



## Full wwPDB EM Validation Report ⓘ

Jan 27, 2022 – 03:43 pm GMT

PDB ID : 7PMK  
EMDB ID : EMD-13537  
Title : *S. cerevisiae* replisome-SCF(Dia2) complex bound to double-stranded DNA  
(conformation I)  
Authors : Jenkyn-Bedford, M.; Yeeles, J.T.P.; Deegan, T.D.  
Deposited on : 2021-09-02  
Resolution : 3.20 Å(reported)

This is a Full wwPDB EM 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/EMValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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

EMDB validation analysis : 0.0.0.dev97  
Mogul : 1.8.4, CSD as541be (2020)  
MolProbity : 4.02b-467  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.26

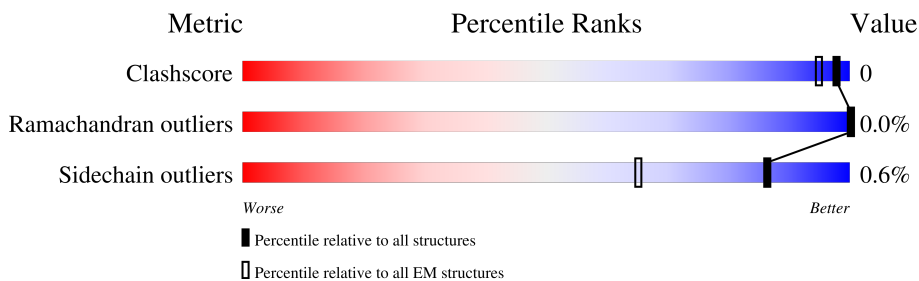
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 3.20 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 (#Entries) | EM structures (#Entries) |
|-----------------------|--------------------------|--------------------------|
| Clashscore            | 158937                   | 4297                     |
| Ramachandran outliers | 154571                   | 4023                     |
| Sidechain outliers    | 154315                   | 3826                     |

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the 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 EM map (all-atom inclusion  $< 40\%$ ). The numeric value is given above the bar.

| Mol | Chain | Length | Quality of chain                   |
|-----|-------|--------|------------------------------------|
| 1   | 2     | 868    | 9% (red), 74% (green), 25% (grey)  |
| 2   | 3     | 1009   | 59% (green), 40% (grey)            |
| 3   | 4     | 933    | 21% (red), 63% (green), 36% (grey) |
| 4   | 5     | 775    | 10% (red), 86% (green), 13% (grey) |
| 5   | 6     | 1017   | 7% (red), 61% (green), 37% (grey)  |
| 6   | 7     | 845    | 16% (red), 73% (green), 26% (grey) |
| 7   | A     | 208    | 7% (red), 94% (green), 5% (grey)   |
| 8   | B     | 213    | 88% (green), 10% (grey)            |

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| Mol | Chain | Length | Quality of chain   |
|-----|-------|--------|--|
| 9   | C     | 194    |  88% 12%       |
| 10  | D     | 294    |  82% 17%       |
| 11  | E     | 657    |  84% 14%       |
| 12  | F     | 962    |  44% 56%       |
| 12  | G     | 962    |  44% 56%       |
| 12  | H     | 962    |  44% 56%       |
| 13  | I     | 115    |  29% 69%       |
| 14  | J     | 122    |  7% 24% 73%    |
| 15  | K     | 194    |  69% 29%       |
| 16  | L     | 735    |  63% 35%       |
| 17  | Q     | 2222   |  34% 66%      |
| 18  | R     | 689    |  10% 77% 20% |
| 19  | X     | 1238   |  53% 46%     |
| 20  | Y     | 319    |  31% 69%     |

## 2 Entry composition i

There are 23 unique types of molecules in this entry. The entry contains 74697 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, 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 DNA replication licensing factor MCM2.

| Mol | Chain | Residues | Atoms |      |     |     |    | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|----|---------|-------|
|     |       |          | Total | C    | N   | O   | S  |         |       |
| 1   | 2     | 655      | 5175  | 3257 | 929 | 970 | 19 | 0       | 0     |

- Molecule 2 is a protein called DNA replication licensing factor MCM3.

| Mol | Chain | Residues | Atoms |      |     |     |    | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|----|---------|-------|
|     |       |          | Total | C    | N   | O   | S  |         |       |
| 2   | 3     | 607      | 4759  | 3007 | 847 | 892 | 13 | 0       | 0     |

There are 38 discrepancies between the modelled and reference sequences:

| Chain | Residue | Modelled | Actual | Comment               | Reference  |
|-------|---------|----------|--------|-----------------------|------------|
| 3     | -37     | MET      | -      | initiating methionine | UNP P24279 |
| 3     | -36     | LYS      | -      | expression tag        | UNP P24279 |
| 3     | -35     | ARG      | -      | expression tag        | UNP P24279 |
| 3     | -34     | ARG      | -      | expression tag        | UNP P24279 |
| 3     | -33     | TRP      | -      | expression tag        | UNP P24279 |
| 3     | -32     | LYS      | -      | expression tag        | UNP P24279 |
| 3     | -31     | LYS      | -      | expression tag        | UNP P24279 |
| 3     | -30     | ASN      | -      | expression tag        | UNP P24279 |
| 3     | -29     | PHE      | -      | expression tag        | UNP P24279 |
| 3     | -28     | ILE      | -      | expression tag        | UNP P24279 |
| 3     | -27     | ALA      | -      | expression tag        | UNP P24279 |
| 3     | -26     | VAL      | -      | expression tag        | UNP P24279 |
| 3     | -25     | SER      | -      | expression tag        | UNP P24279 |
| 3     | -24     | ALA      | -      | expression tag        | UNP P24279 |
| 3     | -23     | ALA      | -      | expression tag        | UNP P24279 |
| 3     | -22     | ASN      | -      | expression tag        | UNP P24279 |
| 3     | -21     | ARG      | -      | expression tag        | UNP P24279 |
| 3     | -20     | PHE      | -      | expression tag        | UNP P24279 |
| 3     | -19     | LYS      | -      | expression tag        | UNP P24279 |
| 3     | -18     | LYS      | -      | expression tag        | UNP P24279 |
| 3     | -17     | ILE      | -      | expression tag        | UNP P24279 |

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| Chain | Residue | Modelled | Actual | Comment        | Reference  |
|-------|---------|----------|--------|----------------|------------|
| 3     | -16     | SER      | -      | expression tag | UNP P24279 |
| 3     | -15     | SER      | -      | expression tag | UNP P24279 |
| 3     | -14     | SER      | -      | expression tag | UNP P24279 |
| 3     | -13     | GLY      | -      | expression tag | UNP P24279 |
| 3     | -12     | ALA      | -      | expression tag | UNP P24279 |
| 3     | -11     | LEU      | -      | expression tag | UNP P24279 |
| 3     | -10     | GLU      | -      | expression tag | UNP P24279 |
| 3     | -9      | ASN      | -      | expression tag | UNP P24279 |
| 3     | -8      | LEU      | -      | expression tag | UNP P24279 |
| 3     | -7      | TYR      | -      | expression tag | UNP P24279 |
| 3     | -6      | PHE      | -      | expression tag | UNP P24279 |
| 3     | -5      | GLN      | -      | expression tag | UNP P24279 |
| 3     | -4      | GLY      | -      | expression tag | UNP P24279 |
| 3     | -3      | GLU      | -      | expression tag | UNP P24279 |
| 3     | -2      | ALA      | -      | expression tag | UNP P24279 |
| 3     | -1      | PRO      | -      | expression tag | UNP P24279 |
| 3     | 0       | VAL      | -      | expression tag | UNP P24279 |

- Molecule 3 is a protein called DNA replication licensing factor MCM4.

| Mol | Chain | Residues | Atoms |      |     |     |    | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|----|---------|-------|
|     |       |          | Total | C    | N   | O   | S  |         |       |
| 3   | 4     | 597      | 4749  | 2996 | 818 | 907 | 28 | 0       | 0     |

- Molecule 4 is a protein called DNA helicase.

| Mol | Chain | Residues | Atoms |      |     |      |    | AltConf | Trace |
|-----|-------|----------|-------|------|-----|------|----|---------|-------|
|     |       |          | Total | C    | N   | O    | S  |         |       |
| 4   | 5     | 673      | 5332  | 3351 | 927 | 1030 | 24 | 0       | 0     |

- Molecule 5 is a protein called DNA replication licensing factor MCM6.

| Mol | Chain | Residues | Atoms |      |     |     |    | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|----|---------|-------|
|     |       |          | Total | C    | N   | O   | S  |         |       |
| 5   | 6     | 637      | 5013  | 3162 | 881 | 945 | 25 | 0       | 0     |

- Molecule 6 is a protein called DNA replication licensing factor MCM7.

| Mol | Chain | Residues | Atoms |      |     |     |    | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|----|---------|-------|
|     |       |          | Total | C    | N   | O   | S  |         |       |
| 6   | 7     | 629      | 4914  | 3109 | 853 | 926 | 26 | 0       | 0     |

- Molecule 7 is a protein called DNA replication complex GINS protein PSF1.

| Mol | Chain | Residues | Atoms |      |     |     |   | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|---|---------|-------|
|     |       |          | Total | C    | N   | O   | S |         |       |
| 7   | A     | 197      | 1611  | 1012 | 277 | 313 | 9 | 0       | 0     |

- Molecule 8 is a protein called DNA replication complex GINS protein PSF2.

| Mol | Chain | Residues | Atoms |      |     |     |   | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|---|---------|-------|
|     |       |          | Total | C    | N   | O   | S |         |       |
| 8   | B     | 192      | 1609  | 1034 | 285 | 286 | 4 | 0       | 0     |

- Molecule 9 is a protein called DNA replication complex GINS protein PSF3.

| Mol | Chain | Residues | Atoms |     |     |     |   | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---|---------|-------|
|     |       |          | Total | C   | N   | O   | S |         |       |
| 9   | C     | 171      | 1381  | 900 | 223 | 252 | 6 | 0       | 0     |

- Molecule 10 is a protein called DNA replication complex GINS protein SLD5.

| Mol | Chain | Residues | Atoms |      |     |     |    | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|----|---------|-------|
|     |       |          | Total | C    | N   | O   | S  |         |       |
| 10  | D     | 243      | 2004  | 1276 | 327 | 389 | 12 | 0       | 0     |

- Molecule 11 is a protein called Cell division control protein 45, Cell division control protein 45.

| Mol | Chain | Residues | Atoms |      |     |     |    | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|----|---------|-------|
|     |       |          | Total | C    | N   | O   | S  |         |       |
| 11  | E     | 564      | 4569  | 2916 | 772 | 867 | 14 | 0       | 0     |

There are 12 discrepancies between the modelled and reference sequences:

| Chain | Residue | Modelled | Actual | Comment        | Reference  |
|-------|---------|----------|--------|----------------|------------|
| E     | 167F    | ASP      | -      | expression tag | UNP Q08032 |
| E     | 167G    | TYR      | -      | expression tag | UNP Q08032 |
| E     | 167H    | LYS      | -      | expression tag | UNP Q08032 |
| E     | 167I    | ASP      | -      | expression tag | UNP Q08032 |
| E     | 167J    | ASP      | -      | expression tag | UNP Q08032 |
| E     | 167K    | ASP      | -      | expression tag | UNP Q08032 |
| E     | 167L    | GLY      | -      | expression tag | UNP Q08032 |
| E     | 167M    | ASP      | -      | expression tag | UNP Q08032 |
| E     | 167N    | TYR      | -      | expression tag | UNP Q08032 |
| E     | 167O    | LYS      | -      | expression tag | UNP Q08032 |

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| Chain | Residue | Modelled | Actual | Comment        | Reference  |
|-------|---------|----------|--------|----------------|------------|
| E     | 167P    | ASP      | -      | expression tag | UNP Q08032 |
| E     | 167Q    | ASP      | -      | expression tag | UNP Q08032 |

- Molecule 12 is a protein called DNA polymerase alpha-binding protein.

| Mol | Chain | Residues | Atoms         |           |          |          |         | AltConf | Trace |
|-----|-------|----------|---------------|-----------|----------|----------|---------|---------|-------|
|     |       |          | Total         | C         | N        | O        | S       |         |       |
| 12  | F     | 424      | Total<br>3404 | C<br>2188 | N<br>564 | O<br>637 | S<br>15 | 0       | 0     |
| 12  | G     | 422      | Total<br>3380 | C<br>2172 | N<br>557 | O<br>636 | S<br>15 | 0       | 0     |
| 12  | H     | 425      | Total<br>3411 | C<br>2193 | N<br>565 | O<br>638 | S<br>15 | 0       | 0     |

There are 105 discrepancies between the modelled and reference sequences:

| Chain | Residue | Modelled | Actual | Comment               | Reference      |
|-------|---------|----------|--------|-----------------------|----------------|
| F     | -34     | MET      | -      | initiating methionine | UNP A0A6A5Q5Y5 |
| F     | -33     | LYS      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -32     | ARG      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -31     | ARG      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -30     | TRP      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -29     | LYS      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -28     | LYS      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -27     | ASN      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -26     | PHE      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -25     | ILE      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -24     | ALA      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -23     | VAL      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -22     | SER      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -21     | ALA      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -20     | ALA      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -19     | ASN      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -18     | ARG      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -17     | PHE      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -16     | LYS      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -15     | LYS      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -14     | ILE      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -13     | SER      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -12     | SER      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -11     | SER      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -10     | GLY      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -9      | ALA      | -      | expression tag        | UNP A0A6A5Q5Y5 |

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| Chain | Residue | Modelled | Actual | Comment               | Reference      |
|-------|---------|----------|--------|-----------------------|----------------|
| F     | -8      | LEU      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -7      | GLU      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -6      | ASN      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -5      | LEU      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -4      | TYR      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -3      | PHE      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -2      | GLN      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | -1      | GLY      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| F     | 0       | GLU      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -34     | MET      | -      | initiating methionine | UNP A0A6A5Q5Y5 |
| G     | -33     | LYS      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -32     | ARG      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -31     | ARG      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -30     | TRP      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -29     | LYS      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -28     | LYS      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -27     | ASN      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -26     | PHE      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -25     | ILE      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -24     | ALA      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -23     | VAL      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -22     | SER      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -21     | ALA      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -20     | ALA      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -19     | ASN      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -18     | ARG      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -17     | PHE      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -16     | LYS      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -15     | LYS      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -14     | ILE      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -13     | SER      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -12     | SER      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -11     | SER      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -10     | GLY      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -9      | ALA      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -8      | LEU      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -7      | GLU      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -6      | ASN      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -5      | LEU      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -4      | TYR      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -3      | PHE      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | -2      | GLN      | -      | expression tag        | UNP A0A6A5Q5Y5 |

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| Chain | Residue | Modelled | Actual | Comment               | Reference      |
|-------|---------|----------|--------|-----------------------|----------------|
| G     | -1      | GLY      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| G     | 0       | GLU      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -34     | MET      | -      | initiating methionine | UNP A0A6A5Q5Y5 |
| H     | -33     | LYS      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -32     | ARG      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -31     | ARG      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -30     | TRP      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -29     | LYS      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -28     | LYS      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -27     | ASN      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -26     | PHE      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -25     | ILE      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -24     | ALA      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -23     | VAL      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -22     | SER      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -21     | ALA      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -20     | ALA      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -19     | ASN      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -18     | ARG      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -17     | PHE      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -16     | LYS      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -15     | LYS      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -14     | ILE      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -13     | SER      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -12     | SER      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -11     | SER      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -10     | GLY      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -9      | ALA      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -8      | LEU      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -7      | GLU      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -6      | ASN      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -5      | LEU      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -4      | TYR      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -3      | PHE      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -2      | GLN      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | -1      | GLY      | -      | expression tag        | UNP A0A6A5Q5Y5 |
| H     | 0       | GLU      | -      | expression tag        | UNP A0A6A5Q5Y5 |

- Molecule 13 is a DNA chain called Leading strand template DNA.

| Mol | Chain | Residues | Atoms |     |     |     |    | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|----|---------|-------|
|     |       |          | Total | C   | N   | O   | P  |         |       |
| 13  | I     | 36       | 782   | 360 | 165 | 221 | 36 | 0       | 0     |

- Molecule 14 is a DNA chain called Lagging strand template DNA.

| Mol | Chain | Residues | Atoms |     |     |     |    | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|----|---------|-------|
|     |       |          | Total | C   | N   | O   | P  |         |       |
| 14  | J     | 33       | 629   | 298 | 101 | 197 | 33 | 0       | 0     |

- Molecule 15 is a protein called E3 ubiquitin ligase complex SCF subunit.

| Mol | Chain | Residues | Atoms |     |     |     |   | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---|---------|-------|
|     |       |          | Total | C   | N   | O   | S |         |       |
| 15  | K     | 137      | 1120  | 709 | 195 | 212 | 4 | 0       | 0     |

- Molecule 16 is a protein called Protein DIA2.

| Mol | Chain | Residues | Atoms |      |     |     |    | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|----|---------|-------|
|     |       |          | Total | C    | N   | O   | S  |         |       |
| 16  | L     | 475      | 3921  | 2533 | 654 | 710 | 24 | 0       | 0     |

There are 3 discrepancies between the modelled and reference sequences:

| Chain | Residue | Modelled | Actual | Comment        | Reference  |
|-------|---------|----------|--------|----------------|------------|
| L     | -2      | GLY      | -      | expression tag | UNP Q08496 |
| L     | -1      | ALA      | -      | expression tag | UNP Q08496 |
| L     | 0       | GLY      | -      | expression tag | UNP Q08496 |

- Molecule 17 is a protein called DNA polymerase epsilon catalytic subunit A.

| Mol | Chain | Residues | Atoms |      |      |      |    | AltConf | Trace |
|-----|-------|----------|-------|------|------|------|----|---------|-------|
|     |       |          | Total | C    | N    | O    | S  |         |       |
| 17  | Q     | 766      | 6203  | 4028 | 1015 | 1124 | 36 | 0       | 0     |

There are 2 discrepancies between the modelled and reference sequences:

| Chain | Residue | Modelled | Actual | Comment | Reference  |
|-------|---------|----------|--------|---------|------------|
| Q     | 290     | ALA      | ASP    | variant | UNP P21951 |
| Q     | 292     | ALA      | GLU    | variant | UNP P21951 |

- Molecule 18 is a protein called DNA polymerase epsilon subunit B.

| Mol | Chain | Residues | Atoms |      |     |     |    | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|----|---------|-------|
|     |       |          | Total | C    | N   | O   | S  |         |       |
| 18  | R     | 552      | 4427  | 2843 | 759 | 807 | 18 | 0       | 0     |

- Molecule 19 is a protein called Topoisomerase 1-associated factor 1.

| Mol | Chain | Residues | Atoms |      |     |     |    | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|----|---------|-------|
|     |       |          | Total | C    | N   | O   | S  |         |       |
| 19  | X     | 665      | 5410  | 3505 | 912 | 974 | 19 | 0       | 0     |

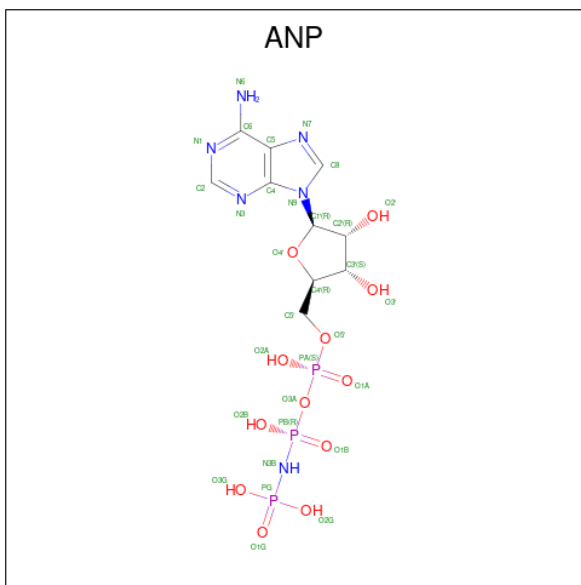
- Molecule 20 is a protein called Chromosome segregation in meiosis protein 3.

| Mol | Chain | Residues | Atoms |     |     |     |   | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---|---------|-------|
|     |       |          | Total | C   | N   | O   | S |         |       |
| 20  | Y     | 98       | 791   | 511 | 138 | 138 | 4 | 0       | 0     |

There are 2 discrepancies between the modelled and reference sequences:

| Chain | Residue | Modelled | Actual | Comment        | Reference  |
|-------|---------|----------|--------|----------------|------------|
| Y     | -1      | GLY      | -      | expression tag | UNP Q04659 |
| Y     | 0       | GLU      | -      | expression tag | UNP Q04659 |

- Molecule 21 is PHOSPHOAMINOPHOSPHONIC ACID-ADENYLATE ESTER (three-letter code: ANP) (formula:  $C_{10}H_{17}N_6O_{12}P_3$ ) (labeled as "Ligand of Interest" by depositor).



| Mol | Chain | Residues | Atoms |    |   |    |   | AltConf |
|-----|-------|----------|-------|----|---|----|---|---------|
|     |       |          | Total | C  | N | O  | P |         |
| 21  | 2     | 1        | 31    | 10 | 6 | 12 | 3 | 0       |
| 21  | 3     | 1        | 31    | 10 | 6 | 12 | 3 | 0       |
| 21  | 5     | 1        | 31    | 10 | 6 | 12 | 3 | 0       |

- Molecule 22 is MAGNESIUM ION (three-letter code: MG) (formula: Mg) (labeled as "Ligand of Interest" by depositor).

| Mol | Chain | Residues | Atoms           | AltConf |
|-----|-------|----------|-----------------|---------|
| 22  | 2     | 1        | Total Mg<br>1 1 | 0       |
| 22  | 3     | 1        | Total Mg<br>1 1 | 0       |
| 22  | 5     | 1        | Total Mg<br>1 1 | 0       |

- Molecule 23 is ZINC ION (three-letter code: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

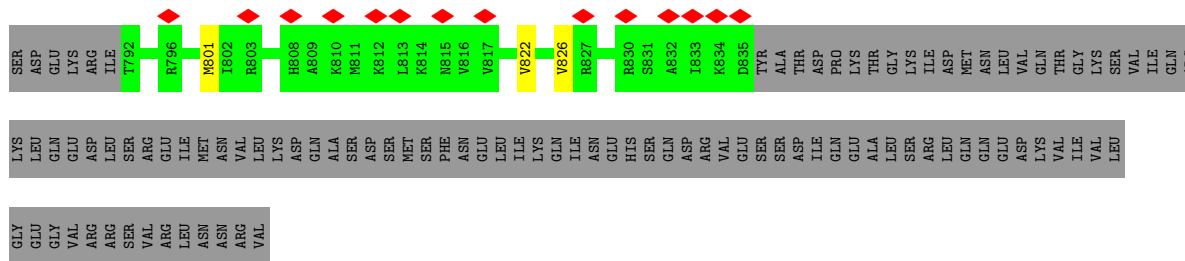
| Mol | Chain | Residues | Atoms           | AltConf |
|-----|-------|----------|-----------------|---------|
| 23  | 2     | 1        | Total Zn<br>1 1 | 0       |
| 23  | 4     | 1        | Total Zn<br>1 1 | 0       |
| 23  | 5     | 1        | Total Zn<br>1 1 | 0       |
| 23  | 6     | 1        | Total Zn<br>1 1 | 0       |
| 23  | 7     | 1        | Total Zn<br>1 1 | 0       |
| 23  | Q     | 2        | Total Zn<br>2 2 | 0       |



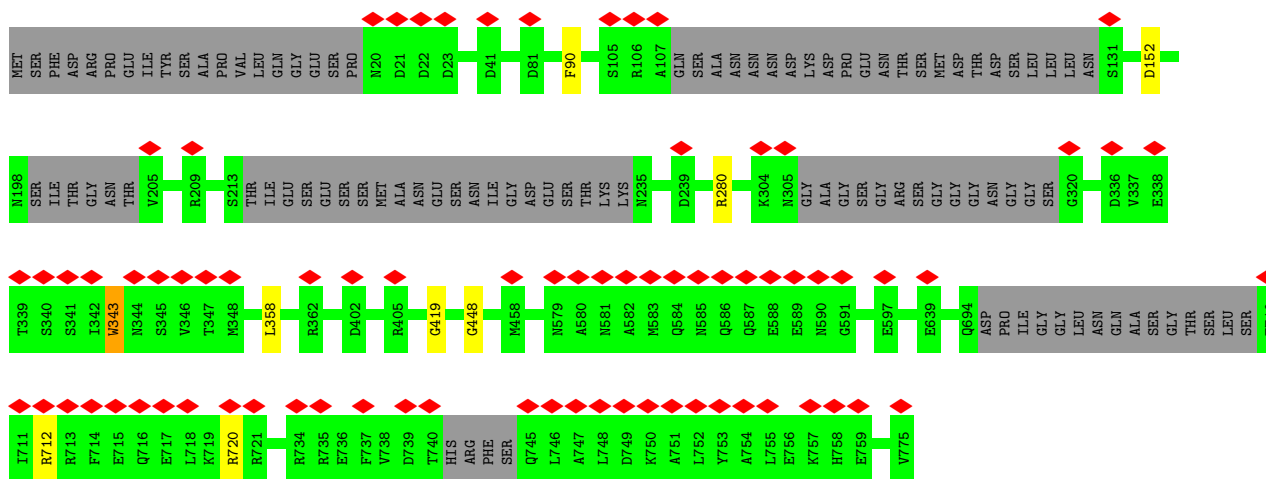
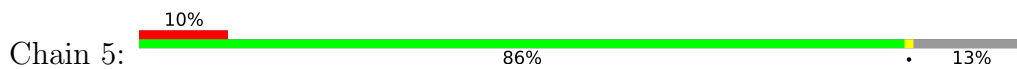


● Molecule 3: DNA replication licensing factor MCM4

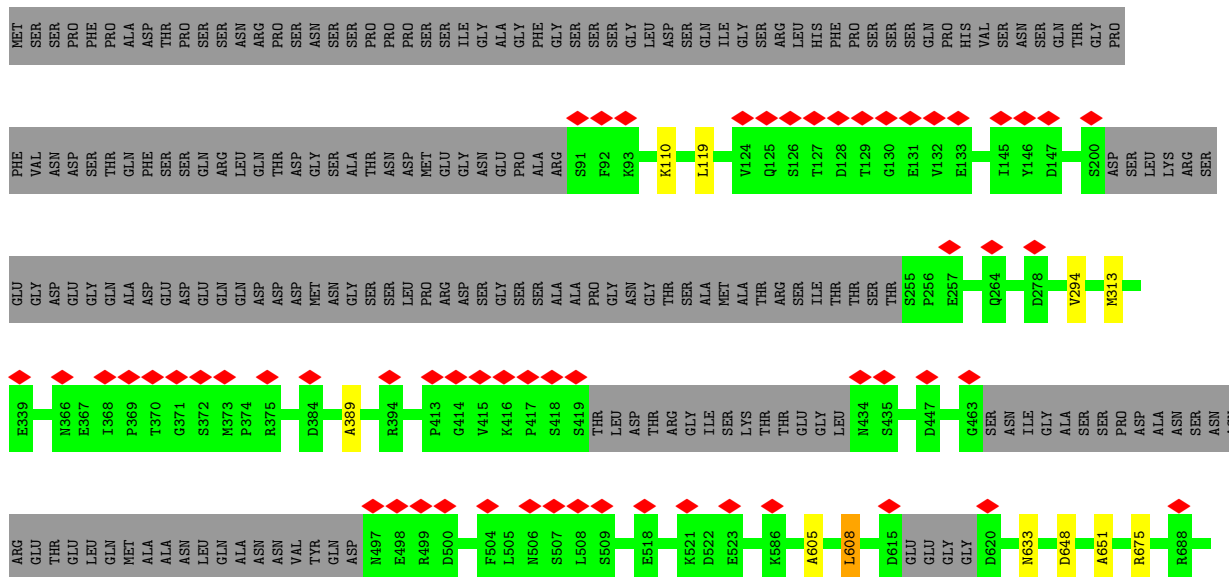


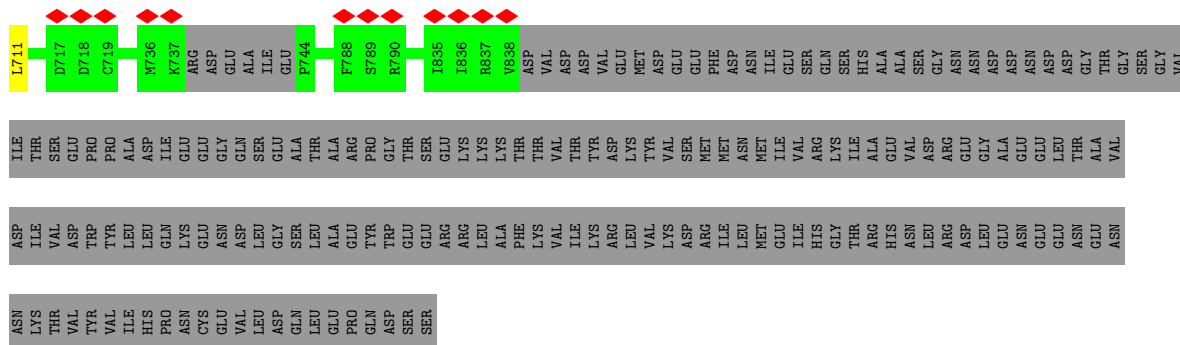


• Molecule 4: DNA helicase

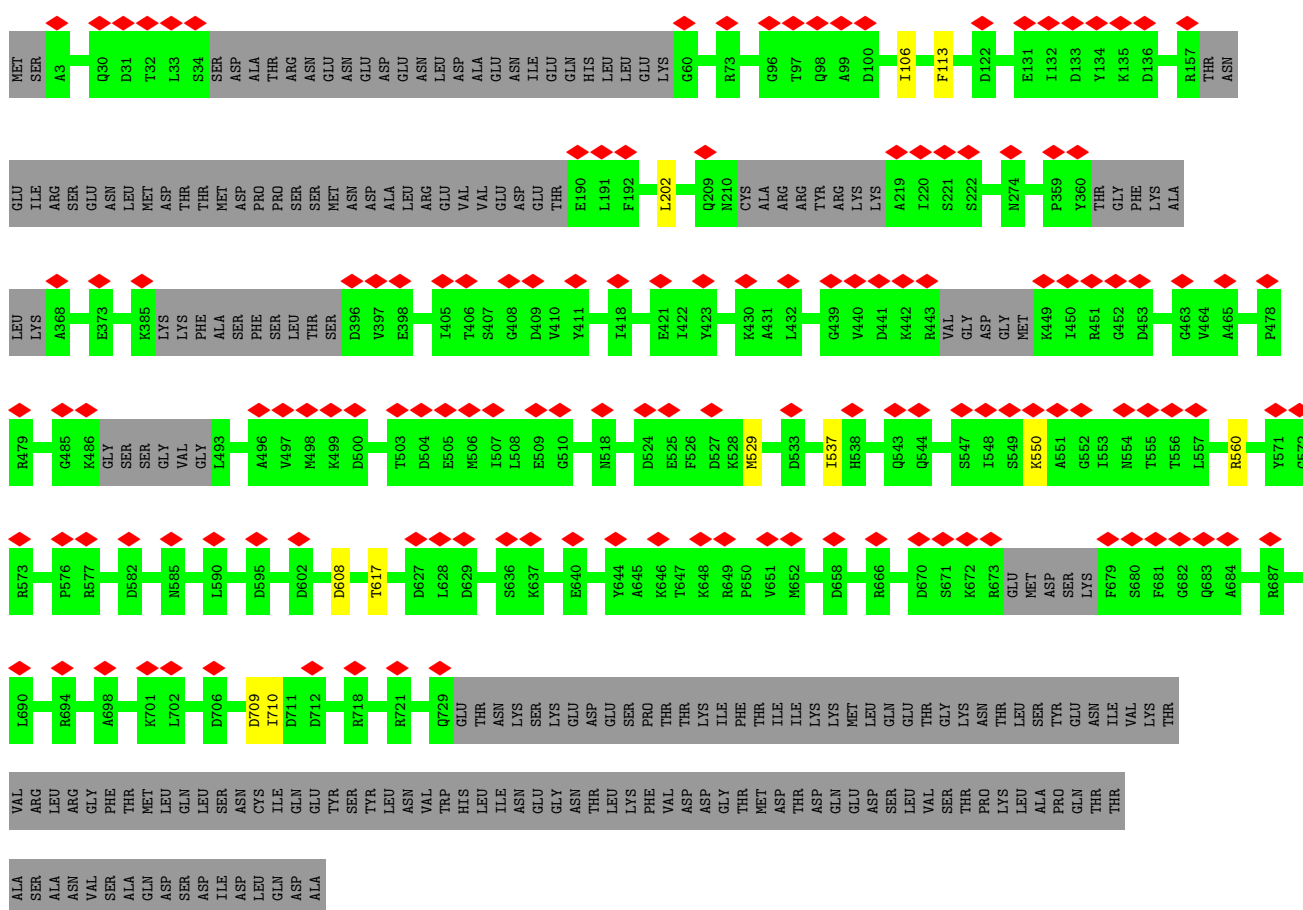


• Molecule 5: DNA replication licensing factor MCM6

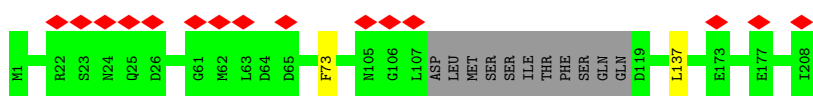




• Molecule 6: DNA replication licensing factor MCM7



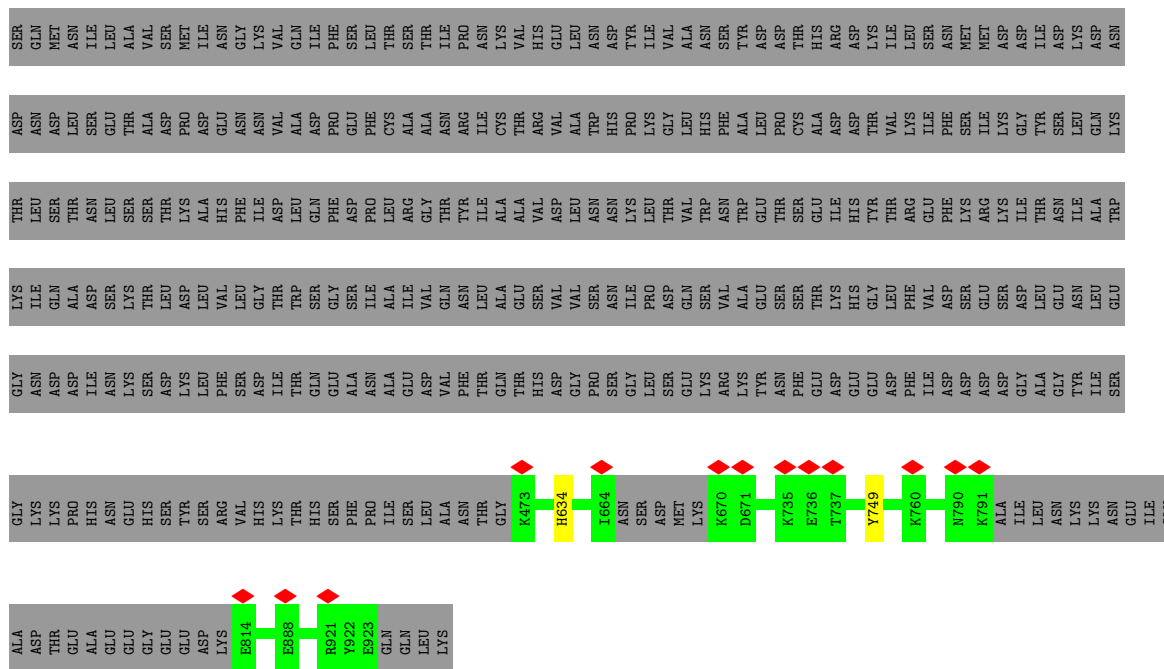
• Molecule 7: DNA replication complex GINS protein PSF1



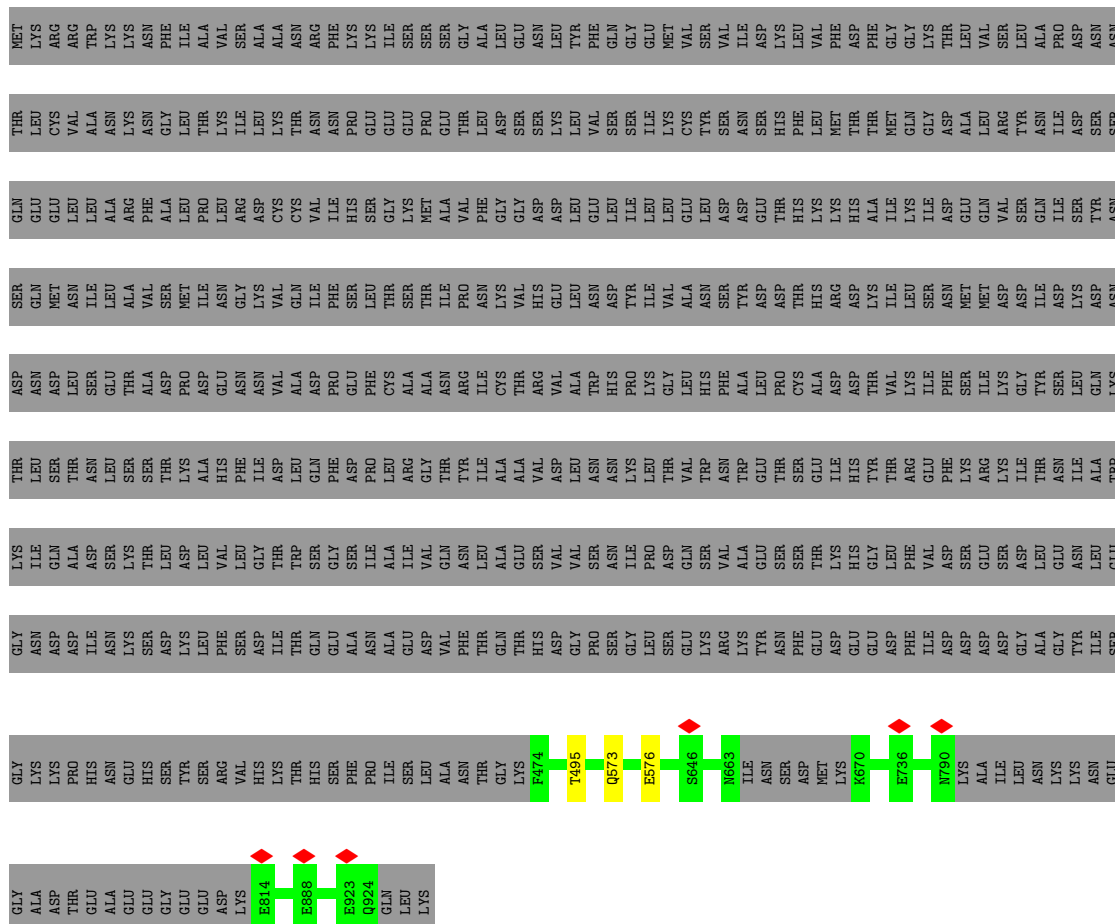
• Molecule 8: DNA replication complex GINS protein PSF2







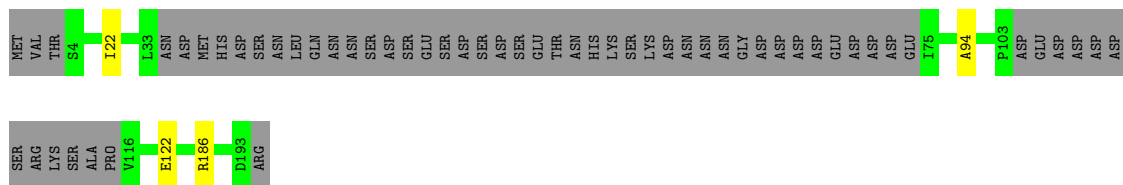
● Molecule 12: DNA polymerase alpha-binding protein



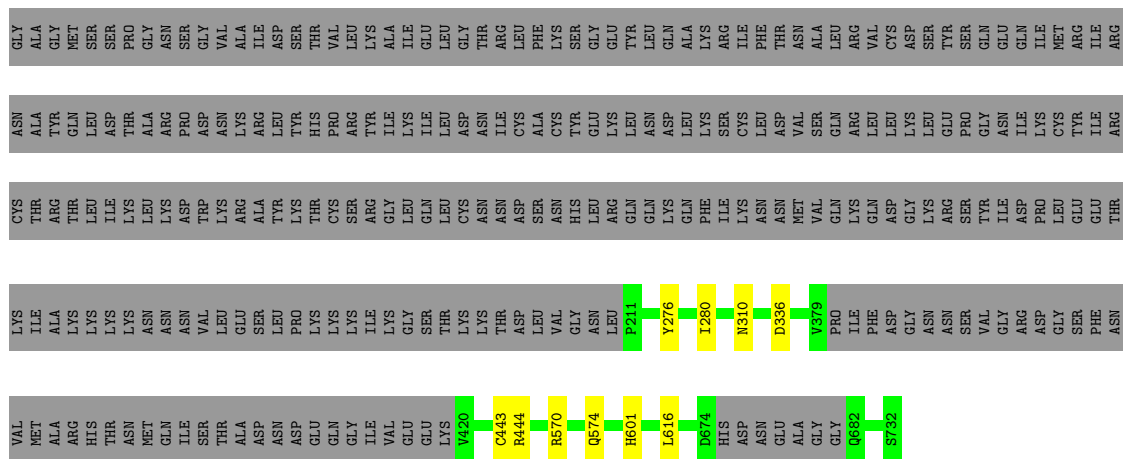




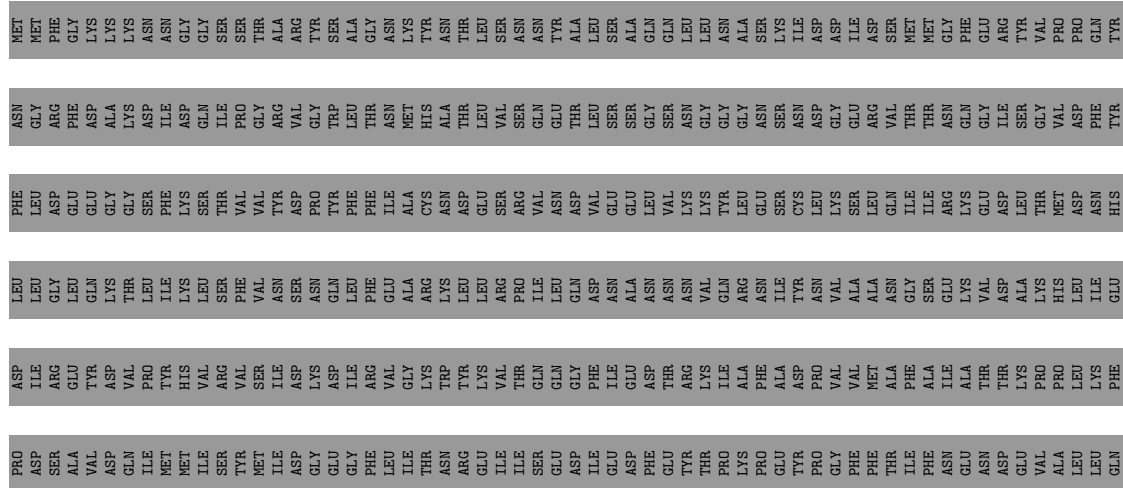
● Molecule 15: E3 ubiquitin ligase complex SCF subunit



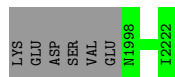
● Molecule 16: Protein DIA2



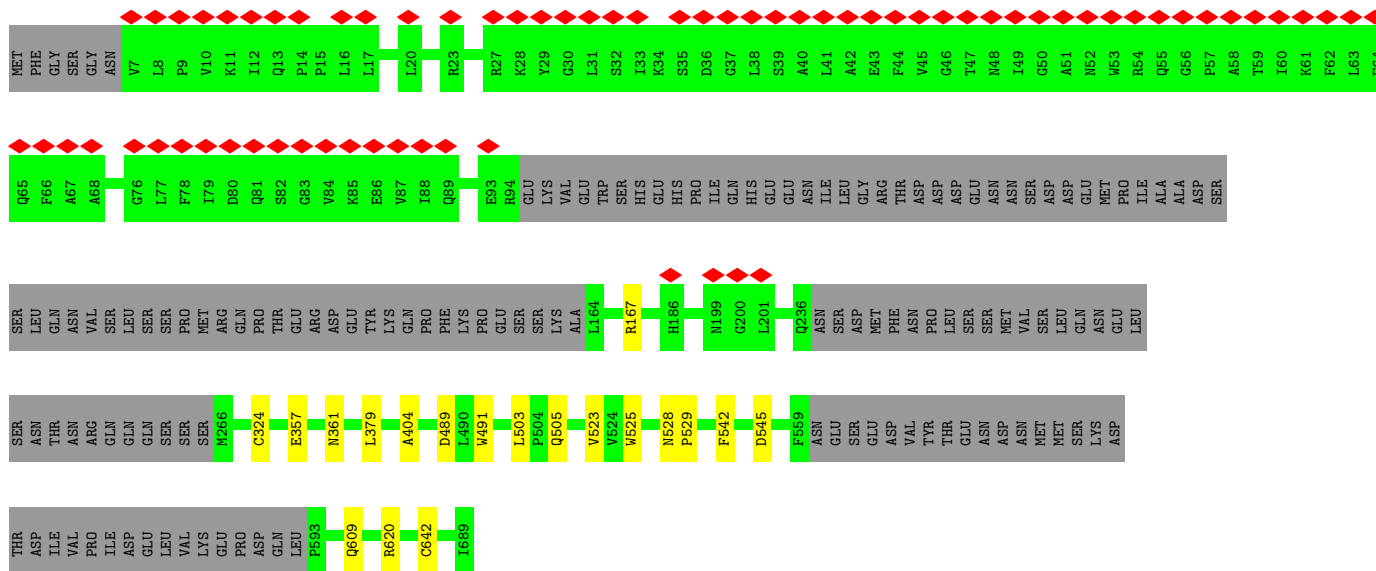
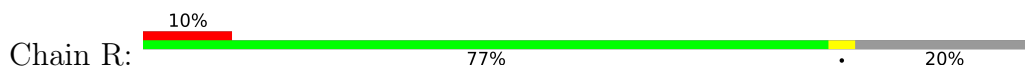
● Molecule 17: DNA polymerase epsilon catalytic subunit A



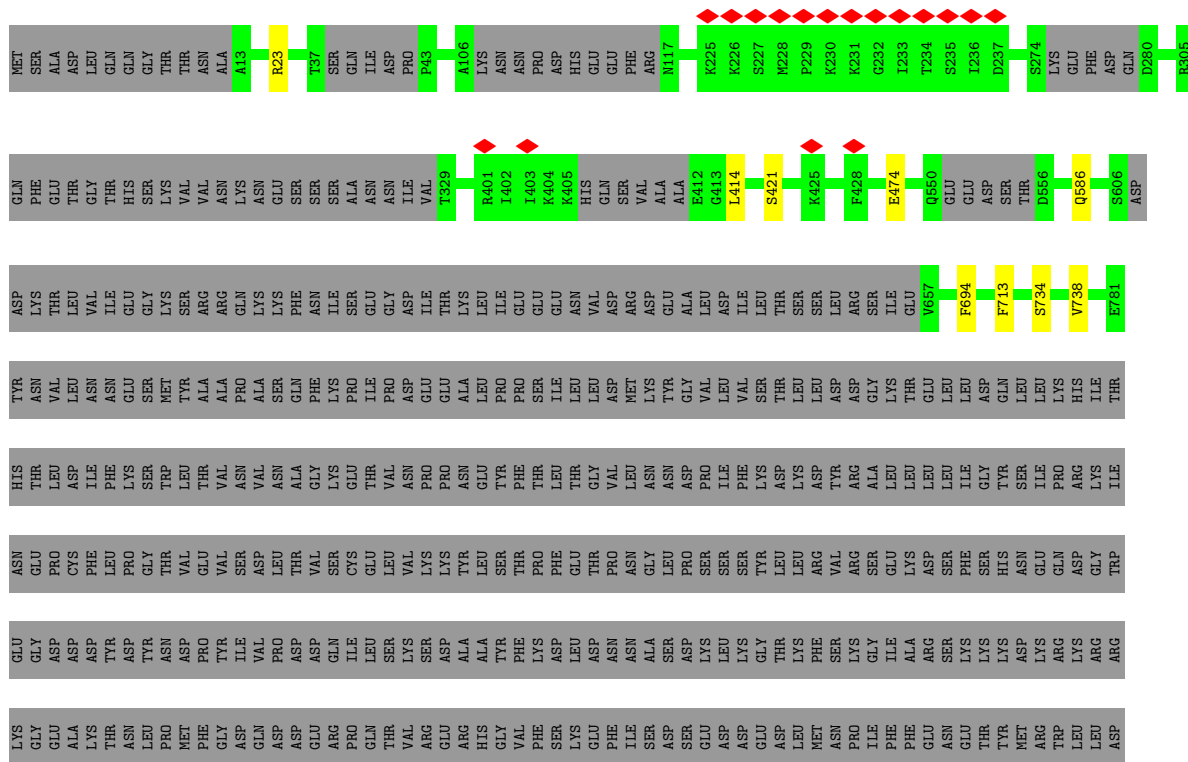




• Molecule 18: DNA polymerase epsilon subunit B



• Molecule 19: Topoisomerase 1-associated factor 1





## 4 Experimental information

| Property                             | Value                                   | Source    |
|--------------------------------------|---|-----------|
| EM reconstruction method             | SINGLE PARTICLE                         | Depositor |
| Imposed symmetry                     | POINT, Not provided                     |           |
| Number of particles used             | 369254                                  | Depositor |
| Resolution determination method      | FSC 0.143 CUT-OFF                       | Depositor |
| CTF correction method                | PHASE FLIPPING AND AMPLITUDE CORRECTION | Depositor |
| Microscope                           | FEI TITAN KRIOS                         | Depositor |
| Voltage (kV)                         | 300                                     | Depositor |
| Electron dose ( $e^-/\text{\AA}^2$ ) | 38.8                                    | Depositor |
| Minimum defocus (nm)                 | 400                                     | Depositor |
| Maximum defocus (nm)                 | 2200                                    | Depositor |
| Magnification                        | 81000                                   | Depositor |
| Image detector                       | GATAN K3 BIOQUANTUM (6k x 4k)           | Depositor |
| Maximum map value                    | 72.258                                  | Depositor |
| Minimum map value                    | -40.891                                 | Depositor |
| Average map value                    | 0.048                                   | Depositor |
| Map value standard deviation         | 1.677                                   | Depositor |
| Recommended contour level            | 7.09                                    | Depositor |
| Map size (Å)                         | 398.55997, 398.55997, 398.55997         | wwPDB     |
| Map dimensions                       | 376, 376, 376                           | wwPDB     |
| Map angles (°)                       | 90.0, 90.0, 90.0                        | wwPDB     |
| Pixel spacing (Å)                    | 1.06, 1.06, 1.06                        | Depositor |



## 5 Model quality i

### 5.1 Standard geometry i

Bond lengths and bond angles in the following residue types are not validated in this section: ZN, ANP, MG

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   | 2     | 0.34         | 0/5264         | 0.68        | 0/7111          |
| 2   | 3     | 0.31         | 0/4843         | 0.65        | 0/6565          |
| 3   | 4     | 0.32         | 0/4819         | 0.67        | 0/6512          |
| 4   | 5     | 0.34         | 0/5407         | 0.67        | 2/7300 (0.0%)   |
| 5   | 6     | 0.32         | 0/5095         | 0.67        | 0/6875          |
| 6   | 7     | 0.31         | 0/4987         | 0.64        | 0/6747          |
| 7   | A     | 0.32         | 0/1631         | 0.65        | 0/2194          |
| 8   | B     | 0.30         | 0/1642         | 0.63        | 0/2221          |
| 9   | C     | 0.32         | 0/1414         | 0.56        | 0/1911          |
| 10  | D     | 0.32         | 0/2040         | 0.60        | 0/2755          |
| 11  | E     | 0.31         | 0/4653         | 0.64        | 0/6297          |
| 12  | F     | 0.31         | 0/3489         | 0.63        | 0/4724          |
| 12  | G     | 0.31         | 0/3465         | 0.63        | 0/4696          |
| 12  | H     | 0.32         | 0/3496         | 0.62        | 0/4735          |
| 13  | I     | 0.79         | 0/883          | 1.18        | 3/1371 (0.2%)   |
| 14  | J     | 1.22         | 1/694 (0.1%)   | 1.39        | 3/1053 (0.3%)   |
| 15  | K     | 0.34         | 0/1139         | 0.68        | 0/1539          |
| 16  | L     | 0.36         | 0/3996         | 0.66        | 0/5395          |
| 17  | Q     | 0.33         | 0/6332         | 0.61        | 0/8548          |
| 18  | R     | 0.34         | 0/4526         | 0.65        | 0/6125          |
| 19  | X     | 0.33         | 0/5512         | 0.61        | 0/7426          |
| 20  | Y     | 0.33         | 0/807          | 0.61        | 0/1084          |
| All | All   | 0.35         | 1/76134 (0.0%) | 0.67        | 8/103184 (0.0%) |

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

| Mol | Chain | #Chirality outliers | #Planarity outliers |
|-----|-------|---------------------|---------------------|
| 16  | L     | 0                   | 1                   |

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| Mol | Chain | #Chirality outliers | #Planarity outliers |
|-----|-------|---------------------|---------------------|
| 18  | R     | 0                   | 1                   |
| All | All   | 0                   | 2                   |

All (1) bond length outliers are listed below:

| Mol | Chain | Res | Type | Atoms  | Z    | Observed(Å) | Ideal(Å) |
|-----|-------|-----|------|--------|------|-------------|----------|
| 14  | J     | 104 | DC   | C1'-N1 | 7.01 | 1.58        | 1.49     |

All (8) bond angle outliers are listed below:

| Mol | Chain | Res | Type | Atoms       | Z     | Observed(°) | Ideal(°) |
|-----|-------|-----|------|-------------|-------|-------------|----------|
| 13  | I     | 101 | DT   | OP1-P-OP2   | -7.19 | 108.81      | 119.60   |
| 13  | I     | 1   | DG   | OP1-P-OP2   | -6.54 | 109.80      | 119.60   |
| 14  | J     | 1   | DC   | OP1-P-OP2   | -6.38 | 110.04      | 119.60   |
| 14  | J     | 101 | DC   | OP1-P-OP2   | -6.17 | 110.35      | 119.60   |
| 13  | I     | 102 | DT   | P-O3'-C3'   | 5.67  | 126.50      | 119.70   |
| 14  | J     | 10  | DC   | C1'-O4'-C4' | -5.58 | 104.52      | 110.10   |
| 4   | 5     | 152 | ASP  | CB-CG-OD1   | 5.08  | 122.87      | 118.30   |
| 4   | 5     | 343 | TRP  | CA-CB-CG    | 5.04  | 123.28      | 113.70   |

There are no chirality outliers.

All (2) planarity outliers are listed below:

| Mol | Chain | Res | Type | Group   |
|-----|-------|-----|------|---------|
| 16  | L     | 601 | HIS  | Peptide |
| 18  | R     | 489 | ASP  | Peptide |

## 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   | 2     | 5175  | 0        | 5219     | 6       | 0            |
| 2   | 3     | 4759  | 0        | 4819     | 7       | 0            |
| 3   | 4     | 4749  | 0        | 4816     | 3       | 0            |
| 4   | 5     | 5332  | 0        | 5397     | 3       | 0            |
| 5   | 6     | 5013  | 0        | 5022     | 5       | 0            |

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| Mol | Chain | Non-H | H(model) | H(added) | Clashes | Symm-Clashes |
|-----|-------|-------|----------|----------|---------|--------------|
| 6   | 7     | 4914  | 0        | 4949     | 6       | 0            |
| 7   | A     | 1611  | 0        | 1615     | 2       | 0            |
| 8   | B     | 1609  | 0        | 1662     | 2       | 0            |
| 9   | C     | 1381  | 0        | 1394     | 0       | 0            |
| 10  | D     | 2004  | 0        | 2001     | 2       | 0            |
| 11  | E     | 4569  | 0        | 4556     | 3       | 0            |
| 12  | F     | 3404  | 0        | 3352     | 1       | 0            |
| 12  | G     | 3380  | 0        | 3310     | 1       | 0            |
| 12  | H     | 3411  | 0        | 3355     | 2       | 0            |
| 13  | I     | 782   | 0        | 403      | 0       | 0            |
| 14  | J     | 629   | 0        | 365      | 0       | 0            |
| 15  | K     | 1120  | 0        | 1111     | 1       | 0            |
| 16  | L     | 3921  | 0        | 4025     | 3       | 0            |
| 17  | Q     | 6203  | 0        | 6270     | 2       | 0            |
| 18  | R     | 4427  | 0        | 4480     | 10      | 0            |
| 19  | X     | 5410  | 0        | 5573     | 3       | 0            |
| 20  | Y     | 791   | 0        | 811      | 0       | 0            |
| 21  | 2     | 31    | 0        | 13       | 2       | 0            |
| 21  | 3     | 31    | 0        | 13       | 1       | 0            |
| 21  | 5     | 31    | 0        | 13       | 2       | 0            |
| 22  | 2     | 1     | 0        | 0        | 0       | 0            |
| 22  | 3     | 1     | 0        | 0        | 0       | 0            |
| 22  | 5     | 1     | 0        | 0        | 0       | 0            |
| 23  | 2     | 1     | 0        | 0        | 0       | 0            |
| 23  | 4     | 1     | 0        | 0        | 0       | 0            |
| 23  | 5     | 1     | 0        | 0        | 0       | 0            |
| 23  | 6     | 1     | 0        | 0        | 0       | 0            |
| 23  | 7     | 1     | 0        | 0        | 0       | 0            |
| 23  | Q     | 2     | 0        | 0        | 0       | 0            |
| All | All   | 74697 | 0        | 74544    | 57      | 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 0.

All (57) 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) |
|------------------|--------------------|--------------------------|-------------------|
| 2:3:412:SER:H    | 21:3:1500:ANP:HNB1 | 1.44                     | 0.66              |
| 6:7:106:ILE:HG22 | 6:7:113:PHE:CG     | 2.41                     | 0.55              |
| 6:7:529:MET:HE1  | 6:7:537:ILE:HD12   | 1.88                     | 0.55              |
| 1:2:546:GLY:H    | 21:2:1500:ANP:HNB1 | 1.55                     | 0.53              |

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| Atom-1            | Atom-2             | Interatomic distance (Å) | Clash overlap (Å) |
|-------------------|--------------------|--------------------------|-------------------|
| 18:R:503:LEU:HD11 | 18:R:542:PHE:HE1   | 1.73                     | 0.53              |
| 7:A:137:LEU:HD13  | 10:D:185:THR:HG21  | 1.91                     | 0.52              |
| 6:7:529:MET:CE    | 6:7:537:ILE:HD12   | 2.39                     | 0.52              |
| 18:R:503:LEU:HD11 | 18:R:542:PHE:CE1   | 2.45                     | 0.51              |
| 11:E:45:LEU:HD21  | 11:E:82:LEU:HD22   | 1.93                     | 0.51              |
| 3:4:801:MET:SD    | 3:4:826:VAL:HG22   | 2.51                     | 0.51              |
| 8:B:85:CYS:SG     | 8:B:86:SER:N       | 2.84                     | 0.51              |
| 16:L:443:CYS:SG   | 16:L:444:ARG:N     | 2.84                     | 0.51              |
| 4:5:419:GLY:H     | 21:5:1500:ANP:HNB1 | 1.58                     | 0.50              |
| 19:X:694:PHE:CZ   | 19:X:738:VAL:HG22  | 2.47                     | 0.50              |
| 2:3:676:ILE:HD12  | 6:7:617:THR:HB     | 1.93                     | 0.50              |
| 18:R:503:LEU:O    | 18:R:505:GLN:N     | 2.45                     | 0.49              |
| 5:6:605:ALA:HB2   | 5:6:648:ASP:HA     | 1.93                     | 0.49              |
| 4:5:419:GLY:N     | 21:5:1500:ANP:HNB1 | 2.10                     | 0.49              |
| 2:3:674:GLU:OE2   | 2:3:722:ASN:ND2    | 2.44                     | 0.49              |
| 11:E:2:TYR:OH     | 11:E:137:SER:O     | 2.22                     | 0.48              |
| 1:2:546:GLY:N     | 21:2:1500:ANP:HNB1 | 2.12                     | 0.48              |
| 19:X:734:SER:O    | 19:X:738:VAL:HG23  | 2.15                     | 0.47              |
| 5:6:605:ALA:HB1   | 5:6:651:ALA:HB2    | 1.97                     | 0.46              |
| 8:B:113:SER:O     | 8:B:152:ARG:NH2    | 2.48                     | 0.46              |
| 18:R:523:VAL:HG11 | 18:R:525:TRP:CZ2   | 2.51                     | 0.46              |
| 6:7:106:ILE:HG22  | 6:7:113:PHE:CD1    | 2.51                     | 0.46              |
| 2:3:671:LEU:HG    | 2:3:676:ILE:HD11   | 1.98                     | 0.45              |
| 7:A:137:LEU:HD13  | 10:D:185:THR:CG2   | 2.47                     | 0.44              |
| 1:2:671:GLU:OE1   | 1:2:671:GLU:N      | 2.50                     | 0.44              |
| 15:K:22:ILE:HG23  | 15:K:94:ALA:HB1    | 2.00                     | 0.44              |
| 2:3:367:LEU:HD22  | 2:3:421:PHE:HE2    | 1.82                     | 0.44              |
| 2:3:367:LEU:HD23  | 2:3:656:LEU:HD21   | 1.99                     | 0.44              |
| 3:4:822:VAL:O     | 3:4:826:VAL:HG23   | 2.18                     | 0.43              |
| 18:R:361:ASN:ND2  | 18:R:379:LEU:O     | 2.52                     | 0.43              |
| 12:F:634:HIS:NE2  | 12:H:657:LEU:O     | 2.51                     | 0.43              |
| 12:H:513:ILE:N    | 12:H:528:PHE:O     | 2.50                     | 0.43              |
| 18:R:324:CYS:SG   | 18:R:609:GLN:NE2   | 2.92                     | 0.43              |
| 18:R:528:ASN:HB3  | 18:R:529:PRO:HD3   | 2.01                     | 0.43              |
| 17:Q:1574:SER:O   | 17:Q:1578:THR:HG23 | 2.18                     | 0.42              |
| 18:R:503:LEU:HD13 | 18:R:620:ARG:NH2   | 2.34                     | 0.42              |
| 1:2:364:CYS:O     | 1:2:368:LYS:N      | 2.51                     | 0.42              |
| 18:R:503:LEU:O    | 18:R:503:LEU:HD12  | 2.19                     | 0.42              |
| 6:7:709:ASP:OD1   | 6:7:710:ILE:N      | 2.52                     | 0.42              |
| 1:2:611:LYS:NZ    | 1:2:651:ASN:OD1    | 2.52                     | 0.41              |
| 5:6:294:VAL:HG21  | 5:6:389:ALA:HB1    | 2.02                     | 0.41              |

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| Atom-1             | Atom-2           | Interatomic distance (Å) | Clash overlap (Å) |
|--------------------|------------------|--------------------------|-------------------|
| 5:6:608:LEU:HD23   | 5:6:608:LEU:HA   | 1.82                     | 0.41              |
| 16:L:570:ARG:NH2   | 16:L:574:GLN:OE1 | 2.52                     | 0.41              |
| 17:Q:1743:THR:HG21 | 17:Q:1840:THR:HA | 2.02                     | 0.41              |
| 18:R:404:ALA:HB2   | 18:R:642:CYS:SG  | 2.61                     | 0.41              |
| 19:X:421:SER:O     | 19:X:586:GLN:NE2 | 2.51                     | 0.41              |
| 2:3:235:ASP:OD1    | 2:3:236:THR:N    | 2.52                     | 0.41              |
| 12:G:573:GLN:NE2   | 12:G:576:GLU:OE1 | 2.54                     | 0.41              |
| 3:4:567:CYS:SG     | 3:4:568:GLY:N    | 2.92                     | 0.41              |
| 11:E:10:GLU:OE1    | 11:E:10:GLU:N    | 2.54                     | 0.41              |
| 16:L:280:ILE:HG22  | 16:L:310:ASN:HB2 | 2.02                     | 0.40              |
| 5:6:633:ASN:N      | 5:6:675:ARG:O    | 2.54                     | 0.40              |
| 1:2:633:LYS:HA     | 4:5:448:GLY:HA3  | 2.03                     | 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 PDB entries followed by that with respect to all EM entries.

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   | 2     | 649/868 (75%)  | 636 (98%) | 13 (2%) | 0        | 100         | 100 |
| 2   | 3     | 595/1009 (59%) | 584 (98%) | 10 (2%) | 1 (0%)   | 47          | 79  |
| 3   | 4     | 585/933 (63%)  | 573 (98%) | 12 (2%) | 0        | 100         | 100 |
| 4   | 5     | 659/775 (85%)  | 641 (97%) | 18 (3%) | 0        | 100         | 100 |
| 5   | 6     | 625/1017 (62%) | 602 (96%) | 23 (4%) | 0        | 100         | 100 |
| 6   | 7     | 611/845 (72%)  | 597 (98%) | 14 (2%) | 0        | 100         | 100 |
| 7   | A     | 193/208 (93%)  | 187 (97%) | 6 (3%)  | 0        | 100         | 100 |
| 8   | B     | 188/213 (88%)  | 182 (97%) | 6 (3%)  | 0        | 100         | 100 |
| 9   | C     | 165/194 (85%)  | 163 (99%) | 2 (1%)  | 0        | 100         | 100 |
| 10  | D     | 237/294 (81%)  | 232 (98%) | 5 (2%)  | 0        | 100         | 100 |

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| Mol | Chain | Analysed         | Favoured   | Allowed  | Outliers | Percentiles |     |
|-----|-------|------------------|------------|----------|----------|-------------|-----|
| 11  | E     | 554/657 (84%)    | 547 (99%)  | 7 (1%)   | 0        | 100         | 100 |
| 12  | F     | 418/962 (44%)    | 407 (97%)  | 11 (3%)  | 0        | 100         | 100 |
| 12  | G     | 416/962 (43%)    | 404 (97%)  | 12 (3%)  | 0        | 100         | 100 |
| 12  | H     | 419/962 (44%)    | 410 (98%)  | 9 (2%)   | 0        | 100         | 100 |
| 15  | K     | 131/194 (68%)    | 123 (94%)  | 8 (6%)   | 0        | 100         | 100 |
| 16  | L     | 469/735 (64%)    | 445 (95%)  | 24 (5%)  | 0        | 100         | 100 |
| 17  | Q     | 740/2222 (33%)   | 720 (97%)  | 20 (3%)  | 0        | 100         | 100 |
| 18  | R     | 544/689 (79%)    | 530 (97%)  | 14 (3%)  | 0        | 100         | 100 |
| 19  | X     | 649/1238 (52%)   | 636 (98%)  | 13 (2%)  | 0        | 100         | 100 |
| 20  | Y     | 96/319 (30%)     | 95 (99%)   | 1 (1%)   | 0        | 100         | 100 |
| All | All   | 8943/15296 (58%) | 8714 (97%) | 228 (2%) | 1 (0%)   | 100         | 100 |

All (1) Ramachandran outliers are listed below:

| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 2   | 3     | 443 | THR  |

### 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 PDB entries followed by that with respect to all EM entries.

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   | 2     | 569/770 (74%) | 564 (99%)  | 5 (1%)   | 78          | 91  |
| 2   | 3     | 522/866 (60%) | 522 (100%) | 0        | 100         | 100 |
| 3   | 4     | 539/848 (64%) | 538 (100%) | 1 (0%)   | 93          | 98  |
| 4   | 5     | 604/688 (88%) | 598 (99%)  | 6 (1%)   | 76          | 90  |
| 5   | 6     | 550/886 (62%) | 545 (99%)  | 5 (1%)   | 78          | 91  |
| 6   | 7     | 542/753 (72%) | 538 (99%)  | 4 (1%)   | 84          | 94  |
| 7   | A     | 182/193 (94%) | 181 (100%) | 1 (0%)   | 88          | 95  |
| 8   | B     | 182/198 (92%) | 181 (100%) | 1 (0%)   | 88          | 95  |

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| Mol | Chain | Analysed         | Rotameric  | Outliers | Percentiles |     |
|-----|-------|------------------|------------|----------|-------------|-----|
| 9   | C     | 154/173 (89%)    | 154 (100%) | 0        | 100         | 100 |
| 10  | D     | 234/279 (84%)    | 234 (100%) | 0        | 100         | 100 |
| 11  | E     | 507/592 (86%)    | 502 (99%)  | 5 (1%)   | 76          | 90  |
| 12  | F     | 375/854 (44%)    | 374 (100%) | 1 (0%)   | 92          | 96  |
| 12  | G     | 372/854 (44%)    | 371 (100%) | 1 (0%)   | 92          | 96  |
| 12  | H     | 375/854 (44%)    | 374 (100%) | 1 (0%)   | 92          | 96  |
| 15  | K     | 124/179 (69%)    | 122 (98%)  | 2 (2%)   | 62          | 84  |
| 16  | L     | 456/686 (66%)    | 453 (99%)  | 3 (1%)   | 84          | 94  |
| 17  | Q     | 701/2012 (35%)   | 698 (100%) | 3 (0%)   | 91          | 95  |
| 18  | R     | 498/629 (79%)    | 494 (99%)  | 4 (1%)   | 81          | 93  |
| 19  | X     | 607/1125 (54%)   | 603 (99%)  | 4 (1%)   | 84          | 94  |
| 20  | Y     | 85/286 (30%)     | 85 (100%)  | 0        | 100         | 100 |
| All | All   | 8178/13725 (60%) | 8131 (99%) | 47 (1%)  | 86          | 94  |

All (47) residues with a non-rotameric sidechain are listed below:

| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 1   | 2     | 271 | PHE  |
| 1   | 2     | 558 | LYS  |
| 1   | 2     | 581 | ARG  |
| 1   | 2     | 743 | ARG  |
| 1   | 2     | 779 | HIS  |
| 3   | 4     | 594 | LYS  |
| 4   | 5     | 90  | PHE  |
| 4   | 5     | 280 | ARG  |
| 4   | 5     | 343 | TRP  |
| 4   | 5     | 358 | LEU  |
| 4   | 5     | 712 | ARG  |
| 4   | 5     | 720 | ARG  |
| 5   | 6     | 110 | LYS  |
| 5   | 6     | 119 | LEU  |
| 5   | 6     | 313 | MET  |
| 5   | 6     | 608 | LEU  |
| 5   | 6     | 711 | LEU  |
| 6   | 7     | 202 | LEU  |
| 6   | 7     | 550 | LYS  |
| 6   | 7     | 560 | ARG  |
| 6   | 7     | 608 | ASP  |

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| Mol | Chain | Res  | Type |
|-----|-------|------|------|
| 7   | A     | 73   | PHE  |
| 8   | B     | 85   | CYS  |
| 11  | E     | 2    | TYR  |
| 11  | E     | 325  | TYR  |
| 11  | E     | 357  | LYS  |
| 11  | E     | 607  | MET  |
| 11  | E     | 619  | LYS  |
| 12  | F     | 749  | TYR  |
| 12  | G     | 495  | THR  |
| 12  | H     | 530  | ASP  |
| 15  | K     | 122  | GLU  |
| 15  | K     | 186  | ARG  |
| 16  | L     | 276  | TYR  |
| 16  | L     | 336  | ASP  |
| 16  | L     | 616  | LEU  |
| 17  | Q     | 1610 | MET  |
| 17  | Q     | 1664 | ARG  |
| 17  | Q     | 1920 | LEU  |
| 18  | R     | 167  | ARG  |
| 18  | R     | 357  | GLU  |
| 18  | R     | 491  | TRP  |
| 18  | R     | 545  | ASP  |
| 19  | X     | 23   | ARG  |
| 19  | X     | 414  | LEU  |
| 19  | X     | 474  | GLU  |
| 19  | X     | 713  | PHE  |

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 18  | R     | 609 | GLN  |

### 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](#)

Of 13 ligands modelled in this entry, 10 are monoatomic - leaving 3 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

| Mol | Type | Chain | Res  | Link | Bond lengths |      |          | Bond angles |      |          |
|-----|------|-------|------|------|--------------|------|----------|-------------|------|----------|
|     |      |       |      |      | Counts       | RMSZ | # Z  > 2 | Counts      | RMSZ | # Z  > 2 |
| 21  | ANP  | 2     | 1500 | -    | 29,33,33     | 1.12 | 4 (13%)  | 31,52,52    | 0.98 | 2 (6%)   |
| 21  | ANP  | 3     | 1500 | -    | 29,33,33     | 1.13 | 4 (13%)  | 31,52,52    | 1.00 | 2 (6%)   |
| 21  | ANP  | 5     | 1500 | -    | 29,33,33     | 1.09 | 4 (13%)  | 31,52,52    | 1.04 | 2 (6%)   |

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

| Mol | Type | Chain | Res  | Link | Chirals | Torsions   | Rings   |
|-----|------|-------|------|------|---------|------------|---------|
| 21  | ANP  | 2     | 1500 | -    | -       | 3/14/38/38 | 0/3/3/3 |
| 21  | ANP  | 3     | 1500 | -    | -       | 3/14/38/38 | 0/3/3/3 |
| 21  | ANP  | 5     | 1500 | -    | -       | 4/14/38/38 | 0/3/3/3 |

All (12) bond length outliers are listed below:

| Mol | Chain | Res  | Type | Atoms  | Z     | Observed(Å) | Ideal(Å) |
|-----|-------|------|------|--------|-------|-------------|----------|
| 21  | 3     | 1500 | ANP  | PB-O3A | -3.38 | 1.54        | 1.59     |
| 21  | 2     | 1500 | ANP  | PB-O3A | -3.19 | 1.55        | 1.59     |
| 21  | 5     | 1500 | ANP  | PB-O3A | -2.81 | 1.55        | 1.59     |
| 21  | 2     | 1500 | ANP  | PG-O1G | 2.40  | 1.50        | 1.46     |
| 21  | 3     | 1500 | ANP  | PG-O1G | 2.39  | 1.49        | 1.46     |
| 21  | 5     | 1500 | ANP  | PG-O1G | 2.31  | 1.49        | 1.46     |
| 21  | 2     | 1500 | ANP  | PB-O1B | 2.30  | 1.49        | 1.46     |
| 21  | 5     | 1500 | ANP  | PG-N3B | 2.24  | 1.69        | 1.63     |

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| Mol | Chain | Res  | Type | Atoms  | Z    | Observed(Å) | Ideal(Å) |
|-----|-------|------|------|--------|------|-------------|----------|
| 21  | 2     | 1500 | ANP  | PG-N3B | 2.22 | 1.69        | 1.63     |
| 21  | 5     | 1500 | ANP  | PB-O1B | 2.20 | 1.49        | 1.46     |
| 21  | 3     | 1500 | ANP  | PB-O1B | 2.19 | 1.49        | 1.46     |
| 21  | 3     | 1500 | ANP  | PG-N3B | 2.08 | 1.68        | 1.63     |

All (6) bond angle outliers are listed below:

| Mol | Chain | Res  | Type | Atoms     | Z     | Observed(°) | Ideal(°) |
|-----|-------|------|------|-----------|-------|-------------|----------|
| 21  | 5     | 1500 | ANP  | PB-O3A-PA | -3.60 | 119.93      | 132.62   |
| 21  | 2     | 1500 | ANP  | PB-O3A-PA | -3.09 | 121.72      | 132.62   |
| 21  | 3     | 1500 | ANP  | PB-O3A-PA | -2.89 | 122.44      | 132.62   |
| 21  | 5     | 1500 | ANP  | C5-C6-N6  | 2.35  | 123.93      | 120.35   |
| 21  | 3     | 1500 | ANP  | C5-C6-N6  | 2.30  | 123.84      | 120.35   |
| 21  | 2     | 1500 | ANP  | C5-C6-N6  | 2.29  | 123.84      | 120.35   |

There are no chirality outliers.

All (10) torsion outliers are listed below:

| Mol | Chain | Res  | Type | Atoms           |
|-----|-------|------|------|-----------------|
| 21  | 2     | 1500 | ANP  | PB-N3B-PG-O1G   |
| 21  | 2     | 1500 | ANP  | PA-O3A-PB-O1B   |
| 21  | 2     | 1500 | ANP  | PA-O3A-PB-O2B   |
| 21  | 3     | 1500 | ANP  | PB-N3B-PG-O1G   |
| 21  | 3     | 1500 | ANP  | PA-O3A-PB-O1B   |
| 21  | 3     | 1500 | ANP  | PA-O3A-PB-O2B   |
| 21  | 5     | 1500 | ANP  | PB-N3B-PG-O1G   |
| 21  | 5     | 1500 | ANP  | O4'-C4'-C5'-O5' |
| 21  | 5     | 1500 | ANP  | C3'-C4'-C5'-O5' |
| 21  | 5     | 1500 | ANP  | PA-O3A-PB-O2B   |

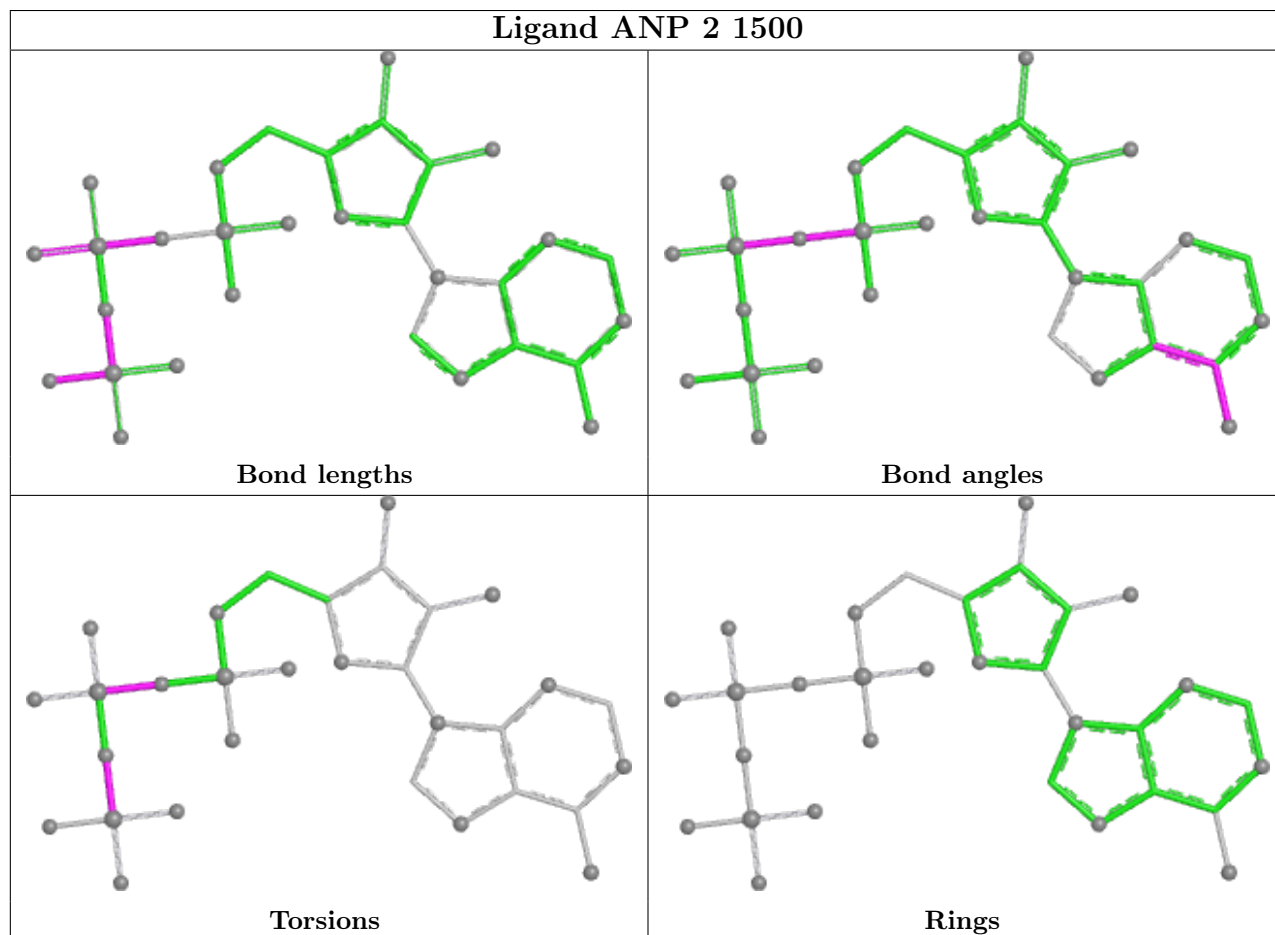
There are no ring outliers.

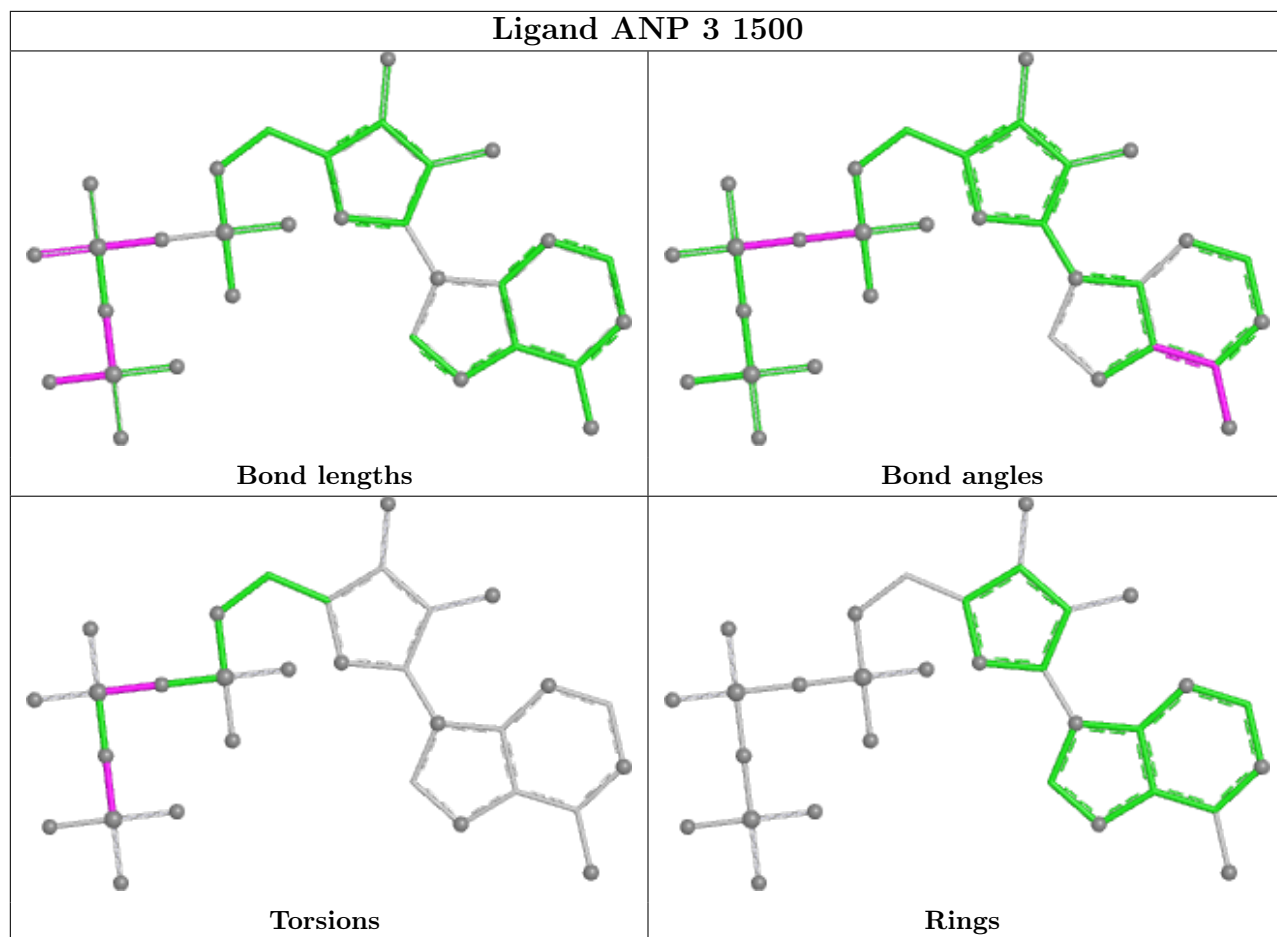
3 monomers are involved in 5 short contacts:

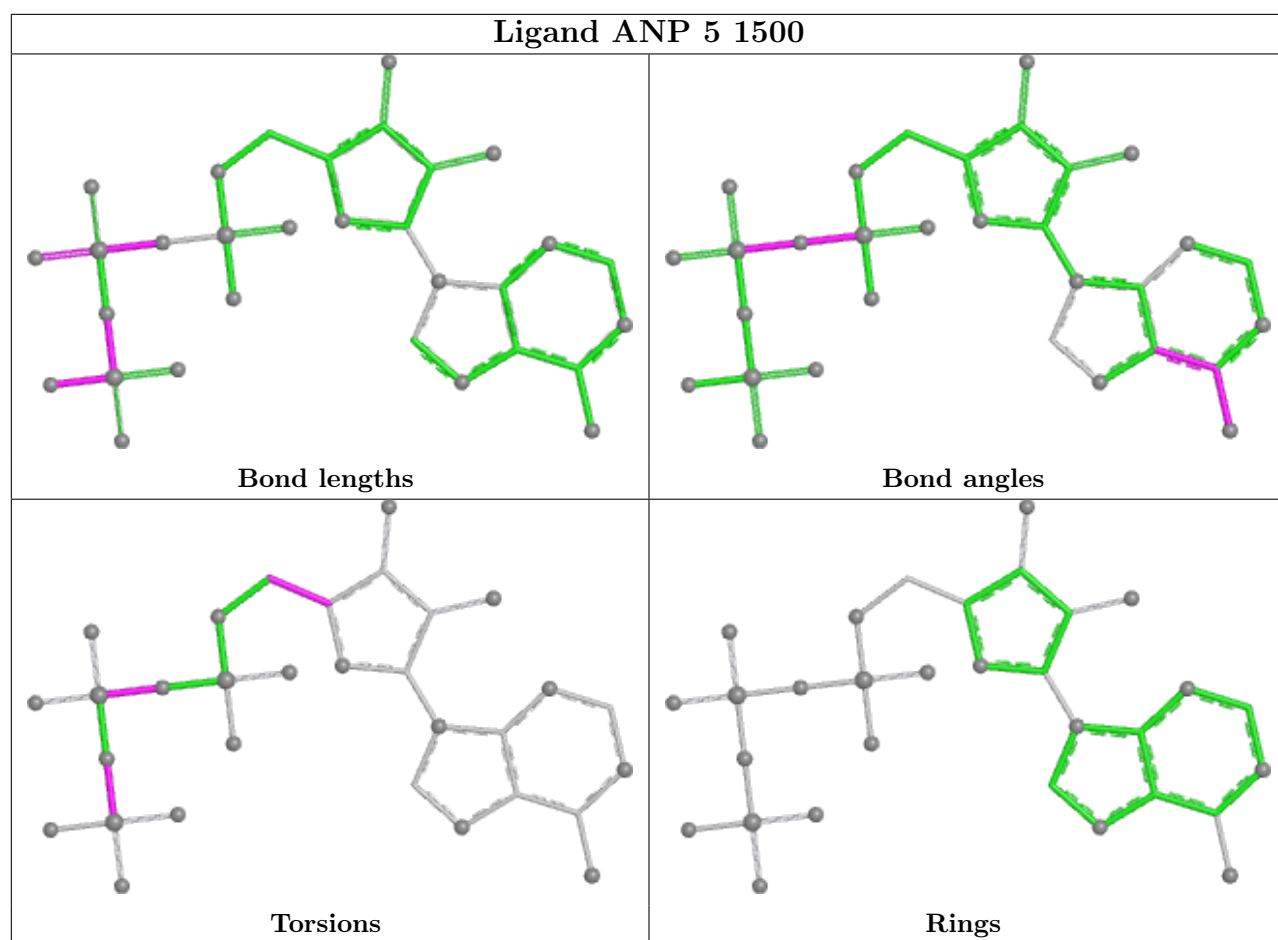
| Mol | Chain | Res  | Type | Clashes | Symm-Clashes |
|-----|-------|------|------|---------|--------------|
| 21  | 2     | 1500 | ANP  | 2       | 0            |
| 21  | 3     | 1500 | ANP  | 1       | 0            |
| 21  | 5     | 1500 | ANP  | 2       | 0            |

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will

also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.







## 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.

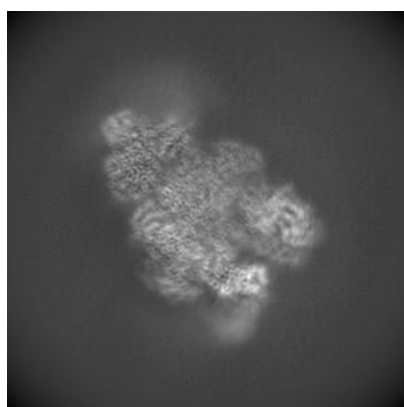
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-13537. These allow visual inspection of the internal detail of the map and identification of artifacts.

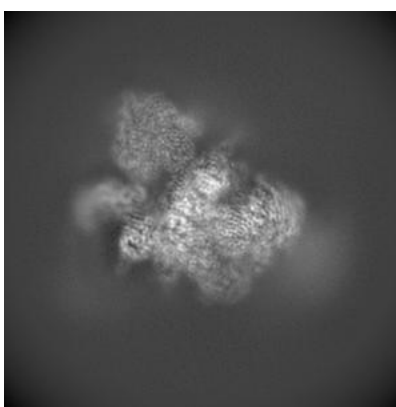
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

### 6.1 Orthogonal projections [i](#)

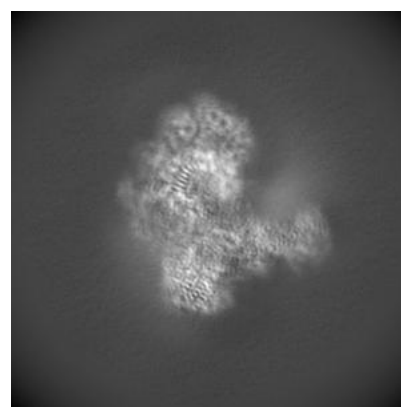
#### 6.1.1 Primary map



X



Y

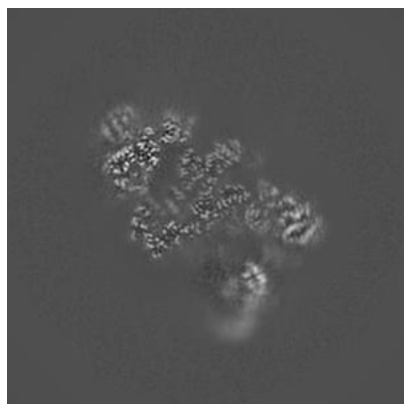


Z

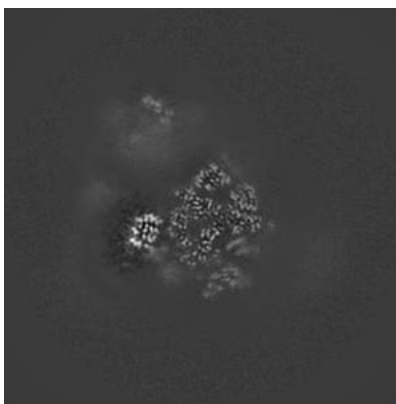
The images above show the map projected in three orthogonal directions.

### 6.2 Central slices [i](#)

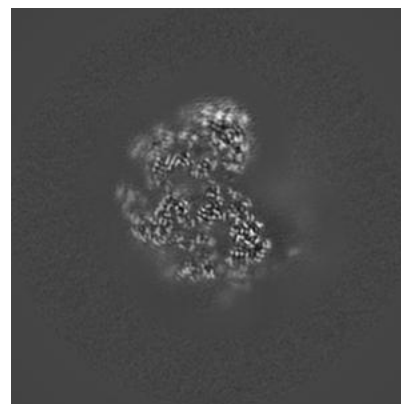
#### 6.2.1 Primary map



X Index: 188



Y Index: 188

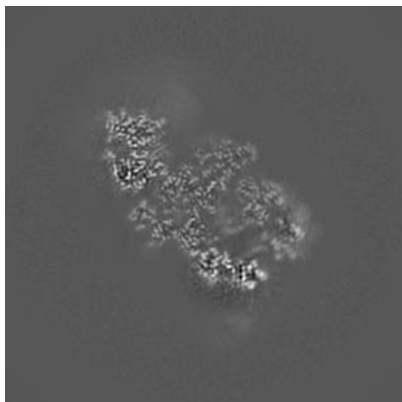


Z Index: 188

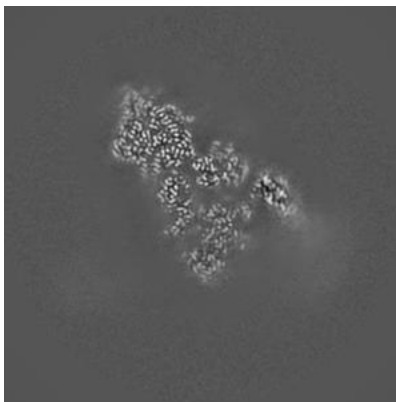
The images above show central slices of the map in three orthogonal directions.

## 6.3 Largest variance slices [i](#)

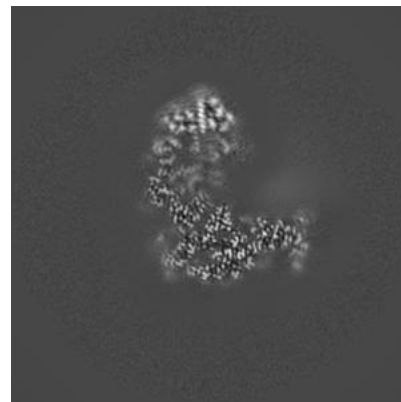
### 6.3.1 Primary map



X Index: 166



Y Index: 161



Z Index: 167

The images above show the largest variance slices of the map in three orthogonal directions.

## 6.4 Orthogonal surface views [i](#)

### 6.4.1 Primary map



X



Y



Z

The images above show the 3D surface view of the map at the recommended contour level 7.09. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

## 6.5 Mask visualisation

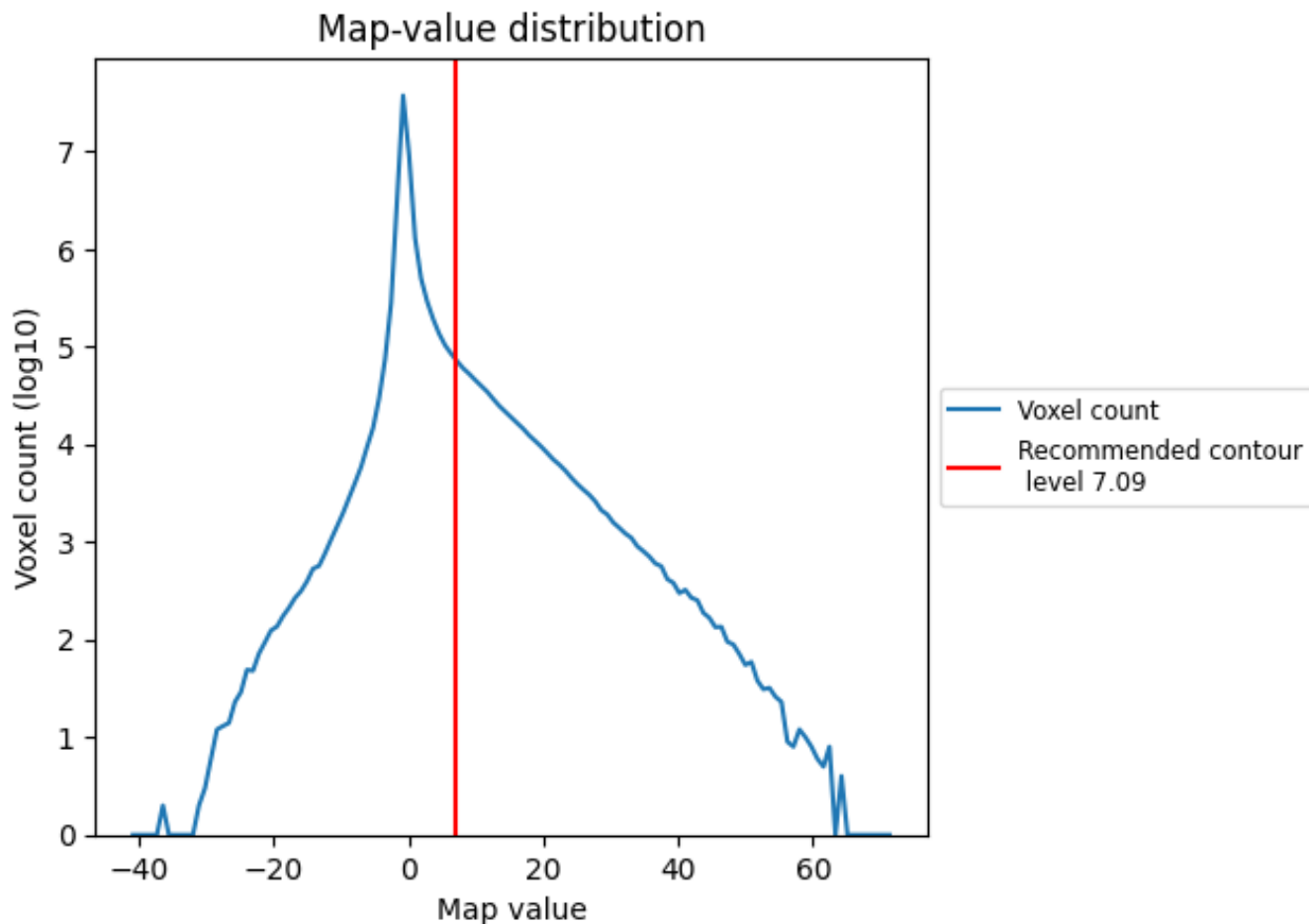
This section was not generated. No masks/segmentation were deposited.



## 7 Map analysis [i](#)

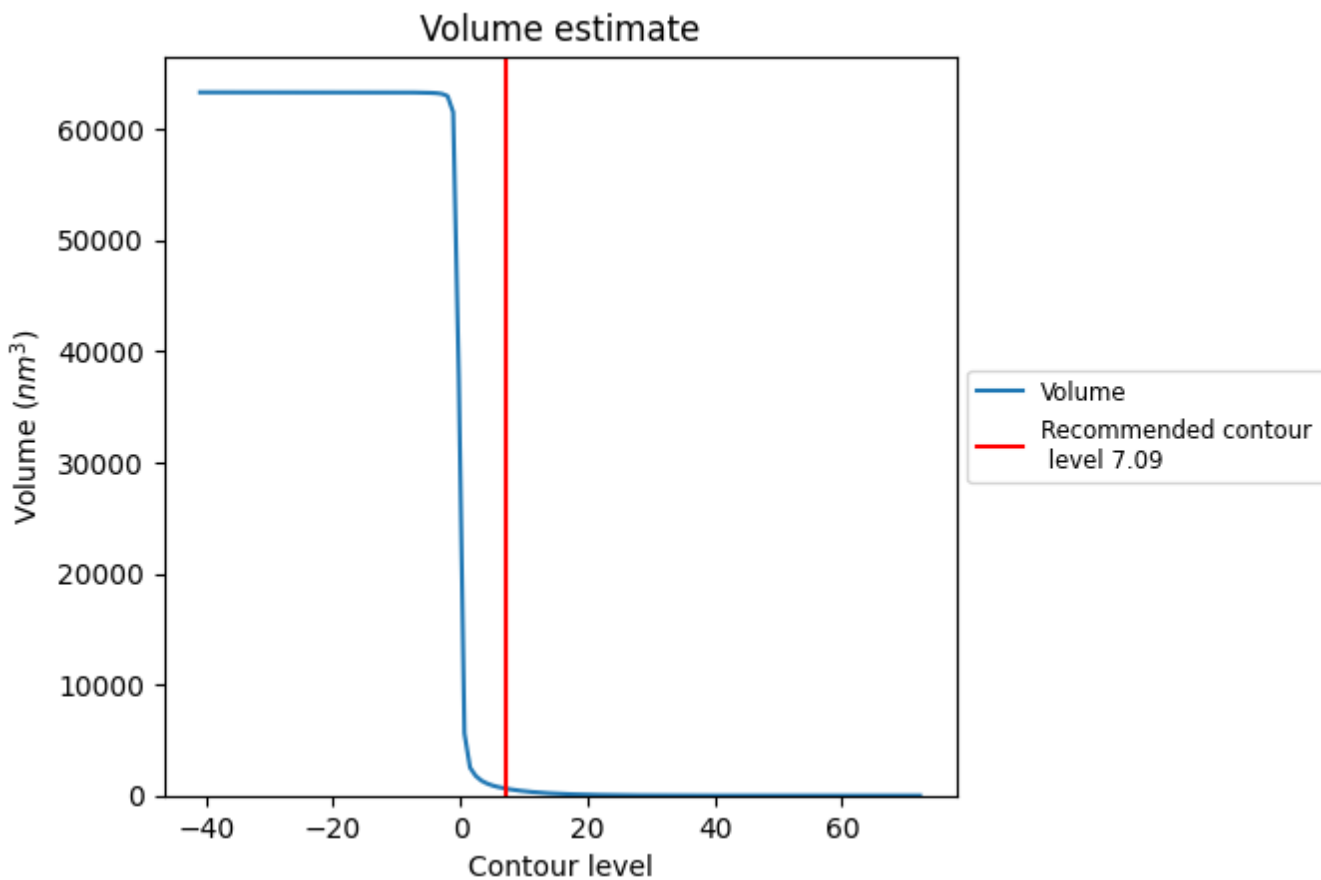
This section contains the results of statistical analysis of the map.

### 7.1 Map-value distribution [i](#)



The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

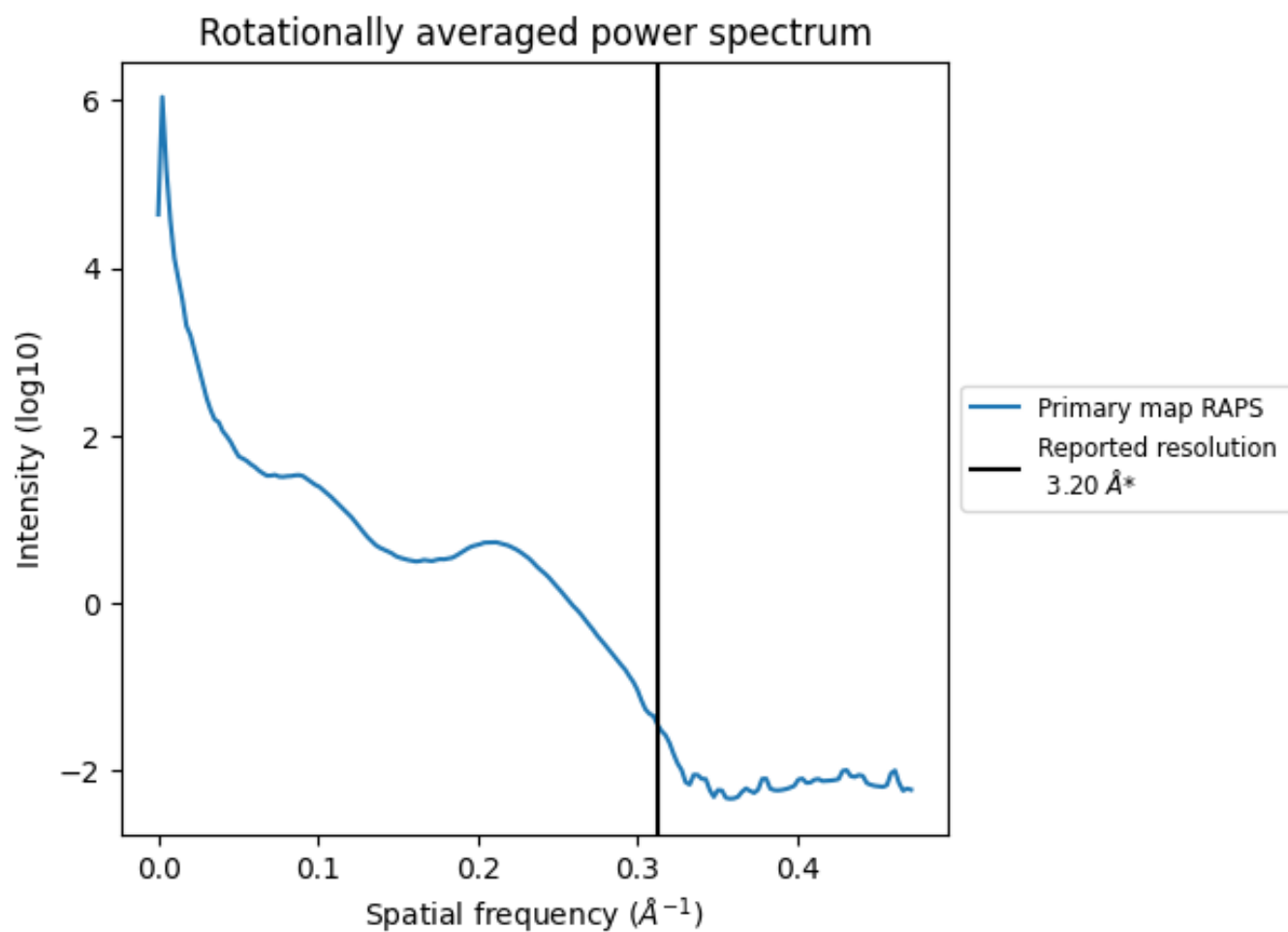
## 7.2 Volume estimate [i](#)



The volume at the recommended contour level is 636  $\text{nm}^3$ ; this corresponds to an approximate mass of 575 kDa.

The volume estimate graph shows how the enclosed volume varies with the contour level. The recommended contour level is shown as a vertical line and the intersection between the line and the curve gives the volume of the enclosed surface at the given level.

### 7.3 Rotationally averaged power spectrum i



\*Reported resolution corresponds to spatial frequency of 0.312 Å<sup>-1</sup>

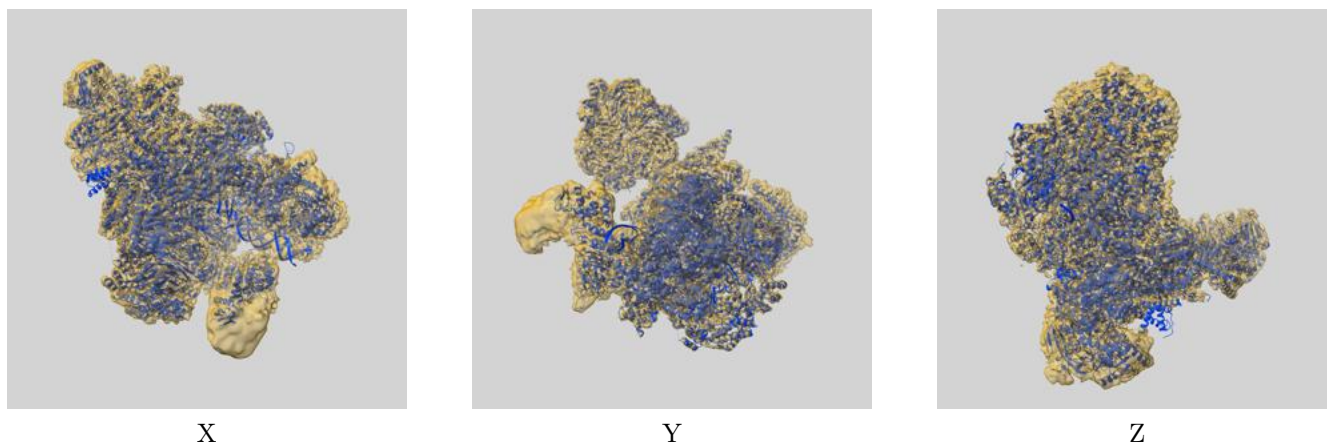
## 8 Fourier-Shell correlation

This section was not generated. No FSC curve or half-maps provided.

## 9 Map-model fit [i](#)

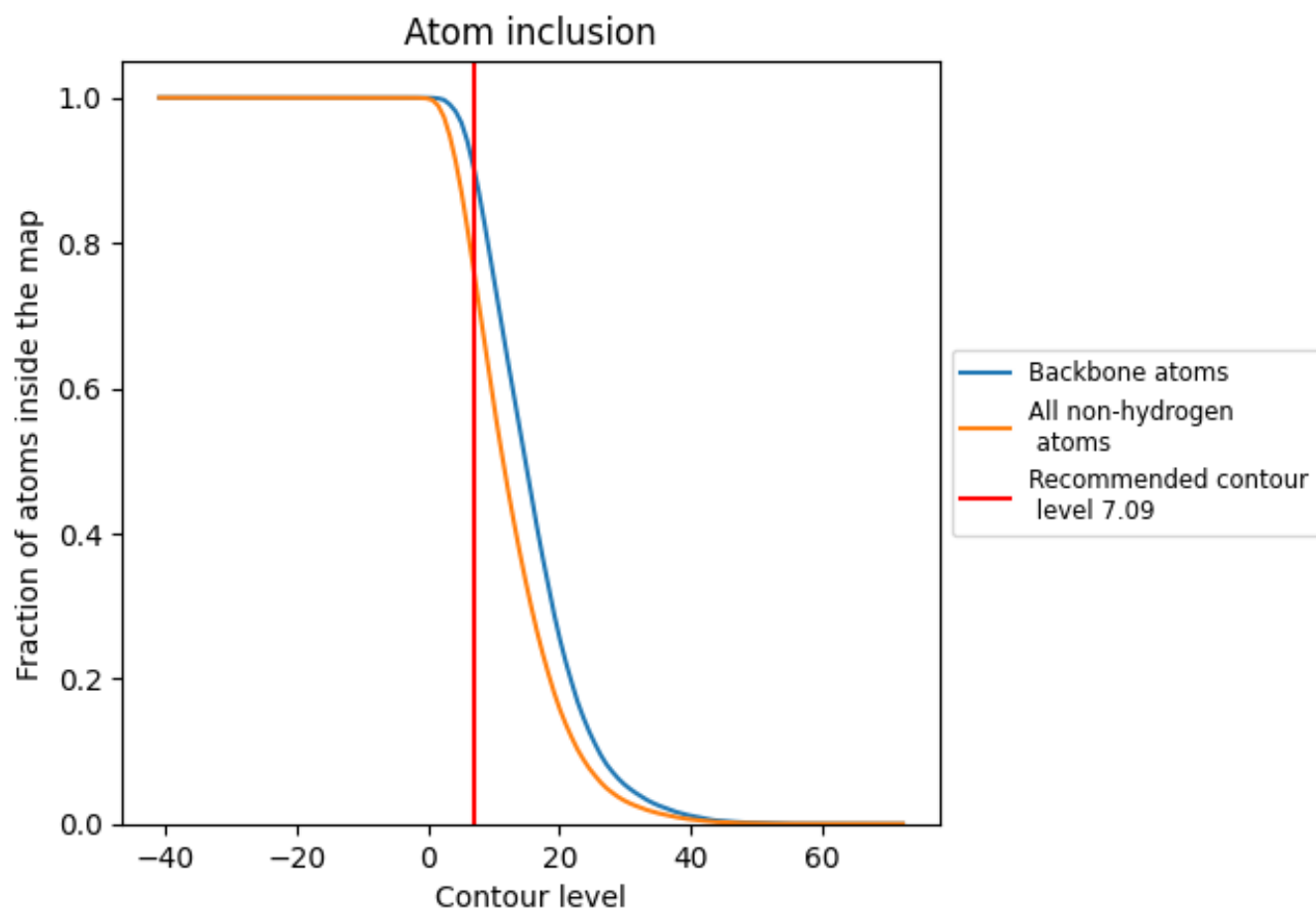
This section contains information regarding the fit between EMDB map EMD-13537 and PDB model 7PMK. Per-residue inclusion information can be found in section [3](#) on page [13](#).

### 9.1 Map-model overlay [i](#)



The images above show the 3D surface view of the map at the recommended contour level 7.09 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

## 9.2 Atom inclusion [i](#)



At the recommended contour level, 90% of all backbone atoms, 75% of all non-hydrogen atoms, are inside the map.