.25         | 0/2092  | 0.41        | 0/2837  |
| 1   | D     | 0.25         | 0/2136  | 0.41        | 0/2896  |
| 2   | E     | 0.26         | 0/753   | 0.48        | 0/1024  |
| 2   | F     | 0.25         | 0/753   | 0.47        | 0/1024  |
| 3   | G     | 0.55         | 0/246   | 0.81        | 0/377   |
| 4   | H     | 0.55         | 0/249   | 0.79        | 0/382   |
| 5   | J     | 0.53         | 0/990   | 0.91        | 0/1525  |
| 6   | K     | 0.57         | 0/990   | 0.90        | 0/1525  |
| All | All   | 0.33         | 0/12347 | 0.55        | 0/17199 |

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

### 5.2 Too-close contacts i

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

| Mol | Chain | Non-H | H(model) | H(added) | Clashes | Symm-Clashes |
|-----|-------|-------|----------|----------|---------|--------------|
| 1   | A     | 2045  | 0        | 2097     | 17      | 0            |
| 1   | B     | 2017  | 0        | 2095     | 27      | 0            |
| 1   | C     | 2052  | 0        | 2106     | 26      | 0            |
| 1   | D     | 2096  | 0        | 2155     | 25      | 0            |
| 2   | E     | 739   | 0        | 756      | 15      | 0            |
| 2   | F     | 739   | 0        | 756      | 16      | 0            |

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| Mol | Chain | Non-H | H(model) | H(added) | Clashes | Symm-Clashes |
|-----|-------|-------|----------|----------|---------|--------------|
| 3   | G     | 220   | 0        | 124      | 4       | 0            |
| 4   | H     | 222   | 0        | 124      | 4       | 0            |
| 5   | J     | 883   | 0        | 487      | 25      | 0            |
| 6   | K     | 883   | 0        | 485      | 18      | 0            |
| All | All   | 11896 | 0        | 11185    | 155     | 0            |

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 7.

All (155) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

| Atom-1           | Atom-2          | Interatomic distance (Å) | Clash overlap (Å) |
|------------------|-----------------|--------------------------|-------------------|
| 1:D:18:ILE:HD11  | 2:E:86:LEU:HD23 | 1.64                     | 0.80              |
| 5:J:39:DG:H2''   | 5:J:40:DA:C8    | 2.17                     | 0.79              |
| 5:J:47:DT:H2''   | 5:J:48:DA:C8    | 2.23                     | 0.74              |
| 1:C:145:VAL:HG21 | 5:J:58:DA:H5'   | 1.71                     | 0.72              |
| 1:A:59:ARG:NH1   | 4:H:2:DA:OP1    | 2.23                     | 0.72              |
| 1:D:123:ARG:NH1  | 1:D:141:GLU:OE1 | 2.23                     | 0.71              |
| 2:E:18:ARG:NH1   | 2:E:46:GLN:OE1  | 2.24                     | 0.71              |
| 1:B:217:TYR:O    | 1:B:221:ASP:HB2 | 1.92                     | 0.69              |
| 1:C:18:ILE:HG22  | 1:C:49:VAL:HG21 | 1.78                     | 0.65              |
| 1:D:138:ARG:NH1  | 1:D:207:VAL:O   | 2.29                     | 0.63              |
| 5:J:46:DC:H2'    | 5:J:47:DT:H71   | 1.82                     | 0.62              |
| 1:B:97:ASP:OD1   | 1:B:97:ASP:N    | 2.32                     | 0.61              |
| 1:D:114:LYS:HB3  | 1:D:274:ALA:HB1 | 1.83                     | 0.61              |
| 2:F:16:ARG:NH2   | 2:F:25:GLU:OE2  | 2.28                     | 0.61              |
| 6:K:54:DT:H2''   | 6:K:55:DG:H8    | 1.67                     | 0.60              |
| 2:E:16:ARG:NH2   | 2:E:25:GLU:OE2  | 2.24                     | 0.60              |
| 1:D:27:VAL:HA    | 1:D:31:ALA:O    | 2.01                     | 0.60              |
| 1:A:59:ARG:NH2   | 1:B:26:ASP:OD1  | 2.35                     | 0.60              |
| 1:C:90:GLN:HB3   | 1:C:94:ALA:HB2  | 1.85                     | 0.59              |
| 1:C:208:HIS:NE2  | 6:K:17:DG:OP2   | 2.35                     | 0.59              |
| 1:D:11:LEU:HD12  | 1:D:14:ARG:HD2  | 1.85                     | 0.58              |
| 5:J:17:DG:H2'    | 5:J:18:DG:C8    | 2.38                     | 0.58              |
| 1:C:248:ARG:NH2  | 6:K:11:DC:OP1   | 2.36                     | 0.57              |
| 1:C:84:ARG:NH1   | 6:K:13:DG:OP1   | 2.37                     | 0.57              |
| 6:K:45:DG:H2'    | 6:K:46:DA:C8    | 2.39                     | 0.57              |
| 1:C:25:ILE:HG13  | 1:C:34:LEU:HD23 | 1.87                     | 0.57              |
| 1:A:156:TYR:HD1  | 1:A:237:ARG:HD2 | 1.71                     | 0.56              |
| 1:A:184:THR:HG22 | 1:A:224:LYS:HD2 | 1.86                     | 0.56              |
| 2:E:7:VAL:HG21   | 2:F:30:VAL:HG11 | 1.88                     | 0.56              |

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| Atom-1           | Atom-2           | Interatomic distance (Å) | Clash overlap (Å) |
|------------------|------------------|--------------------------|-------------------|
| 6:K:46:DA:H2'    | 6:K:47:DG:C8     | 2.41                     | 0.56              |
| 2:F:18:ARG:NH1   | 2:F:46:GLN:OE1   | 2.39                     | 0.55              |
| 5:J:10:DT:H2'    | 5:J:11:DC:C6     | 2.41                     | 0.55              |
| 1:B:198:ALA:HB2  | 1:B:265:ILE:HD12 | 1.87                     | 0.55              |
| 1:D:94:ALA:HA    | 1:D:199:GLY:HA2  | 1.87                     | 0.55              |
| 5:J:9:DG:H2'     | 5:J:10:DT:H71    | 1.89                     | 0.54              |
| 5:J:38:DG:H2''   | 5:J:39:DG:C8     | 2.42                     | 0.54              |
| 1:A:83:VAL:HG12  | 1:A:84:ARG:HG2   | 1.89                     | 0.54              |
| 1:B:181:SER:O    | 1:B:185:SER:HB2  | 2.08                     | 0.53              |
| 5:J:4:DT:H2''    | 5:J:5:DG:C8      | 2.44                     | 0.53              |
| 6:K:19:DG:H4'    | 6:K:20:DT:OP1    | 2.09                     | 0.53              |
| 1:A:20:LEU:HD22  | 1:A:34:LEU:HD22  | 1.91                     | 0.52              |
| 1:A:138:ARG:NH1  | 1:A:207:VAL:O    | 2.41                     | 0.52              |
| 5:J:55:DT:H2''   | 5:J:56:DA:C8     | 2.45                     | 0.52              |
| 1:B:9:ILE:HG12   | 2:E:39:ILE:HD12  | 1.92                     | 0.52              |
| 1:B:17:MET:O     | 1:B:252:ARG:NH1  | 2.43                     | 0.52              |
| 5:J:4:DT:H2''    | 5:J:5:DG:H8      | 1.76                     | 0.51              |
| 1:A:123:ARG:NH2  | 1:A:141:GLU:OE2  | 2.43                     | 0.50              |
| 1:C:21:GLN:HB3   | 1:C:55:GLU:HB2   | 1.92                     | 0.50              |
| 6:K:54:DT:H2''   | 6:K:55:DG:C8     | 2.45                     | 0.50              |
| 1:C:83:VAL:HG12  | 1:C:84:ARG:HG2   | 1.91                     | 0.50              |
| 1:C:131:ARG:O    | 1:C:132:ARG:NH1  | 2.40                     | 0.50              |
| 3:G:5:DC:H2''    | 3:G:6:DA:C8      | 2.46                     | 0.50              |
| 1:A:248:ARG:NH1  | 5:J:11:DC:OP1    | 2.41                     | 0.50              |
| 1:B:187:LEU:HD22 | 1:B:228:VAL:HG21 | 1.94                     | 0.50              |
| 2:F:78:ARG:NH1   | 5:J:3:DC:OP1     | 2.41                     | 0.50              |
| 1:B:15:VAL:HG11  | 2:F:86:LEU:HD13  | 1.93                     | 0.49              |
| 1:B:231:LYS:HG2  | 1:B:250:ALA:HB1  | 1.93                     | 0.49              |
| 5:J:1:DC:H2''    | 5:J:2:DA:C8      | 2.47                     | 0.49              |
| 1:B:195:ILE:HD12 | 1:B:216:VAL:HG22 | 1.93                     | 0.49              |
| 2:F:86:LEU:HD23  | 2:F:88:LEU:HG    | 1.95                     | 0.49              |
| 2:E:30:VAL:HG11  | 2:F:7:VAL:HG21   | 1.94                     | 0.49              |
| 6:K:47:DG:H2'    | 6:K:48:DC:C6     | 2.48                     | 0.49              |
| 1:B:9:ILE:HB     | 1:B:14:ARG:HH21  | 1.78                     | 0.48              |
| 1:B:11:LEU:HD12  | 1:B:14:ARG:HD2   | 1.95                     | 0.48              |
| 6:K:6:DT:H2''    | 6:K:7:DG:C8      | 2.48                     | 0.48              |
| 1:D:20:LEU:HD22  | 1:D:34:LEU:HD22  | 1.94                     | 0.48              |
| 3:G:8:DT:H2''    | 3:G:9:DA:H8      | 1.79                     | 0.48              |
| 1:C:118:LYS:HG3  | 1:C:122:LEU:HD12 | 1.95                     | 0.48              |
| 1:B:208:HIS:ND1  | 1:B:218:ASP:OD1  | 2.41                     | 0.48              |
| 1:D:195:ILE:HG23 | 1:D:200:TYR:HB2  | 1.96                     | 0.48              |

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| Atom-1           | Atom-2           | Interatomic distance (Å) | Clash overlap (Å) |
|------------------|------------------|--------------------------|-------------------|
| 5:J:40:DA:H1'    | 5:J:41:DA:C8     | 2.47                     | 0.48              |
| 1:B:218:ASP:O    | 1:B:222:ILE:HG13 | 2.14                     | 0.47              |
| 2:F:46:GLN:O     | 2:F:50:LEU:HB2   | 2.14                     | 0.47              |
| 1:C:124:PHE:CE1  | 1:C:144:ARG:HD2  | 2.49                     | 0.47              |
| 1:B:18:ILE:HG12  | 1:B:49:VAL:HG21  | 1.96                     | 0.47              |
| 1:C:198:ALA:HB2  | 1:C:265:ILE:HG23 | 1.97                     | 0.47              |
| 1:D:116:VAL:HG13 | 1:D:207:VAL:HG22 | 1.96                     | 0.47              |
| 5:J:42:DC:H4'    | 5:J:43:DA:OP1    | 2.14                     | 0.47              |
| 1:D:97:ASP:OD1   | 1:D:97:ASP:N     | 2.48                     | 0.46              |
| 1:D:245:ARG:HG3  | 2:E:84:ASP:HA    | 1.97                     | 0.46              |
| 2:E:26:VAL:HG21  | 2:F:57:VAL:HG21  | 1.97                     | 0.46              |
| 5:J:45:DT:H5'    | 5:J:45:DT:H6     | 1.81                     | 0.46              |
| 5:J:55:DT:H2''   | 5:J:56:DA:N7     | 2.30                     | 0.46              |
| 5:J:3:DC:C6      | 5:J:4:DT:H72     | 2.50                     | 0.46              |
| 1:C:138:ARG:NH2  | 1:C:207:VAL:O    | 2.48                     | 0.46              |
| 1:D:84:ARG:CZ    | 1:D:213:LEU:HD11 | 2.46                     | 0.45              |
| 1:B:17:MET:HE1   | 1:B:186:CYS:HB3  | 1.97                     | 0.45              |
| 1:C:101:TYR:HE1  | 1:C:277:ILE:HG22 | 1.80                     | 0.45              |
| 1:D:252:ARG:NH2  | 2:E:84:ASP:O     | 2.40                     | 0.45              |
| 2:E:86:LEU:HA    | 2:E:86:LEU:HD12  | 1.70                     | 0.45              |
| 1:C:195:ILE:HD12 | 1:C:216:VAL:HG22 | 1.98                     | 0.45              |
| 1:D:75:LEU:O     | 1:D:87:ALA:HA    | 2.16                     | 0.45              |
| 1:A:195:ILE:HD12 | 1:A:216:VAL:HG22 | 1.98                     | 0.45              |
| 6:K:7:DG:H2''    | 6:K:8:DG:H8      | 1.82                     | 0.45              |
| 4:H:4:DC:H2''    | 4:H:5:DA:C8      | 2.52                     | 0.44              |
| 2:E:57:VAL:HG21  | 2:F:26:VAL:HG21  | 1.98                     | 0.44              |
| 1:C:32:PHE:HB2   | 1:C:44:ILE:HB    | 1.99                     | 0.44              |
| 1:C:86:TYR:OH    | 6:K:12:DC:OP2    | 2.20                     | 0.44              |
| 6:K:40:DA:H2''   | 6:K:41:DA:C8     | 2.52                     | 0.44              |
| 6:K:42:DA:H2''   | 6:K:43:DC:OP2    | 2.17                     | 0.44              |
| 1:C:244:ASP:N    | 1:C:244:ASP:OD1  | 2.51                     | 0.44              |
| 1:D:11:LEU:HA    | 1:D:14:ARG:HD2   | 2.00                     | 0.44              |
| 1:C:100:LEU:HB3  | 1:D:107:LEU:HD21 | 1.99                     | 0.44              |
| 1:B:117:ARG:HG3  | 1:B:128:ALA:HB3  | 1.99                     | 0.44              |
| 1:D:160:TRP:CZ2  | 1:D:163:ARG:HB2  | 2.53                     | 0.44              |
| 1:A:28:ILE:HG13  | 1:A:33:VAL:HG11  | 2.00                     | 0.44              |
| 1:A:90:GLN:HG2   | 1:A:94:ALA:HB2   | 2.00                     | 0.44              |
| 1:A:219:ILE:HG12 | 1:A:268:ILE:HG12 | 2.00                     | 0.43              |
| 1:B:27:VAL:HA    | 1:B:31:ALA:O     | 2.18                     | 0.43              |
| 1:D:19:PHE:CZ    | 1:D:53:MET:HG3   | 2.53                     | 0.43              |
| 1:D:208:HIS:ND1  | 1:D:218:ASP:OD1  | 2.42                     | 0.43              |

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| Atom-1           | Atom-2           | Interatomic distance (Å) | Clash overlap (Å) |
|------------------|------------------|--------------------------|-------------------|
| 2:F:10:ASN:HB2   | 6:K:1:DG:H5''    | 2.00                     | 0.43              |
| 1:C:265:ILE:HB   | 1:C:266:PRO:HD3  | 1.99                     | 0.43              |
| 2:F:18:ARG:HD3   | 2:F:18:ARG:HA    | 1.86                     | 0.43              |
| 1:B:78:VAL:HG12  | 1:B:84:ARG:HA    | 2.00                     | 0.43              |
| 1:D:119:MET:HG2  | 1:D:222:ILE:HD11 | 2.00                     | 0.43              |
| 2:F:42:MET:O     | 2:F:46:GLN:HG2   | 2.19                     | 0.43              |
| 5:J:43:DA:C2     | 6:K:19:DG:C2     | 3.07                     | 0.43              |
| 1:C:213:LEU:HD22 | 1:C:216:VAL:HG21 | 2.01                     | 0.43              |
| 1:D:84:ARG:HH21  | 1:D:87:ALA:HB3   | 1.84                     | 0.43              |
| 1:B:105:LEU:HD23 | 1:B:111:LEU:HD13 | 2.01                     | 0.43              |
| 1:C:219:ILE:HG12 | 1:C:268:ILE:HG12 | 2.01                     | 0.43              |
| 1:C:227:THR:HG22 | 1:C:254:ILE:HD13 | 2.01                     | 0.43              |
| 1:D:15:VAL:HG13  | 2:E:65:GLU:OE1   | 2.19                     | 0.42              |
| 6:K:50:DG:H2''   | 6:K:51:DA:C8     | 2.53                     | 0.42              |
| 1:D:17:MET:HE1   | 1:D:186:CYS:HB3  | 2.01                     | 0.42              |
| 5:J:13:DC:H4'    | 5:J:14:DC:C5     | 2.54                     | 0.42              |
| 1:B:265:ILE:HB   | 1:B:266:PRO:HD3  | 2.02                     | 0.42              |
| 1:B:98:LYS:HB3   | 1:B:200:TYR:CE1  | 2.54                     | 0.42              |
| 2:E:3:MET:O      | 2:E:60:TRP:HA    | 2.20                     | 0.42              |
| 1:C:95:ARG:NH1   | 1:C:98:LYS:HE3   | 2.35                     | 0.42              |
| 4:H:8:DA:H2''    | 4:H:9:DG:C8      | 2.54                     | 0.42              |
| 1:A:208:HIS:O    | 1:A:214:SER:HB3  | 2.20                     | 0.42              |
| 5:J:7:DT:H2''    | 5:J:8:DG:C8      | 2.54                     | 0.42              |
| 1:A:34:LEU:HB3   | 1:A:42:THR:HB    | 2.01                     | 0.42              |
| 3:G:5:DC:H2''    | 3:G:6:DA:H8      | 1.84                     | 0.42              |
| 1:D:218:ASP:O    | 1:D:222:ILE:HG13 | 2.20                     | 0.41              |
| 2:E:58:MET:O     | 2:E:70:PHE:HA    | 2.20                     | 0.41              |
| 2:F:58:MET:O     | 2:F:70:PHE:HA    | 2.20                     | 0.41              |
| 5:J:50:DG:N2     | 5:J:52:DT:H1'    | 2.36                     | 0.41              |
| 5:J:21:DT:H2''   | 5:J:22:DA:C8     | 2.55                     | 0.41              |
| 2:F:18:ARG:HD3   | 2:F:21:ILE:HD12  | 2.02                     | 0.41              |
| 4:H:6:DC:H2''    | 4:H:7:DC:C6      | 2.55                     | 0.41              |
| 1:A:101:TYR:HE1  | 1:A:277:ILE:HG22 | 1.86                     | 0.41              |
| 1:C:105:LEU:HD23 | 1:C:111:LEU:HD13 | 2.02                     | 0.41              |
| 1:B:229:VAL:N    | 1:B:230:PRO:HD2  | 2.35                     | 0.41              |
| 1:B:235:ILE:HD12 | 1:B:238:ARG:HH21 | 1.86                     | 0.41              |
| 5:J:40:DA:H4'    | 5:J:41:DA:OP1    | 2.21                     | 0.41              |
| 1:B:217:TYR:O    | 1:B:221:ASP:CB   | 2.67                     | 0.41              |
| 2:E:7:VAL:HB     | 2:E:57:VAL:HG13  | 2.03                     | 0.40              |
| 2:F:15:LEU:HB2   | 2:F:50:LEU:HB3   | 2.03                     | 0.40              |
| 6:K:53:DA:H2''   | 6:K:54:DT:O4'    | 2.22                     | 0.40              |

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| Atom-1          | Atom-2           | Interatomic distance (Å) | Clash overlap (Å) |
|-----------------|------------------|--------------------------|-------------------|
| 1:A:258:SER:HB2 | 1:A:260:THR:HG23 | 2.03                     | 0.40              |
| 1:B:213:LEU:HB2 | 1:B:217:TYR:CZ   | 2.57                     | 0.40              |
| 3:G:8:DT:H2''   | 3:G:9:DA:C8      | 2.56                     | 0.40              |

There are no symmetry-related clashes.

## 5.3 Torsion angles [i](#)

### 5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

| Mol | Chain | Analysed        | Favoured   | Allowed | Outliers | Percentiles |     |
|-----|-------|-----------------|------------|---------|----------|-------------|-----|
| 1   | A     | 264/308 (86%)   | 262 (99%)  | 2 (1%)  | 0        | 100         | 100 |
| 1   | B     | 259/308 (84%)   | 253 (98%)  | 6 (2%)  | 0        | 100         | 100 |
| 1   | C     | 265/308 (86%)   | 260 (98%)  | 5 (2%)  | 0        | 100         | 100 |
| 1   | D     | 268/308 (87%)   | 262 (98%)  | 6 (2%)  | 0        | 100         | 100 |
| 2   | E     | 92/94 (98%)     | 89 (97%)   | 3 (3%)  | 0        | 100         | 100 |
| 2   | F     | 92/94 (98%)     | 88 (96%)   | 4 (4%)  | 0        | 100         | 100 |
| All | All   | 1240/1420 (87%) | 1214 (98%) | 26 (2%) | 0        | 100         | 100 |

There are no Ramachandran outliers to report.

### 5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

| Mol | Chain | Analysed        | Rotameric  | Outliers | Percentiles |     |
|-----|-------|-----------------|------------|----------|-------------|-----|
| 1   | A     | 211/248 (85%)   | 208 (99%)  | 3 (1%)   | 67          | 89  |
| 1   | B     | 210/248 (85%)   | 209 (100%) | 1 (0%)   | 88          | 96  |
| 1   | C     | 212/248 (86%)   | 210 (99%)  | 2 (1%)   | 78          | 93  |
| 1   | D     | 218/248 (88%)   | 216 (99%)  | 2 (1%)   | 78          | 93  |
| 2   | E     | 79/79 (100%)    | 79 (100%)  | 0        | 100         | 100 |
| 2   | F     | 79/79 (100%)    | 78 (99%)   | 1 (1%)   | 69          | 90  |
| All | All   | 1009/1150 (88%) | 1000 (99%) | 9 (1%)   | 78          | 93  |

All (9) residues with a non-rotameric sidechain are listed below:

| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 1   | A     | 135 | GLU  |
| 1   | A     | 190 | VAL  |
| 1   | A     | 227 | THR  |
| 1   | B     | 97  | ASP  |
| 1   | C     | 97  | ASP  |
| 1   | C     | 190 | VAL  |
| 1   | D     | 78  | VAL  |
| 1   | D     | 260 | THR  |
| 2   | F     | 86  | LEU  |

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

## 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.



## 5.6 Ligand geometry [i](#)

There are no ligands in this entry.

## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

## 6 Fit of model and data

### 6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95<sup>th</sup> percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

| Mol | Chain | Analysed        | <RSRZ> | #RSRZ>2        | OWAB(Å <sup>2</sup> ) | Q<0.9 |
|-----|-------|-----------------|--------|----------------|-----------------------|-------|
| 1   | A     | 266/308 (86%)   | 0.81   | 34 (12%) 3 2   | 59, 99, 139, 158      | 0     |
| 1   | B     | 263/308 (85%)   | 0.92   | 33 (12%) 3 3   | 55, 105, 164, 171     | 0     |
| 1   | C     | 267/308 (86%)   | 0.69   | 16 (5%) 21 18  | 57, 85, 116, 157      | 0     |
| 1   | D     | 272/308 (88%)   | 0.67   | 14 (5%) 28 24  | 47, 85, 125, 149      | 0     |
| 2   | E     | 94/94 (100%)    | 0.72   | 6 (6%) 19 15   | 48, 70, 96, 108       | 0     |
| 2   | F     | 94/94 (100%)    | 0.53   | 4 (4%) 35 31   | 52, 68, 101, 116      | 0     |
| 3   | G     | 11/11 (100%)    | -0.03  | 0 100 100      | 63, 88, 177, 189      | 0     |
| 4   | H     | 11/11 (100%)    | 0.06   | 0 100 100      | 68, 93, 199, 202      | 0     |
| 5   | J     | 43/58 (74%)     | -0.37  | 0 100 100      | 74, 129, 191, 208     | 0     |
| 6   | K     | 43/58 (74%)     | -0.25  | 0 100 100      | 67, 145, 198, 210     | 0     |
| All | All   | 1364/1558 (87%) | 0.67   | 107 (7%) 13 10 | 47, 90, 158, 210      | 0     |

All (107) RSRZ outliers are listed below:

| Mol | Chain | Res | Type | RSRZ |
|-----|-------|-----|------|------|
| 1   | B     | 152 | LEU  | 10.3 |
| 1   | A     | 158 | VAL  | 5.0  |
| 1   | A     | 272 | LEU  | 4.9  |
| 1   | A     | 156 | TYR  | 4.7  |
| 1   | A     | 155 | GLN  | 4.6  |
| 1   | B     | 153 | ALA  | 4.4  |
| 1   | A     | 152 | LEU  | 4.4  |
| 1   | D     | 238 | ARG  | 4.2  |
| 1   | B     | 233 | PHE  | 4.1  |
| 1   | B     | 159 | THR  | 4.0  |
| 1   | B     | 149 | TYR  | 4.0  |
| 1   | A     | 99  | LEU  | 3.6  |
| 1   | B     | 229 | VAL  | 3.5  |

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| <b>Mol</b> | <b>Chain</b> | <b>Res</b> | <b>Type</b> | <b>RSRZ</b> |
|------------|--------------|------------|-------------|-------------|
| 1          | B            | 6          | LEU         | 3.5         |
| 1          | C            | 46         | VAL         | 3.4         |
| 1          | A            | 225        | PHE         | 3.4         |
| 1          | A            | 176        | ILE         | 3.3         |
| 1          | A            | 180        | ILE         | 3.3         |
| 1          | B            | 237        | ARG         | 3.3         |
| 1          | B            | 154        | LYS         | 3.3         |
| 1          | B            | 141        | GLU         | 3.2         |
| 1          | B            | 82         | GLY         | 3.1         |
| 1          | C            | 137        | LEU         | 3.0         |
| 1          | C            | 261        | LEU         | 3.0         |
| 1          | B            | 161        | ASN         | 3.0         |
| 1          | B            | 156        | TYR         | 2.9         |
| 1          | A            | 227        | THR         | 2.9         |
| 1          | B            | 80         | GLU         | 2.8         |
| 1          | B            | 158        | VAL         | 2.8         |
| 1          | A            | 238        | ARG         | 2.7         |
| 1          | A            | 235        | ILE         | 2.7         |
| 1          | A            | 137        | LEU         | 2.7         |
| 1          | A            | 233        | PHE         | 2.7         |
| 1          | D            | 94         | ALA         | 2.7         |
| 1          | D            | 122        | LEU         | 2.6         |
| 1          | B            | 18         | ILE         | 2.6         |
| 2          | E            | 4          | LEU         | 2.6         |
| 1          | B            | 100        | LEU         | 2.6         |
| 1          | B            | 204        | ILE         | 2.6         |
| 1          | B            | 264        | LEU         | 2.6         |
| 1          | D            | 158        | VAL         | 2.5         |
| 1          | C            | 196        | LEU         | 2.5         |
| 1          | C            | 60         | VAL         | 2.5         |
| 1          | B            | 54         | LEU         | 2.5         |
| 1          | A            | 204        | ILE         | 2.5         |
| 1          | D            | 190        | VAL         | 2.4         |
| 1          | B            | 20         | LEU         | 2.4         |
| 1          | B            | 200        | TYR         | 2.4         |
| 2          | F            | 88         | LEU         | 2.4         |
| 1          | D            | 233        | PHE         | 2.4         |
| 1          | D            | 65         | VAL         | 2.4         |
| 1          | D            | 88         | SER         | 2.4         |
| 1          | C            | 34         | LEU         | 2.4         |
| 2          | E            | 88         | LEU         | 2.4         |
| 1          | A            | 32         | PHE         | 2.4         |

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| <b>Mol</b> | <b>Chain</b> | <b>Res</b> | <b>Type</b> | <b>RSRZ</b> |
|------------|--------------|------------|-------------|-------------|
| 1          | D            | 22         | TYR         | 2.4         |
| 1          | A            | 261        | LEU         | 2.4         |
| 1          | B            | 81         | ALA         | 2.3         |
| 1          | C            | 168        | LYS         | 2.3         |
| 1          | B            | 75         | LEU         | 2.3         |
| 1          | A            | 222        | ILE         | 2.3         |
| 1          | D            | 113        | LEU         | 2.3         |
| 1          | A            | 237        | ARG         | 2.3         |
| 1          | A            | 140        | ILE         | 2.3         |
| 1          | B            | 235        | ILE         | 2.3         |
| 1          | C            | 219        | ILE         | 2.3         |
| 1          | C            | 33         | VAL         | 2.3         |
| 1          | A            | 154        | LYS         | 2.3         |
| 1          | A            | 172        | LYS         | 2.3         |
| 1          | B            | 247        | VAL         | 2.2         |
| 2          | E            | 86         | LEU         | 2.2         |
| 1          | A            | 268        | ILE         | 2.2         |
| 1          | A            | 149        | TYR         | 2.2         |
| 2          | F            | 26         | VAL         | 2.2         |
| 2          | E            | 32         | VAL         | 2.2         |
| 1          | A            | 144        | ARG         | 2.2         |
| 1          | B            | 64         | ALA         | 2.2         |
| 1          | B            | 60         | VAL         | 2.2         |
| 1          | A            | 267        | LEU         | 2.2         |
| 2          | F            | 32         | VAL         | 2.1         |
| 1          | C            | 40         | ILE         | 2.1         |
| 1          | C            | 51         | CYS         | 2.1         |
| 1          | D            | 51         | CYS         | 2.1         |
| 1          | A            | 105        | LEU         | 2.1         |
| 1          | B            | 163        | ARG         | 2.1         |
| 1          | A            | 160        | TRP         | 2.1         |
| 1          | A            | 165        | TYR         | 2.1         |
| 1          | A            | 60         | VAL         | 2.1         |
| 1          | C            | 228        | VAL         | 2.1         |
| 1          | D            | 154        | LYS         | 2.1         |
| 2          | E            | 70         | PHE         | 2.1         |
| 1          | B            | 178        | GLN         | 2.0         |
| 1          | A            | 174        | ASP         | 2.0         |
| 1          | A            | 161        | ASN         | 2.0         |
| 1          | D            | 176        | ILE         | 2.0         |
| 1          | A            | 65         | VAL         | 2.0         |
| 1          | B            | 206        | PHE         | 2.0         |

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| Mol | Chain | Res | Type | RSRZ |
|-----|-------|-----|------|------|
| 1   | C     | 172 | LYS  | 2.0  |
| 1   | C     | 174 | ASP  | 2.0  |
| 1   | B     | 190 | VAL  | 2.0  |
| 1   | B     | 74  | LEU  | 2.0  |
| 1   | C     | 187 | LEU  | 2.0  |
| 2   | F     | 86  | LEU  | 2.0  |
| 1   | A     | 241 | GLY  | 2.0  |
| 1   | C     | 25  | ILE  | 2.0  |
| 1   | D     | 81  | ALA  | 2.0  |
| 2   | E     | 59  | ALA  | 2.0  |

## 6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

## 6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 6.4 Ligands [i](#)

There are no ligands in this entry.

## 6.5 Other polymers [i](#)

There are no such residues in this entry.