



## Full wwPDB EM Validation Report ⓘ

Mar 5, 2026 – 04:23 PM UTC

PDB ID : 9R2P / pdb\_00009r2p  
EMDB ID : EMD-53536  
Title : p53 bound to nucleosome at position SHL+5.9 (crosslinked sample)  
Authors : Chakraborty, D.; Kater, L.; Kempf, G.; Cavadini, S.; Thoma, N.H.  
Deposited on : 2025-04-30  
Resolution : 4.18 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.

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:

EMDB validation analysis : 0.0.1.dev132  
MolProbity : 4-5-2 with Phenix2.0  
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)  
EM percentile statistics : 202505.v01 (Using data in the EMDB archive up until May 2025)  
MapQ : 1.9.13  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.49

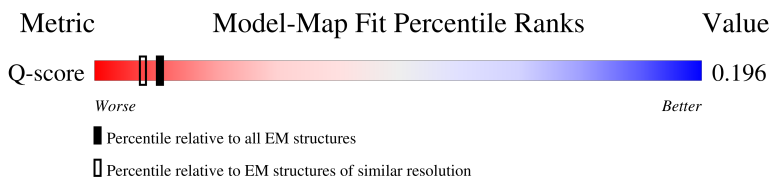
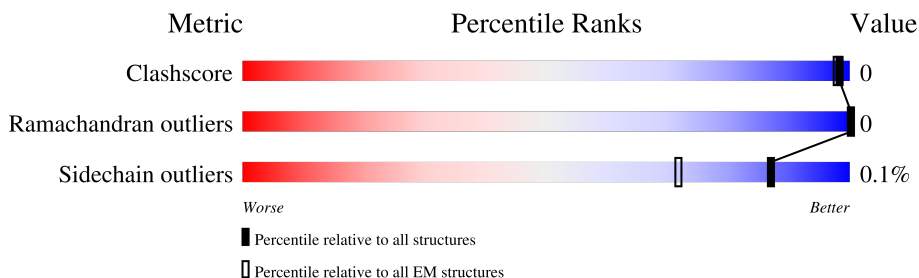
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 4.18 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.



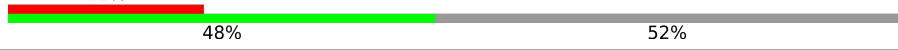
| Metric                | Whole archive<br>(#Entries) | EM structures<br>(#Entries) | Similar EM resolution<br>(#Entries, resolution range(Å)) |
|-----------------------|-----------------------------|-----------------------------|----------------------------------------------------------|
| Clashscore            | 229148                      | 23984                       | -                                                        |
| Ramachandran outliers | 224038                      | 23583                       | -                                                        |
| Sidechain outliers    | 223484                      | 23102                       | -                                                        |
| Q-score               | -                           | 25397                       | 5389 ( 3.68 - 4.68 )                                     |

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   | A     | 139    | <br>68% 31%      |
| 1   | E     | 139    | <br>68% 31%      |
| 2   | B     | 106    | <br>75% 24%      |
| 2   | F     | 106    | <br>75% 23%      |

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| Mol | Chain | Length | Quality of chain                                                                   |
|-----|-------|--------|------------------------------------------------------------------------------------|
| 3   | C     | 133    |  |
| 3   | G     | 133    |  |
| 4   | D     | 128    |  |
| 4   | H     | 128    |  |
| 5   | I     | 153    |  |
| 6   | J     | 153    |  |
| 7   | K     | 417    |  |
| 7   | L     | 417    |  |
| 7   | M     | 417    |  |
| 7   | N     | 417    |  |

## 2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 15460 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 Histone H3.1.

| Mol | Chain | Residues | Atoms |     |     |     |   | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---|---------|-------|
| 1   | A     | 96       | Total | C   | N   | O   | S | 0       | 0     |
|     |       |          | 790   | 499 | 151 | 136 | 4 |         |       |
| 1   | E     | 96       | Total | C   | N   | O   | S | 0       | 0     |
|     |       |          | 790   | 499 | 151 | 136 | 4 |         |       |

There are 6 discrepancies between the modelled and reference sequences:

| Chain | Residue | Modelled | Actual | Comment        | Reference  |
|-------|---------|----------|--------|----------------|------------|
| A     | -2      | GLY      | -      | expression tag | UNP P68431 |
| A     | -1      | SER      | -      | expression tag | UNP P68431 |
| A     | 0       | HIS      | -      | expression tag | UNP P68431 |
| E     | -2      | GLY      | -      | expression tag | UNP P68431 |
| E     | -1      | SER      | -      | expression tag | UNP P68431 |
| E     | 0       | HIS      | -      | expression tag | UNP P68431 |

- Molecule 2 is a protein called Histone H4.

| Mol | Chain | Residues | Atoms |     |     |     |   | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---|---------|-------|
| 2   | B     | 81       | Total | C   | N   | O   | S | 0       | 0     |
|     |       |          | 646   | 407 | 126 | 112 | 1 |         |       |
| 2   | F     | 82       | Total | C   | N   | O   | S | 0       | 0     |
|     |       |          | 653   | 412 | 127 | 113 | 1 |         |       |

There are 6 discrepancies between the modelled and reference sequences:

| Chain | Residue | Modelled | Actual | Comment        | Reference  |
|-------|---------|----------|--------|----------------|------------|
| B     | -2      | GLY      | -      | expression tag | UNP P62805 |
| B     | -1      | SER      | -      | expression tag | UNP P62805 |
| B     | 0       | HIS      | -      | expression tag | UNP P62805 |
| F     | -2      | GLY      | -      | expression tag | UNP P62805 |
| F     | -1      | SER      | -      | expression tag | UNP P62805 |
| F     | 0       | HIS      | -      | expression tag | UNP P62805 |

- Molecule 3 is a protein called Histone H2A type 1-B/E.

| Mol | Chain | Residues | Atoms |     |     |     | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---------|-------|
| 3   | C     | 108      | Total | C   | N   | O   | 0       | 0     |
|     |       |          | 835   | 526 | 165 | 144 |         |       |
| 3   | G     | 108      | Total | C   | N   | O   | 0       | 0     |
|     |       |          | 835   | 526 | 165 | 144 |         |       |

There are 6 discrepancies between the modelled and reference sequences:

| Chain | Residue | Modelled | Actual | Comment        | Reference  |
|-------|---------|----------|--------|----------------|------------|
| C     | -2      | GLY      | -      | expression tag | UNP P04908 |
| C     | -1      | SER      | -      | expression tag | UNP P04908 |
| C     | 0       | HIS      | -      | expression tag | UNP P04908 |
| G     | -2      | GLY      | -      | expression tag | UNP P04908 |
| G     | -1      | SER      | -      | expression tag | UNP P04908 |
| G     | 0       | HIS      | -      | expression tag | UNP P04908 |

- Molecule 4 is a protein called Histone H2B type 1-J.

| Mol | Chain | Residues | Atoms |     |     |     |   | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---|---------|-------|
| 4   | D     | 94       | Total | C   | N   | O   | S | 0       | 0     |
|     |       |          | 736   | 462 | 134 | 138 | 2 |         |       |
| 4   | H     | 94       | Total | C   | N   | O   | S | 0       | 0     |
|     |       |          | 736   | 462 | 134 | 138 | 2 |         |       |

There are 6 discrepancies between the modelled and reference sequences:

| Chain | Residue | Modelled | Actual | Comment        | Reference  |
|-------|---------|----------|--------|----------------|------------|
| D     | -2      | GLY      | -      | expression tag | UNP P06899 |
| D     | -1      | SER      | -      | expression tag | UNP P06899 |
| D     | 0       | HIS      | -      | expression tag | UNP P06899 |
| H     | -2      | GLY      | -      | expression tag | UNP P06899 |
| H     | -1      | SER      | -      | expression tag | UNP P06899 |
| H     | 0       | HIS      | -      | expression tag | UNP P06899 |

- Molecule 5 is a DNA chain called DNA-for.

| Mol | Chain | Residues | Atoms |      |     |     |     | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|-----|---------|-------|
| 5   | I     | 131      | Total | C    | N   | O   | P   | 0       | 0     |
|     |       |          | 2667  | 1265 | 484 | 787 | 131 |         |       |

- Molecule 6 is a DNA chain called DNA-rev.

| Mol | Chain | Residues | Atoms |      |     |     |     | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|-----|---------|-------|
| 6   | J     | 131      | Total | C    | N   | O   | P   | 0       | 0     |
|     |       |          | 2704  | 1277 | 511 | 785 | 131 |         |       |

- Molecule 7 is a protein called Cellular tumor antigen p53.

| Mol | Chain | Residues | Atoms |     |     |     |  | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|--|---------|-------|
| 7   | K     | 200      | Total | C   | N   | O   |  | 0       | 0     |
|     |       |          | 1017  | 617 | 200 | 200 |  |         |       |
| 7   | L     | 200      | Total | C   | N   | O   |  | 0       | 0     |
|     |       |          | 1017  | 617 | 200 | 200 |  |         |       |
| 7   | M     | 200      | Total | C   | N   | O   |  | 0       | 0     |
|     |       |          | 1017  | 617 | 200 | 200 |  |         |       |
| 7   | N     | 200      | Total | C   | N   | O   |  | 0       | 0     |
|     |       |          | 1017  | 617 | 200 | 200 |  |         |       |

There are 96 discrepancies between the modelled and reference sequences:

| Chain | Residue | Modelled | Actual | Comment               | Reference  |
|-------|---------|----------|--------|-----------------------|------------|
| K     | -23     | MET      | -      | initiating methionine | UNP P04637 |
| K     | -22     | ASP      | -      | expression tag        | UNP P04637 |
| K     | -21     | TRP      | -      | expression tag        | UNP P04637 |
| K     | -20     | SER      | -      | expression tag        | UNP P04637 |
| K     | -19     | HIS      | -      | expression tag        | UNP P04637 |
| K     | -18     | PRO      | -      | expression tag        | UNP P04637 |
| K     | -17     | GLN      | -      | expression tag        | UNP P04637 |
| K     | -16     | PHE      | -      | expression tag        | UNP P04637 |
| K     | -15     | GLU      | -      | expression tag        | UNP P04637 |
| K     | -14     | LYS      | -      | expression tag        | UNP P04637 |
| K     | -13     | SER      | -      | expression tag        | UNP P04637 |
| K     | -12     | ALA      | -      | expression tag        | UNP P04637 |
| K     | -11     | VAL      | -      | expression tag        | UNP P04637 |
| K     | -10     | ASP      | -      | expression tag        | UNP P04637 |
| K     | -9      | GLU      | -      | expression tag        | UNP P04637 |
| K     | -8      | ASN      | -      | expression tag        | UNP P04637 |
| K     | -7      | LEU      | -      | expression tag        | UNP P04637 |
| K     | -6      | TYR      | -      | expression tag        | UNP P04637 |
| K     | -5      | PHE      | -      | expression tag        | UNP P04637 |
| K     | -4      | GLN      | -      | expression tag        | UNP P04637 |
| K     | -3      | GLY      | -      | expression tag        | UNP P04637 |
| K     | -2      | GLY      | -      | expression tag        | UNP P04637 |
| K     | -1      | GLY      | -      | expression tag        | UNP P04637 |
| K     | 0       | ARG      | -      | expression tag        | UNP P04637 |
| L     | -23     | MET      | -      | initiating methionine | UNP P04637 |

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| Chain | Residue | Modelled | Actual | Comment               | Reference  |
|-------|---------|----------|--------|-----------------------|------------|
| L     | -22     | ASP      | -      | expression tag        | UNP P04637 |
| L     | -21     | TRP      | -      | expression tag        | UNP P04637 |
| L     | -20     | SER      | -      | expression tag        | UNP P04637 |
| L     | -19     | HIS      | -      | expression tag        | UNP P04637 |
| L     | -18     | PRO      | -      | expression tag        | UNP P04637 |
| L     | -17     | GLN      | -      | expression tag        | UNP P04637 |
| L     | -16     | PHE      | -      | expression tag        | UNP P04637 |
| L     | -15     | GLU      | -      | expression tag        | UNP P04637 |
| L     | -14     | LYS      | -      | expression tag        | UNP P04637 |
| L     | -13     | SER      | -      | expression tag        | UNP P04637 |
| L     | -12     | ALA      | -      | expression tag        | UNP P04637 |
| L     | -11     | VAL      | -      | expression tag        | UNP P04637 |
| L     | -10     | ASP      | -      | expression tag        | UNP P04637 |
| L     | -9      | GLU      | -      | expression tag        | UNP P04637 |
| L     | -8      | ASN      | -      | expression tag        | UNP P04637 |
| L     | -7      | LEU      | -      | expression tag        | UNP P04637 |
| L     | -6      | TYR      | -      | expression tag        | UNP P04637 |
| L     | -5      | PHE      | -      | expression tag        | UNP P04637 |
| L     | -4      | GLN      | -      | expression tag        | UNP P04637 |
| L     | -3      | GLY      | -      | expression tag        | UNP P04637 |
| L     | -2      | GLY      | -      | expression tag        | UNP P04637 |
| L     | -1      | GLY      | -      | expression tag        | UNP P04637 |
| L     | 0       | ARG      | -      | expression tag        | UNP P04637 |
| M     | -23     | MET      | -      | initiating methionine | UNP P04637 |
| M     | -22     | ASP      | -      | expression tag        | UNP P04637 |
| M     | -21     | TRP      | -      | expression tag        | UNP P04637 |
| M     | -20     | SER      | -      | expression tag        | UNP P04637 |
| M     | -19     | HIS      | -      | expression tag        | UNP P04637 |
| M     | -18     | PRO      | -      | expression tag        | UNP P04637 |
| M     | -17     | GLN      | -      | expression tag        | UNP P04637 |
| M     | -16     | PHE      | -      | expression tag        | UNP P04637 |
| M     | -15     | GLU      | -      | expression tag        | UNP P04637 |
| M     | -14     | LYS      | -      | expression tag        | UNP P04637 |
| M     | -13     | SER      | -      | expression tag        | UNP P04637 |
| M     | -12     | ALA      | -      | expression tag        | UNP P04637 |
| M     | -11     | VAL      | -      | expression tag        | UNP P04637 |
| M     | -10     | ASP      | -      | expression tag        | UNP P04637 |
| M     | -9      | GLU      | -      | expression tag        | UNP P04637 |
| M     | -8      | ASN      | -      | expression tag        | UNP P04637 |
| M     | -7      | LEU      | -      | expression tag        | UNP P04637 |
| M     | -6      | TYR      | -      | expression tag        | UNP P04637 |
| M     | -5      | PHE      | -      | expression tag        | UNP P04637 |

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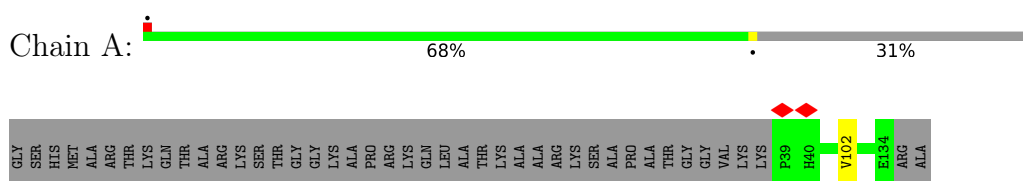
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| Chain | Residue | Modelled | Actual | Comment               | Reference  |
|-------|---------|----------|--------|-----------------------|------------|
| M     | -4      | GLN      | -      | expression tag        | UNP P04637 |
| M     | -3      | GLY      | -      | expression tag        | UNP P04637 |
| M     | -2      | GLY      | -      | expression tag        | UNP P04637 |
| M     | -1      | GLY      | -      | expression tag        | UNP P04637 |
| M     | 0       | ARG      | -      | expression tag        | UNP P04637 |
| N     | -23     | MET      | -      | initiating methionine | UNP P04637 |
| N     | -22     | ASP      | -      | expression tag        | UNP P04637 |
| N     | -21     | TRP      | -      | expression tag        | UNP P04637 |
| N     | -20     | SER      | -      | expression tag        | UNP P04637 |
| N     | -19     | HIS      | -      | expression tag        | UNP P04637 |
| N     | -18     | PRO      | -      | expression tag        | UNP P04637 |
| N     | -17     | GLN      | -      | expression tag        | UNP P04637 |
| N     | -16     | PHE      | -      | expression tag        | UNP P04637 |
| N     | -15     | GLU      | -      | expression tag        | UNP P04637 |
| N     | -14     | LYS      | -      | expression tag        | UNP P04637 |
| N     | -13     | SER      | -      | expression tag        | UNP P04637 |
| N     | -12     | ALA      | -      | expression tag        | UNP P04637 |
| N     | -11     | VAL      | -      | expression tag        | UNP P04637 |
| N     | -10     | ASP      | -      | expression tag        | UNP P04637 |
| N     | -9      | GLU      | -      | expression tag        | UNP P04637 |
| N     | -8      | ASN      | -      | expression tag        | UNP P04637 |
| N     | -7      | LEU      | -      | expression tag        | UNP P04637 |
| N     | -6      | TYR      | -      | expression tag        | UNP P04637 |
| N     | -5      | PHE      | -      | expression tag        | UNP P04637 |
| N     | -4      | GLN      | -      | expression tag        | UNP P04637 |
| N     | -3      | GLY      | -      | expression tag        | UNP P04637 |
| N     | -2      | GLY      | -      | expression tag        | UNP P04637 |
| N     | -1      | GLY      | -      | expression tag        | UNP P04637 |
| N     | 0       | ARG      | -      | expression tag        | UNP P04637 |

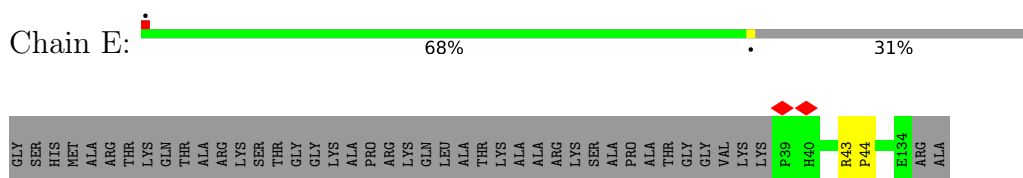
### 3 Residue-property plots [i](#)

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 atom inclusion in map 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 diamond above a residue indicates a poor fit to the EM map for this residue (all-atom inclusion < 40%). 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.

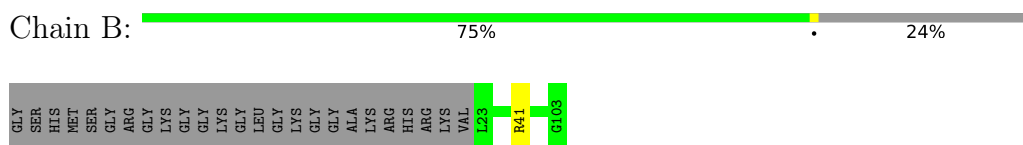
- Molecule 1: Histone H3.1



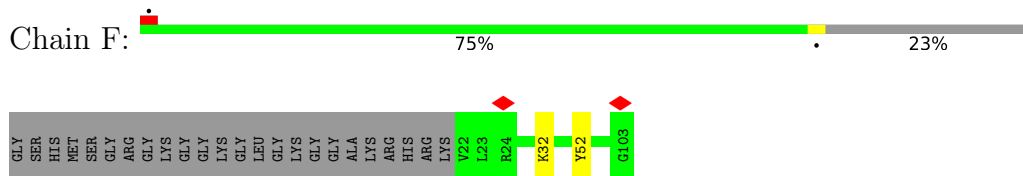
- Molecule 1: Histone H3.1



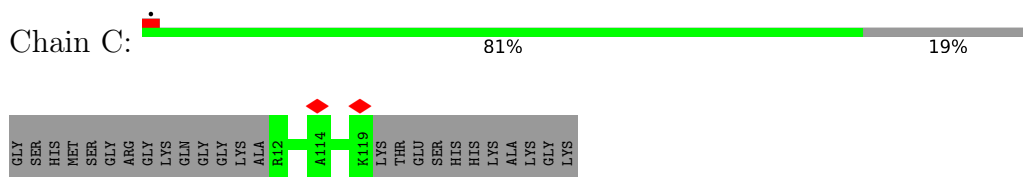
- Molecule 2: Histone H4



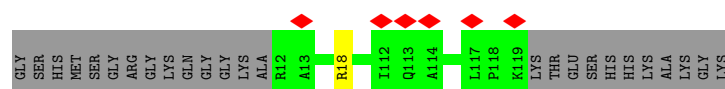
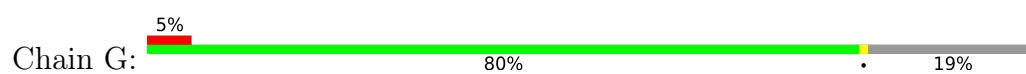
- Molecule 2: Histone H4



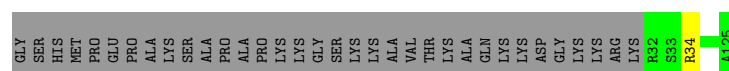
- Molecule 3: Histone H2A type 1-B/E



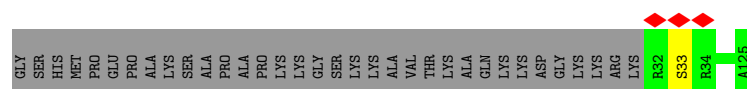
- Molecule 3: Histone H2A type 1-B/E



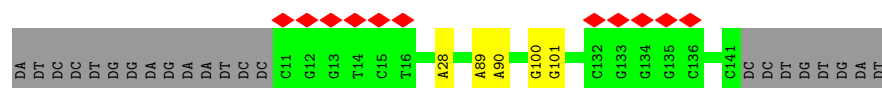
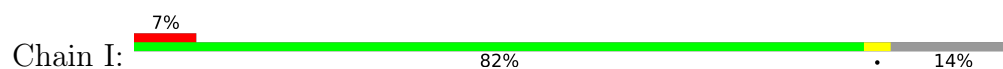
- Molecule 4: Histone H2B type 1-J



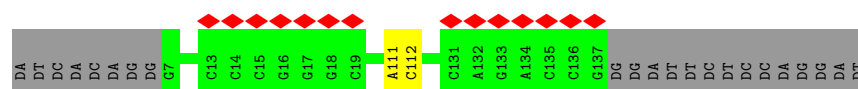
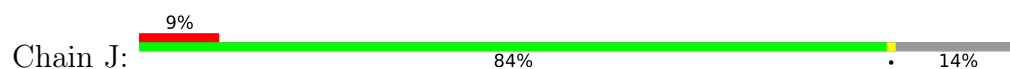
- Molecule 4: Histone H2B type 1-J



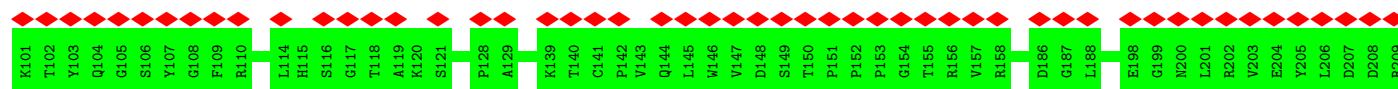
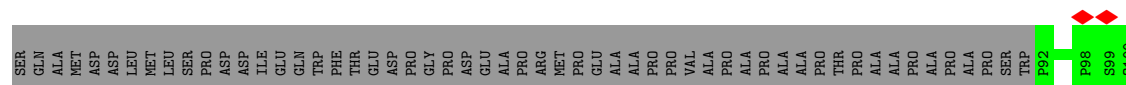
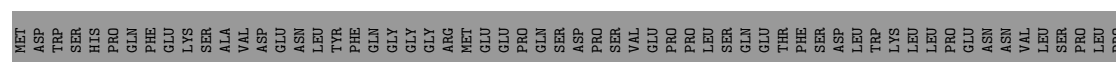
- Molecule 5: DNA-for



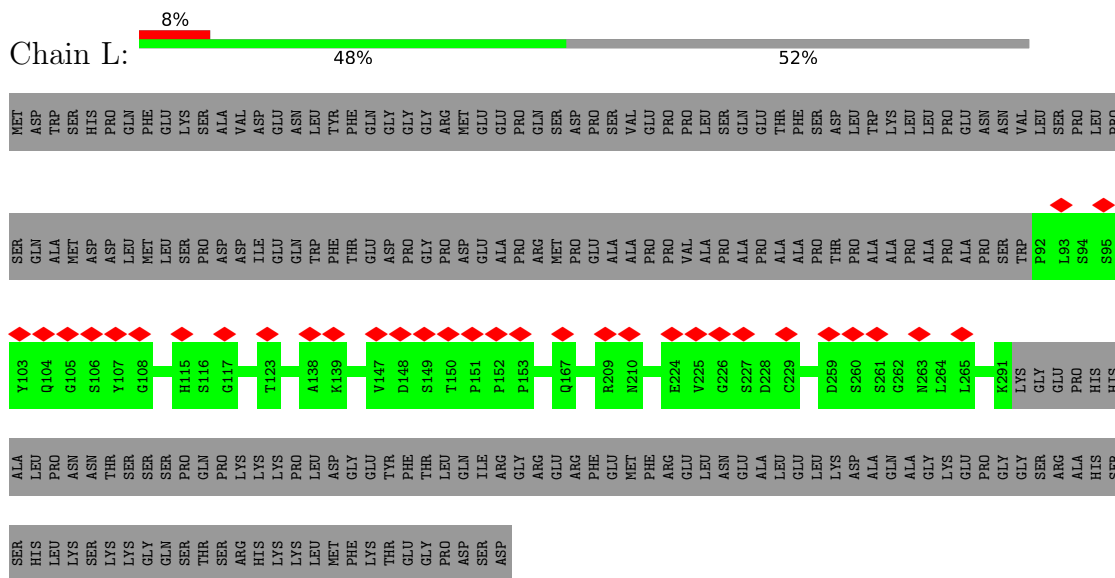
- Molecule 6: DNA-rev



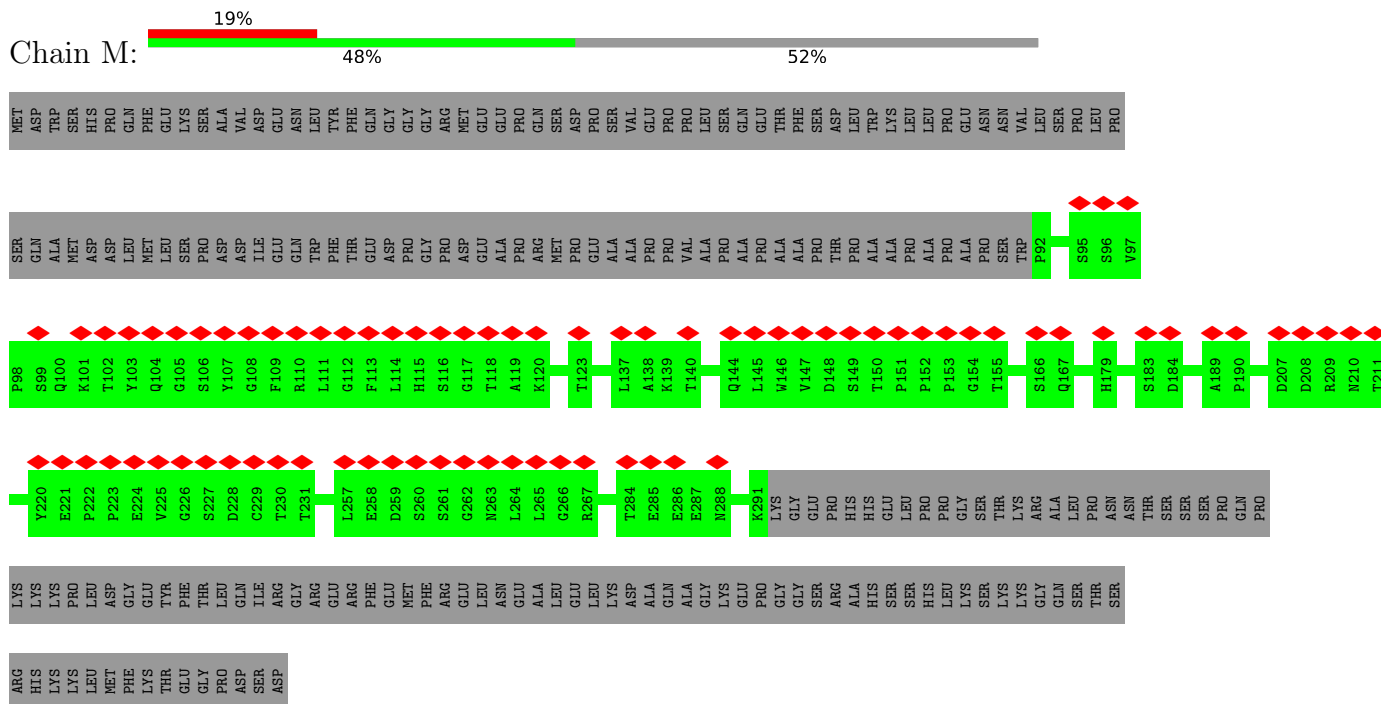
- Molecule 7: Cellular tumor antigen p53



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- Molecule 7: Cellular tumor antigen p53



- Molecule 7: Cellular tumor antigen p53



MET ASP GLN TRP SER HIS PRO GLN PHE GLU LYS SER ALA VAL ASP GLN ASN LEU TYR PHE GLN GLY GLY ARG MET GLU GLU PRO GLN SER ASP PRO SER VAL GLU PRO PRO LEU SER GLN GLU THR PHE SER ASP TRP LYS LEU LEU PRO GLU ASN ASN VAL LEU SER PRO LEU PRO

SER GLN ALA MET ASP LEU MET SER PRO ASP ASP ILE GLN TRP PHE THR GLU ASP PRO GLY ASP GLU ALA PRO ARG MET PRO GLU ALA ALA PRO PRO VAL ALA PRO ALA ALA ALA ALA PRO THR PRO ALA ALA ALA TRP P92 S106 Y107 G108

G112 F113 L114 H115 A119 K120 A129 L137 V146 V147 D148 S149 T150 P151 P152 P153 G154 T155 D184 G199 R209 N210 Y220 E221 P222 P223 E224 V225 G226 S227 D228 M246 N247 R248 R249 D259 S260 S261 G262 N263 L264 S269 F270 E271 T284 E287

R290 K291 LYS GLU PRO HIS HIS GLU LEU PRO PRO GLY GLY SER THR LYS ARG ALA LEU PRO ASN ASN THR SER SER PRO GLN PRO LYS LYS PRO PRO LEU ASP GLY TYR PHE THR LEU GLN ARG GLY ARG GLU ARG PHE PHE MET PHE ARG GLU ASN GLU ALA LEU

GLU LEU LYS ASP ALA GLN ALA GLY LYS GLU PRO GLY SER ARG HIS SER HIS LYS SER LYS GLY GLN SER THR ARG HIS LYS LEU MET PHE LYS THR ASP GLY THR GLU GLY PRO ASP SER ASP

## 4 Experimental information

| Property                             | Value                                   | Source    |
|--------------------------------------|-----------------------------------------|-----------|
| EM reconstruction method             | SINGLE PARTICLE                         | Depositor |
| Imposed symmetry                     | POINT, Not provided                     |           |
| Number of particles used             | 18392                                   | Depositor |
| Resolution determination method      | FSC 0.143 CUT-OFF                       | Depositor |
| CTF correction method                | PHASE FLIPPING AND AMPLITUDE CORRECTION | Depositor |
| Microscope                           | TFS GLACIOS                             | Depositor |
| Voltage (kV)                         | 200                                     | Depositor |
| Electron dose ( $e^-/\text{\AA}^2$ ) | 50                                      | Depositor |
| Minimum defocus (nm)                 | 800                                     | Depositor |
| Maximum defocus (nm)                 | 2000                                    | Depositor |
| Magnification                        | Not provided                            |           |
| Image detector                       | FEI FALCON IV (4k x 4k)                 | Depositor |
| Maximum map value                    | 1.595                                   | Depositor |
| Minimum map value                    | -0.654                                  | Depositor |
| Average map value                    | -0.002                                  | Depositor |
| Map value standard deviation         | 0.044                                   | Depositor |
| Recommended contour level            | 0.165                                   | Depositor |
| Map size ( $\text{\AA}$ )            | 365.82, 365.82, 365.82                  | wwPDB     |
| Map dimensions                       | 420, 420, 420                           | wwPDB     |
| Map angles ( $^\circ$ )              | 90.0, 90.0, 90.0                        | wwPDB     |
| Pixel spacing ( $\text{\AA}$ )       | 0.871, 0.871, 0.871                     | Depositor |

## 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     | 0.13         | 0/802   | 0.36        | 0/1076  |
| 1   | E     | 0.16         | 0/802   | 0.35        | 0/1076  |
| 2   | B     | 0.14         | 0/653   | 0.38        | 0/873   |
| 2   | F     | 0.15         | 0/660   | 0.35        | 0/883   |
| 3   | C     | 0.15         | 0/845   | 0.34        | 0/1139  |
| 3   | G     | 0.14         | 0/845   | 0.39        | 0/1139  |
| 4   | D     | 0.15         | 0/747   | 0.35        | 0/1004  |
| 4   | H     | 0.15         | 0/747   | 0.35        | 0/1004  |
| 5   | I     | 0.37         | 0/2987  | 0.73        | 0/4603  |
| 6   | J     | 0.37         | 0/3037  | 0.72        | 0/4690  |
| 7   | K     | 0.25         | 0/1031  | 0.46        | 0/1445  |
| 7   | L     | 0.25         | 0/1031  | 0.46        | 0/1445  |
| 7   | M     | 0.26         | 0/1031  | 0.45        | 0/1445  |
| 7   | N     | 0.25         | 0/1031  | 0.44        | 0/1445  |
| All | All   | 0.27         | 0/16249 | 0.55        | 0/23267 |

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     | 790   | 0        | 826      | 1       | 0            |
| 1   | E     | 790   | 0        | 826      | 2       | 0            |

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| Mol | Chain | Non-H | H(model) | H(added) | Clashes | Symm-Clashes |
|-----|-------|-------|----------|----------|---------|--------------|
| 2   | B     | 646   | 0        | 687      | 1       | 0            |
| 2   | F     | 653   | 0        | 696      | 1       | 0            |
| 3   | C     | 835   | 0        | 897      | 0       | 0            |
| 3   | G     | 835   | 0        | 897      | 1       | 0            |
| 4   | D     | 736   | 0        | 758      | 1       | 0            |
| 4   | H     | 736   | 0        | 758      | 0       | 0            |
| 5   | I     | 2667  | 0        | 1469     | 3       | 0            |
| 6   | J     | 2704  | 0        | 1468     | 1       | 0            |
| 7   | K     | 1017  | 0        | 509      | 0       | 0            |
| 7   | L     | 1017  | 0        | 509      | 0       | 0            |
| 7   | M     | 1017  | 0        | 509      | 0       | 0            |
| 7   | N     | 1017  | 0        | 509      | 0       | 0            |
| All | All   | 15460 | 0        | 11318    | 9       | 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 (9) 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:E:43:ARG:HG3   | 1:E:44:PRO:HD2 | 1.83                     | 0.60              |
| 1:A:102:VAL:HG21 | 2:B:41:ARG:HD2 | 1.96                     | 0.46              |
| 1:E:43:ARG:HG3   | 1:E:44:PRO:CD  | 2.46                     | 0.46              |
| 3:G:18:ARG:HH11  | 3:G:18:ARG:HB2 | 1.82                     | 0.44              |
| 6:J:111:DA:H2''  | 6:J:112:DC:C6  | 2.54                     | 0.42              |
| 5:I:89:DA:H2''   | 5:I:90:DA:C8   | 2.54                     | 0.41              |
| 2:F:32:LYS:HG3   | 2:F:52:TYR:CZ  | 2.56                     | 0.41              |
| 5:I:100:DG:H2''  | 5:I:101:DG:C8  | 2.56                     | 0.41              |
| 4:D:34:ARG:NE    | 5:I:28:DA:H5'' | 2.36                     | 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   | A     | 94/139 (68%)    | 93 (99%)   | 1 (1%)  | 0        | 100         | 100 |
| 1   | E     | 94/139 (68%)    | 90 (96%)   | 4 (4%)  | 0        | 100         | 100 |
| 2   | B     | 79/106 (74%)    | 77 (98%)   | 2 (2%)  | 0        | 100         | 100 |
| 2   | F     | 80/106 (76%)    | 78 (98%)   | 2 (2%)  | 0        | 100         | 100 |
| 3   | C     | 106/133 (80%)   | 105 (99%)  | 1 (1%)  | 0        | 100         | 100 |
| 3   | G     | 106/133 (80%)   | 106 (100%) | 0       | 0        | 100         | 100 |
| 4   | D     | 92/128 (72%)    | 92 (100%)  | 0       | 0        | 100         | 100 |
| 4   | H     | 92/128 (72%)    | 92 (100%)  | 0       | 0        | 100         | 100 |
| 7   | K     | 198/417 (48%)   | 195 (98%)  | 3 (2%)  | 0        | 100         | 100 |
| 7   | L     | 198/417 (48%)   | 195 (98%)  | 3 (2%)  | 0        | 100         | 100 |
| 7   | M     | 198/417 (48%)   | 195 (98%)  | 3 (2%)  | 0        | 100         | 100 |
| 7   | N     | 198/417 (48%)   | 195 (98%)  | 3 (2%)  | 0        | 100         | 100 |
| All | All   | 1535/2680 (57%) | 1513 (99%) | 22 (1%) | 0        | 100         | 100 |

There are no Ramachandran outliers to report.

### 5.3.2 Protein sidechains ⓘ

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   | A     | 84/113 (74%) | 84 (100%) | 0        | 100         | 100 |
| 1   | E     | 84/113 (74%) | 84 (100%) | 0        | 100         | 100 |
| 2   | B     | 66/81 (82%)  | 66 (100%) | 0        | 100         | 100 |
| 2   | F     | 67/81 (83%)  | 67 (100%) | 0        | 100         | 100 |
| 3   | C     | 85/102 (83%) | 85 (100%) | 0        | 100         | 100 |
| 3   | G     | 85/102 (83%) | 85 (100%) | 0        | 100         | 100 |
| 4   | D     | 80/106 (76%) | 80 (100%) | 0        | 100         | 100 |

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| Mol | Chain | Analysed       | Rotameric  | Outliers | Percentiles |     |
|-----|-------|----------------|------------|----------|-------------|-----|
| 4   | H     | 80/106 (76%)   | 79 (99%)   | 1 (1%)   | 61          | 71  |
| 7   | K     | 15/366 (4%)    | 15 (100%)  | 0        | 100         | 100 |
| 7   | L     | 15/366 (4%)    | 15 (100%)  | 0        | 100         | 100 |
| 7   | M     | 15/366 (4%)    | 15 (100%)  | 0        | 100         | 100 |
| 7   | N     | 15/366 (4%)    | 15 (100%)  | 0        | 100         | 100 |
| All | All   | 691/2268 (30%) | 690 (100%) | 1 (0%)   | 87          | 88  |

All (1) residues with a non-rotameric sidechain are listed below:

| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 4   | H     | 33  | SER  |

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 3   | C     | 74  | ASN  |
| 4   | D     | 96  | GLN  |
| 2   | F     | 26  | ASN  |
| 4   | H     | 96  | 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 oligosaccharides 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.

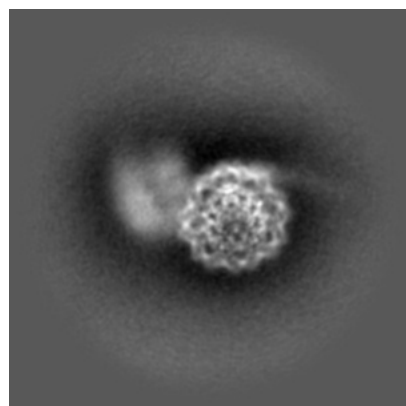
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-53536. These allow visual inspection of the internal detail of the map and identification of artifacts.

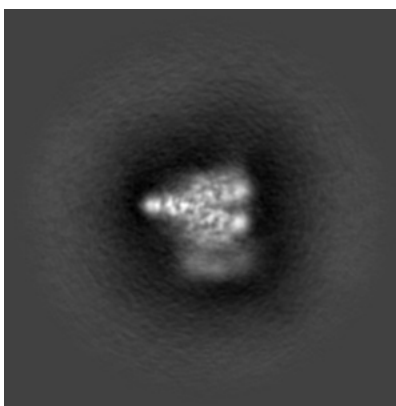
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

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

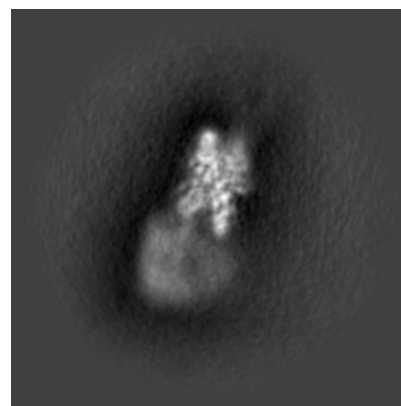
#### 6.1.1 Primary map



X

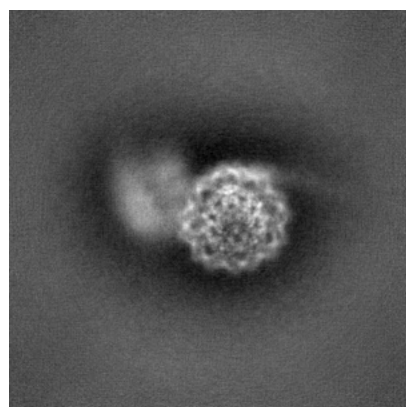


Y

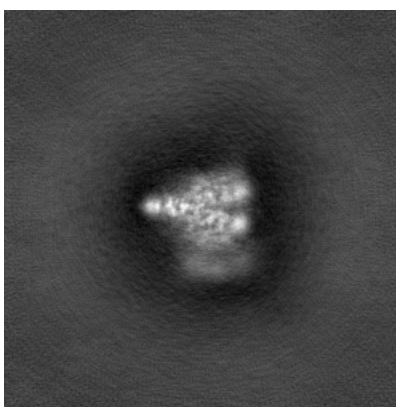


Z

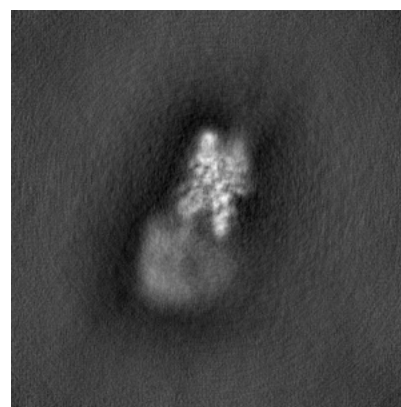
#### 6.1.2 Raw map



X



Y

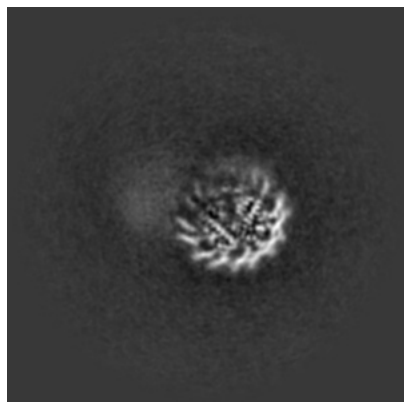


Z

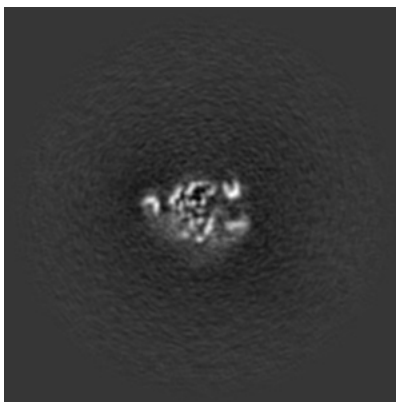
The images above show the map projected in three orthogonal directions.

## 6.2 Central slices [i](#)

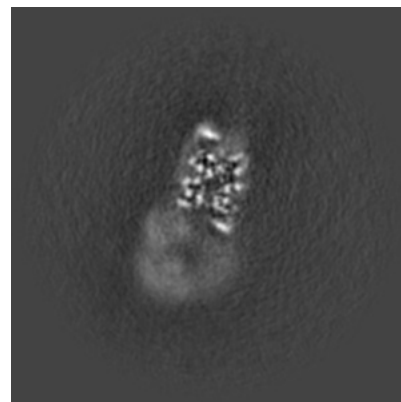
### 6.2.1 Primary map



X Index: 210

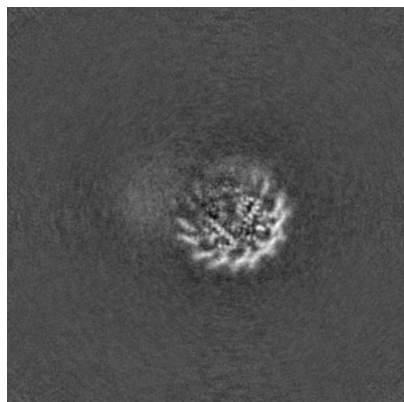


Y Index: 210

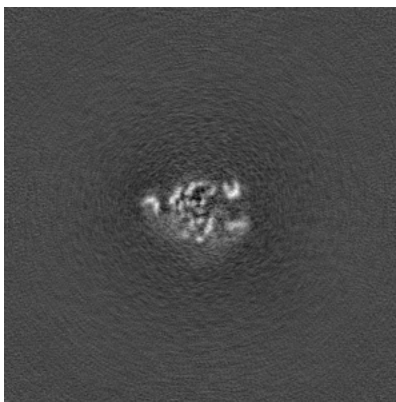


Z Index: 210

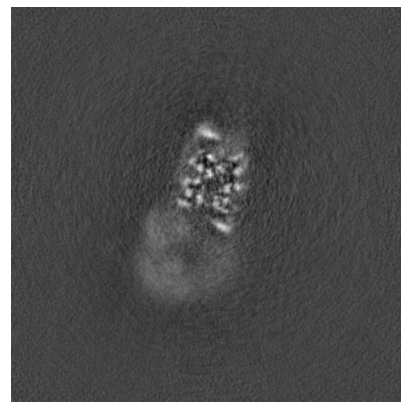
### 6.2.2 Raw map



X Index: 210



Y Index: 210

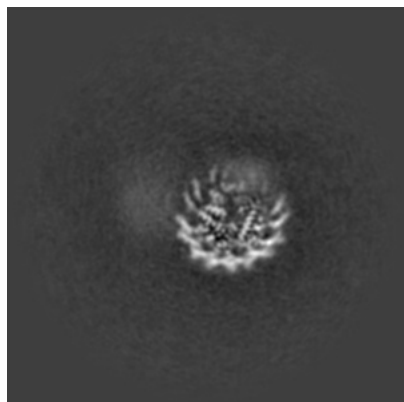


Z Index: 210

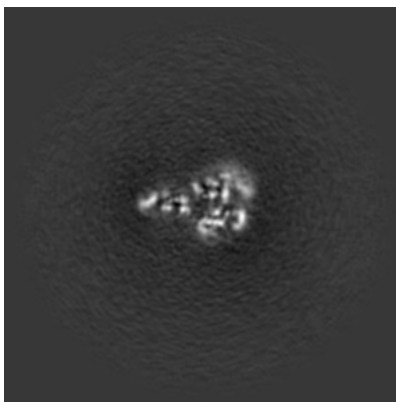
The images above show central slices of the map in three orthogonal directions.

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

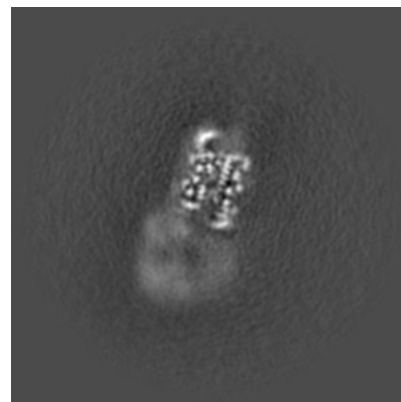
### 6.3.1 Primary map



X Index: 214

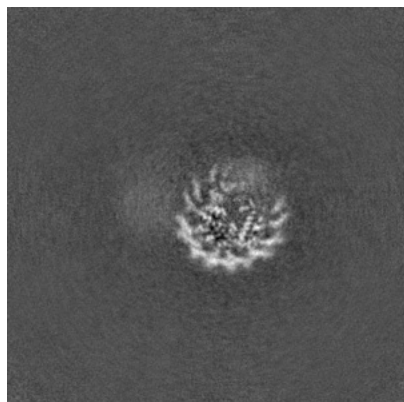


Y Index: 238

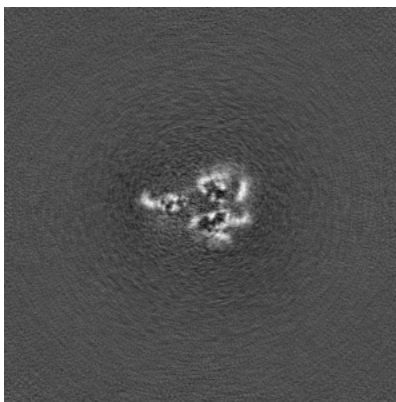


Z Index: 215

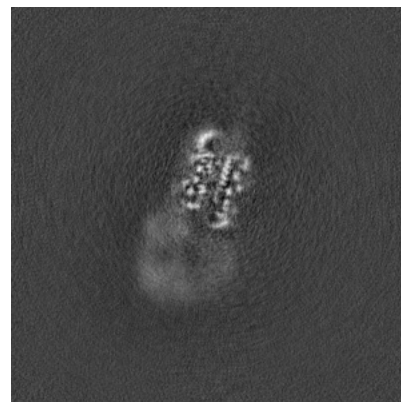
### 6.3.2 Raw map



X Index: 215



Y Index: 231

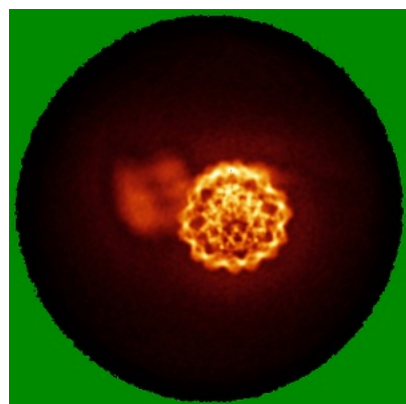


Z Index: 216

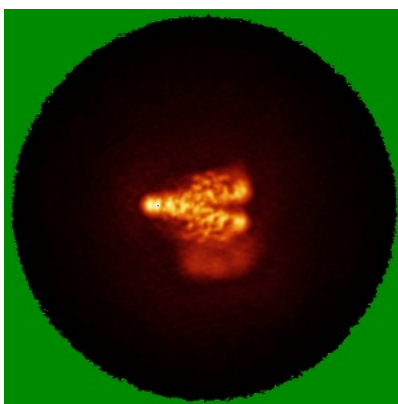
The images above show the largest variance slices of the map in three orthogonal directions.

## 6.4 Orthogonal standard-deviation projections (False-color) [i](#)

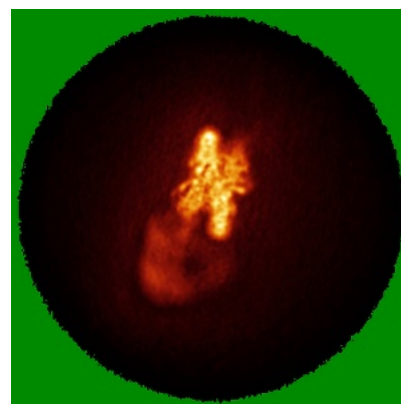
### 6.4.1 Primary map



X

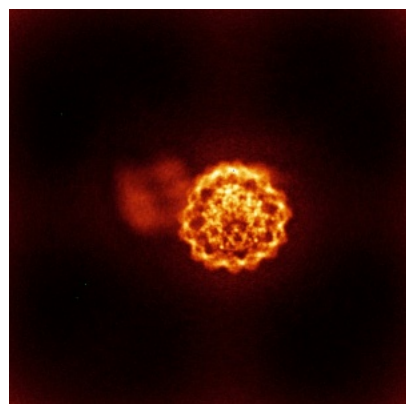


Y

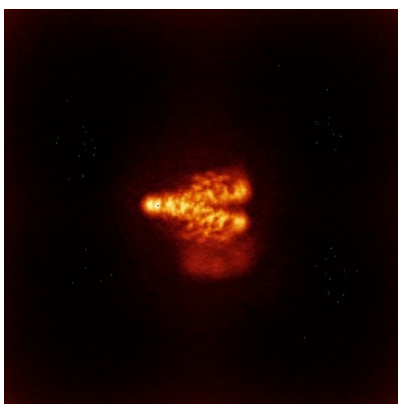


Z

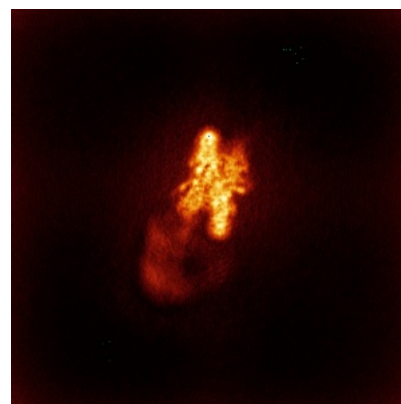
### 6.4.2 Raw map



X



Y

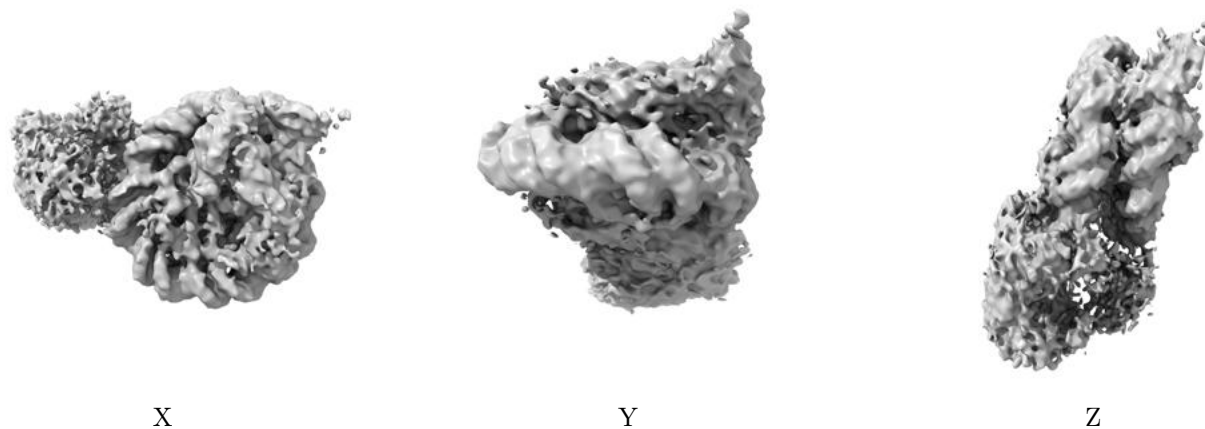


Z

The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

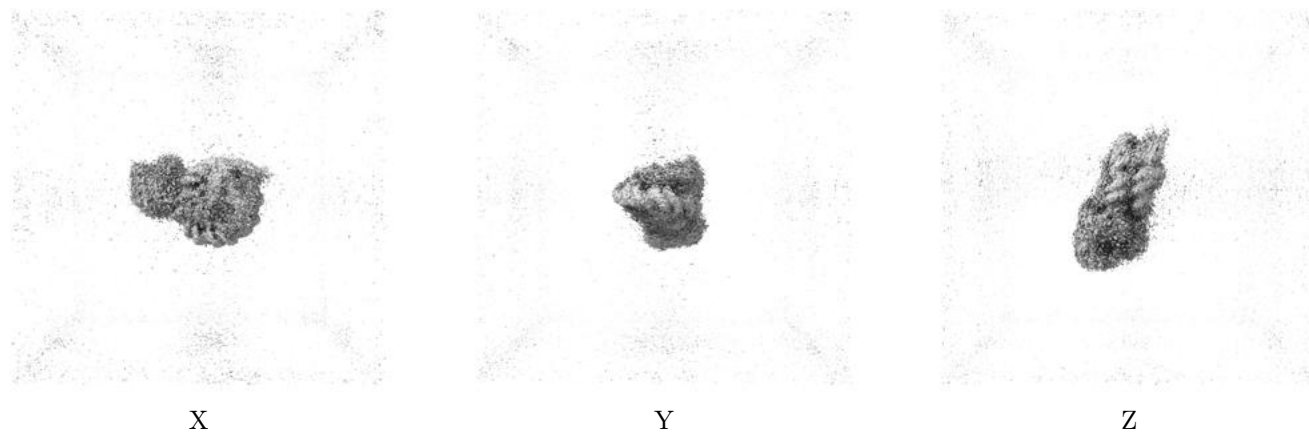
## 6.5 Orthogonal surface views [i](#)

### 6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.165. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

### 6.5.2 Raw map



These images show the 3D surface of the raw map. The raw map's contour level was selected so that its surface encloses the same volume as the primary map does at its recommended contour level.

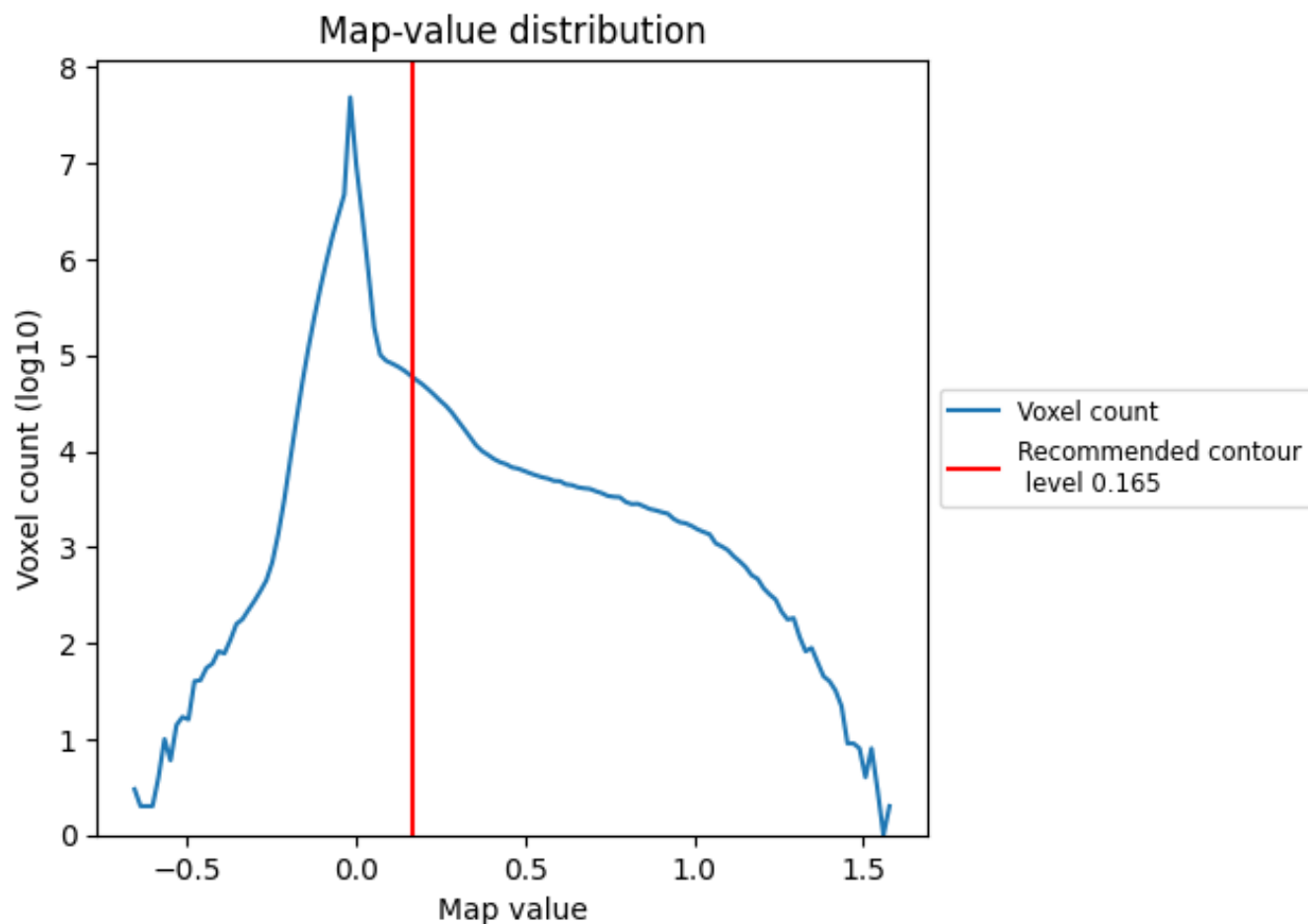
## 6.6 Mask visualisation [i](#)

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

## 7 Map analysis [i](#)

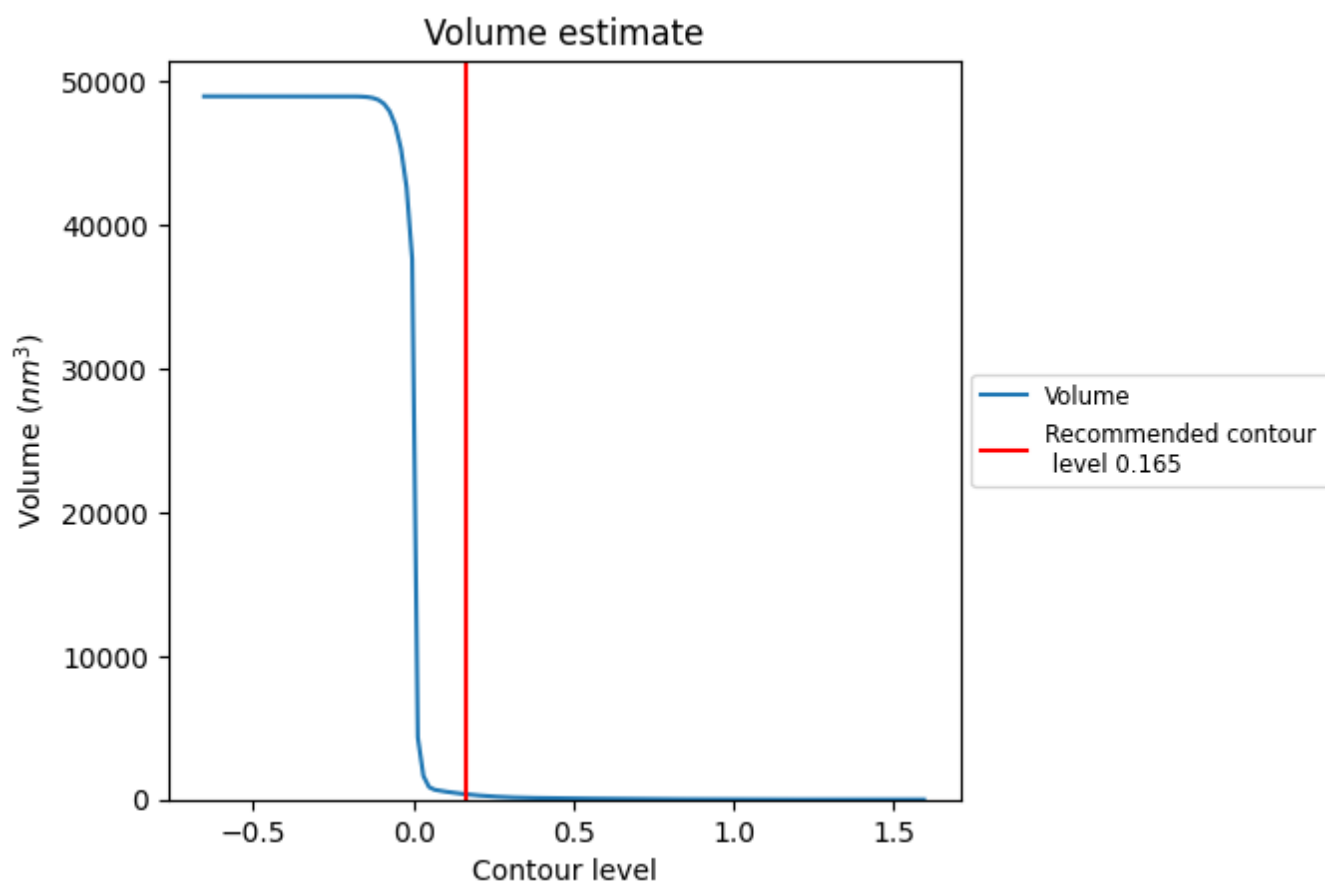
This section contains the results of statistical analysis of the map.

### 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.

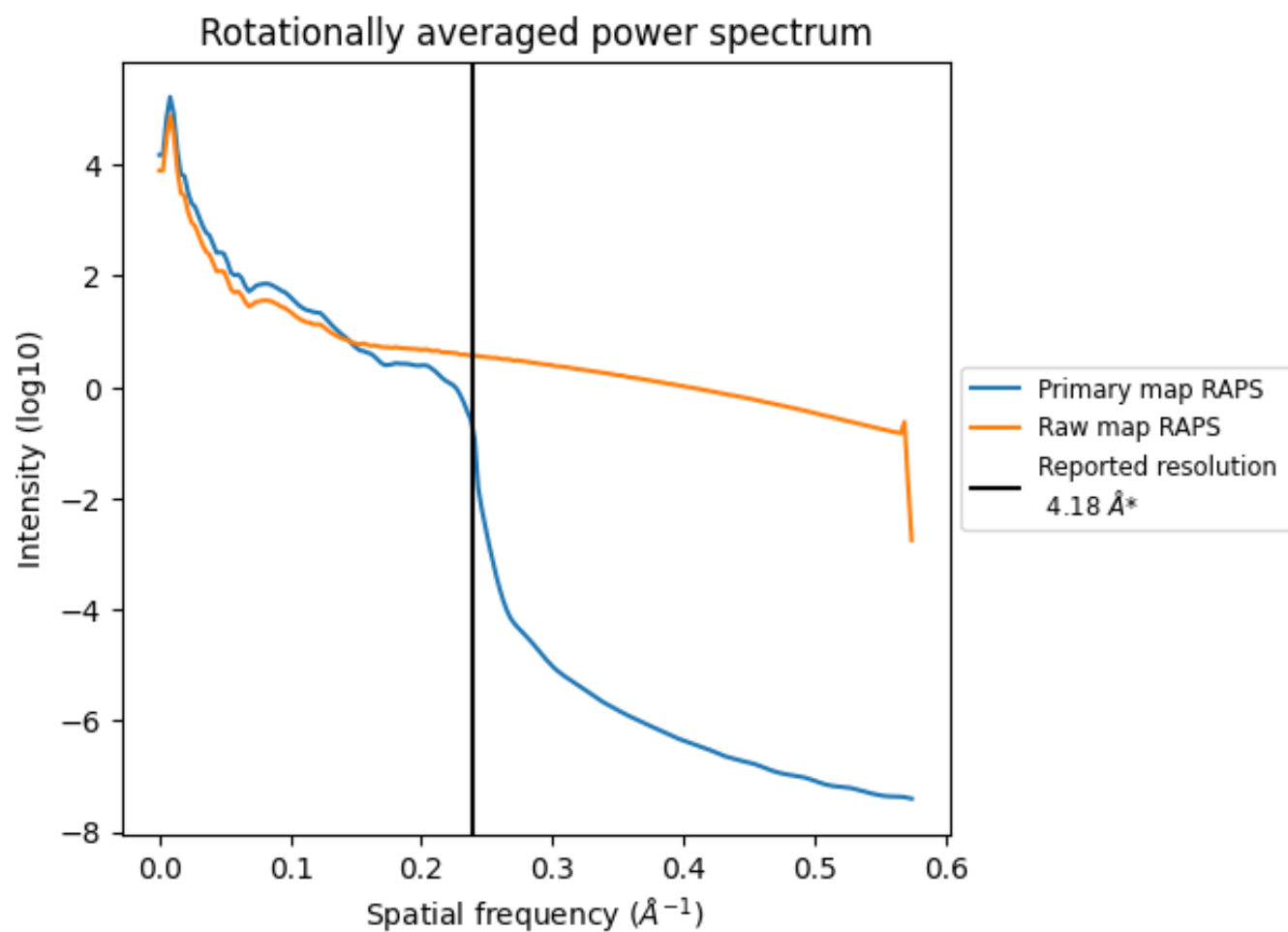
## 7.2 Volume estimate [i](#)



The volume at the recommended contour level is 370  $\text{nm}^3$ ; this corresponds to an approximate mass of 334 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 ⓘ

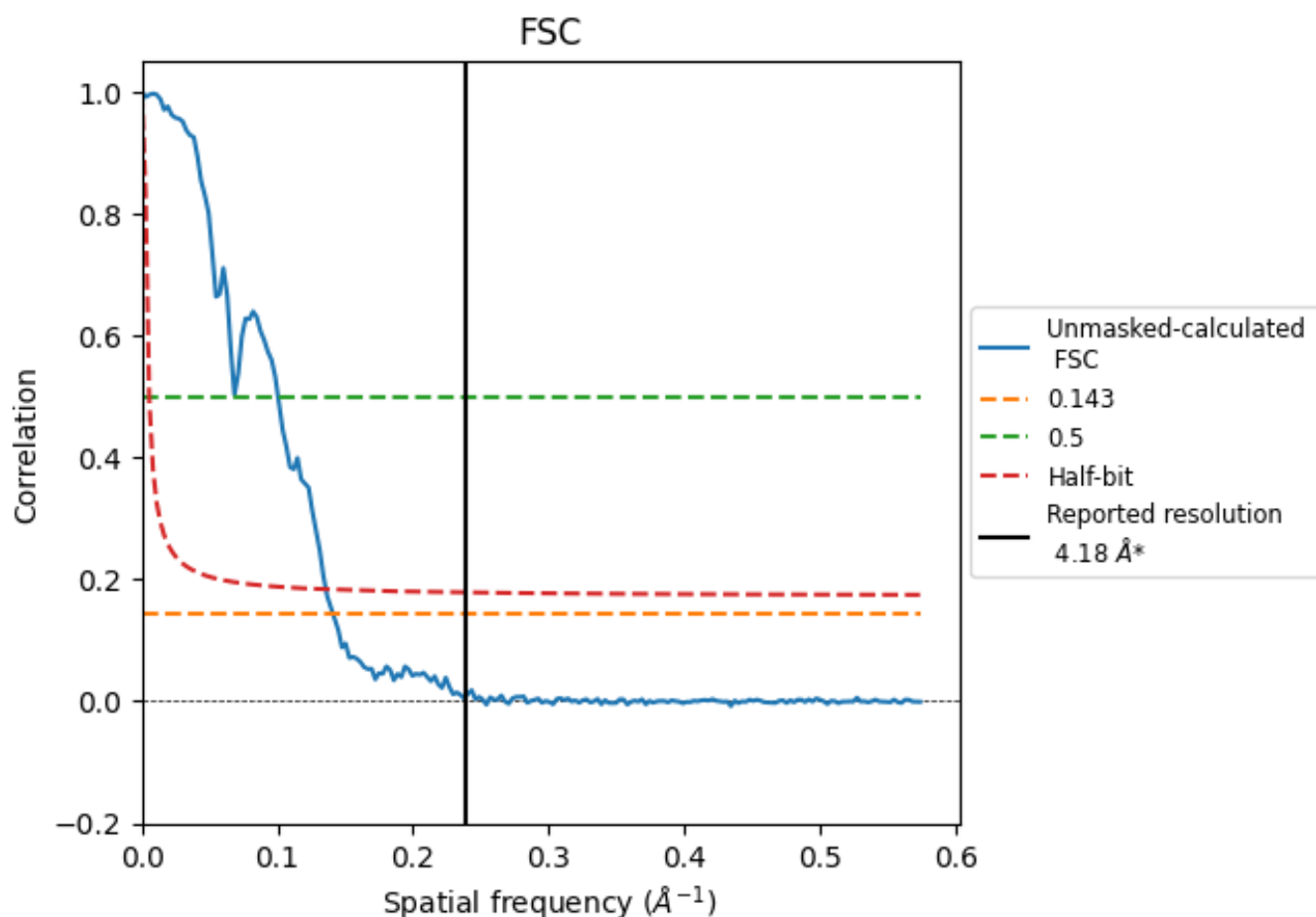


\*Reported resolution corresponds to spatial frequency of 0.239  $\text{\AA}^{-1}$

## 8 Fourier-Shell correlation [i](#)

Fourier-Shell Correlation (FSC) is the most commonly used method to estimate the resolution of single-particle and subtomogram-averaged maps. The shape of the curve depends on the imposed symmetry, mask and whether or not the two 3D reconstructions used were processed from a common reference. The reported resolution is shown as a black line. A curve is displayed for the half-bit criterion in addition to lines showing the 0.143 gold standard cut-off and 0.5 cut-off.

### 8.1 FSC [i](#)



\*Reported resolution corresponds to spatial frequency of  $0.239 \text{ \AA}^{-1}$

## 8.2 Resolution estimates [i](#)

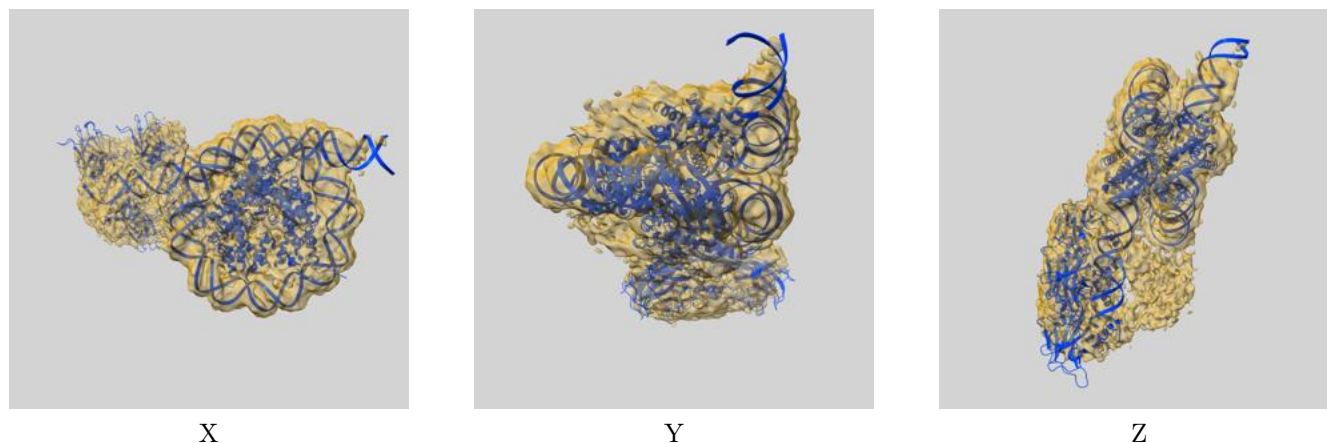
| Resolution estimate (Å)   | Estimation criterion (FSC cut-off) |      |          |
|---------------------------|------------------------------------|------|----------|
|                           | 0.143                              | 0.5  | Half-bit |
| Reported by author        | 4.18                               | -    | -        |
| Author-provided FSC curve | -                                  | -    | -        |
| Unmasked-calculated*      | 7.09                               | 9.95 | 7.36     |

\*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 7.09 differs from the reported value 4.18 by more than 10 %

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

This section contains information regarding the fit between EMDB map EMD-53536 and PDB model 9R2P. Per-residue inclusion information can be found in section [3](#) on page [9](#).

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



The images above show the 3D surface view of the map at the recommended contour level 0.165 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 Q-score mapped to coordinate model [i](#)

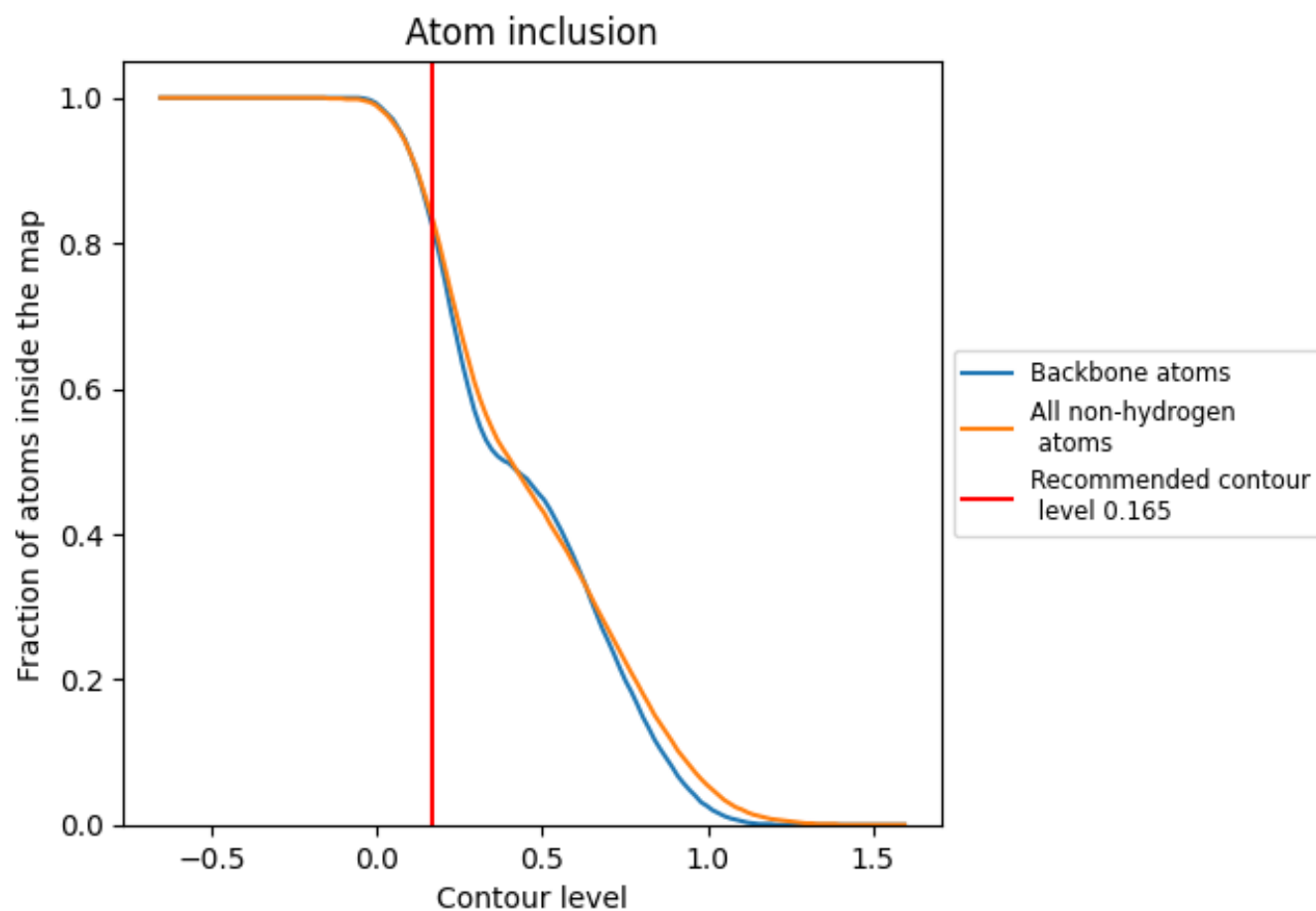


The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions at which atoms can be resolved. Low Q-score values may therefore be expected for many entries.

## 9.3 Atom inclusion mapped to coordinate model [i](#)

This section was not generated.

## 9.4 Atom inclusion [i](#)



At the recommended contour level, 83% of all backbone atoms, 84% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary ⓘ

The table lists the average atom inclusion at the recommended contour level (0.165) and Q-score for the entire model and for each chain.

| Chain | Atom inclusion     | Q-score            |
|-------|--------------------|--------------------|
| All   | <div></div> 0.8380 | <div></div> 0.1960 |
| A     | <div></div> 0.8630 | <div></div> 0.2670 |
| B     | <div></div> 0.8970 | <div></div> 0.2940 |
| C     | <div></div> 0.9220 | <div></div> 0.2500 |
| D     | <div></div> 0.9510 | <div></div> 0.2600 |
| E     | <div></div> 0.9160 | <div></div> 0.2680 |
| F     | <div></div> 0.9440 | <div></div> 0.3090 |
| G     | <div></div> 0.8500 | <div></div> 0.2420 |
| H     | <div></div> 0.9130 | <div></div> 0.2620 |
| I     | <div></div> 0.8890 | <div></div> 0.2240 |
| J     | <div></div> 0.9020 | <div></div> 0.2290 |
| K     | <div></div> 0.5250 | <div></div> 0.0440 |
| L     | <div></div> 0.8130 | <div></div> 0.0720 |
| M     | <div></div> 0.5960 | <div></div> 0.0350 |
| N     | <div></div> 0.7290 | <div></div> 0.0440 |

1.0

0.0

<0.0