# WORLDWIDE PDB
## PROTEIN DATA BANK

# wwPDB EM Validation Summary Report ⓘ

Aug 4, 2025 – 06:37 PM EDT

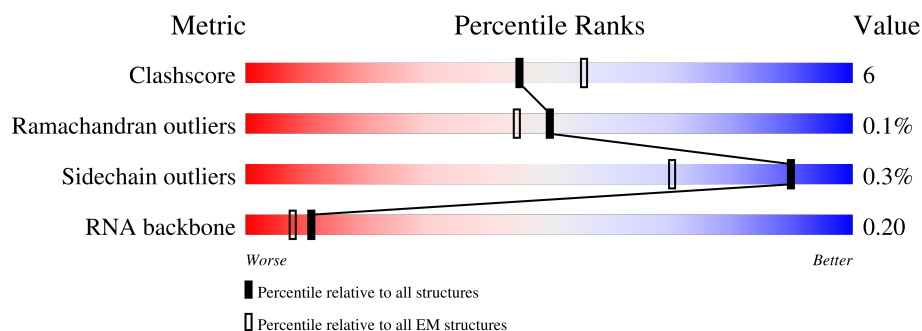| | | |
|---|---|---|
| PDB ID | : | 9CRO / pdb_00009cro |
| EMDB ID | : | EMD-45873 |
| Title | : | Post-targeting aCascade Type IA CRISPR-Cas Surveillance Complexes |
| Authors | : | Findlay, J.L.; Gentry, J.K.; Lawrence, C.M. |
| Deposited on | : | 2024-07-22 |
| Resolution | : | 3.50 Å(reported) |
| Based on initial model | : | . |

# 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 3.50 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 | Percentile Ranks | Value |
|---|---|---|
| Clashscore | | 6 |
| Ramachandran outliers | | 0.1% |
| Sidechain outliers | | 0.3% |
| RNA backbone | | 0.20 |

*Worse*          *Better*

▌ Percentile relative to all structures

▯ Percentile relative to all EM structures

| Metric | Whole archive (#Entries) | EM structures (#Entries) |
|---|---|---|
| Clashscore | 210492 | 15764 |
| Ramachandran outliers | 207382 | 16835 |
| Sidechain outliers | 206894 | 16415 |
| RNA backbone | 6643 | 2191 |

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 >=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 <=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 | I | 156 | 66%   15%   19% |
| 1 | J | 156 | 46%   69%   12%   19% |
| 1 | K | 156 | 65%   15%   19% |
| 1 | L | 156 | 63%   17%   19% |
| 1 | M | 156 | 68%   13%   19% |
| 1 | N | 156 | 6%   62%   16%   22% |
| 2 | A | 321 | 91%   7%   • |

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| Mol | Chain | Length | Quality of chain |
|-----|-------|--------|------------------|
| 2 | B | 321 | 91%    8% |
| 2 | C | 321 | 89%    10% |
| 2 | D | 321 | 90%    9% |
| 2 | E | 321 | 90%    8% |
| 2 | F | 321 | 91%    7% |
| 2 | G | 321 | 79%    6%    15% |
| 3 | H | 240 | 80%    6%    14% |
| 4 | S | 63 | 19%    27%    22%    30% |

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

| Mol | Type | Chain | Res | Chirality | Geometry | Clashes | Electron density |
|-----|------|-------|-----|-----------|----------|---------|------------------|
| 5 | TRS | B | 401 | - | - | X | - |
| 5 | TRS | C | 401 | - | - | X | - |
| 5 | TRS | D | 401 | - | - | X | - |
| 5 | TRS | E | 401 | - | - | X | - |

# 2 Entry composition ⓘ

There are 5 unique types of molecules in this entry. The entry contains 32552 atoms, of which 7274 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 CRISPR type I-A cluster 2/Apern-associated protein Csa5-2.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|
| 1 | J | 126 | Total 977 | C 618 | N 165 | O 191 | S 3 | 0 | 0 |
| 1 | I | 126 | Total 977 | C 618 | N 165 | O 191 | S 3 | 0 | 0 |
| 1 | K | 126 | Total 977 | C 618 | N 165 | O 191 | S 3 | 0 | 0 |
| 1 | L | 126 | Total 977 | C 618 | N 165 | O 191 | S 3 | 0 | 0 |
| 1 | M | 126 | Total 977 | C 618 | N 165 | O 191 | S 3 | 0 | 0 |
| 1 | N | 122 | Total 944 | C 598 | N 158 | O 185 | S 3 | 0 | 0 |

There are 36 discrepancies between the modelled and reference sequences:

| Chain | Residue | Modelled | Actual | Comment | Reference |
|---|---|---|---|---|---|
| J | -5 | HIS | - | expression tag | UNP Q97Y90 |
| J | -4 | HIS | - | expression tag | UNP Q97Y90 |
| J | -3 | HIS | - | expression tag | UNP Q97Y90 |
| J | -2 | HIS | - | expression tag | UNP Q97Y90 |
| J | -1 | HIS | - | expression tag | UNP Q97Y90 |
| J | 0 | HIS | - | expression tag | UNP Q97Y90 |
| I | -5 | HIS | - | expression tag | UNP Q97Y90 |
| I | -4 | HIS | - | expression tag | UNP Q97Y90 |
| I | -3 | HIS | - | expression tag | UNP Q97Y90 |
| I | -2 | HIS | - | expression tag | UNP Q97Y90 |
| I | -1 | HIS | - | expression tag | UNP Q97Y90 |
| I | 0 | HIS | - | expression tag | UNP Q97Y90 |
| K | -5 | HIS | - | expression tag | UNP Q97Y90 |
| K | -4 | HIS | - | expression tag | UNP Q97Y90 |
| K | -3 | HIS | - | expression tag | UNP Q97Y90 |
| K | -2 | HIS | - | expression tag | UNP Q97Y90 |
| K | -1 | HIS | - | expression tag | UNP Q97Y90 |
| K | 0 | HIS | - | expression tag | UNP Q97Y90 |

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| Chain | Residue | Modelled | Actual | Comment | Reference |
|---|---|---|---|---|---|
| L | -5 | HIS | - | expression tag | UNP Q97Y90 |
| L | -4 | HIS | - | expression tag | UNP Q97Y90 |
| L | -3 | HIS | - | expression tag | UNP Q97Y90 |
| L | -2 | HIS | - | expression tag | UNP Q97Y90 |
| L | -1 | HIS | - | expression tag | UNP Q97Y90 |
| L | 0 | HIS | - | expression tag | UNP Q97Y90 |
| M | -5 | HIS | - | expression tag | UNP Q97Y90 |
| M | -4 | HIS | - | expression tag | UNP Q97Y90 |
| M | -3 | HIS | - | expression tag | UNP Q97Y90 |
| M | -2 | HIS | - | expression tag | UNP Q97Y90 |
| M | -1 | HIS | - | expression tag | UNP Q97Y90 |
| M | 0 | HIS | - | expression tag | UNP Q97Y90 |
| N | -5 | HIS | - | expression tag | UNP Q97Y90 |
| N | -4 | HIS | - | expression tag | UNP Q97Y90 |
| N | -3 | HIS | - | expression tag | UNP Q97Y90 |
| N | -2 | HIS | - | expression tag | UNP Q97Y90 |
| N | -1 | HIS | - | expression tag | UNP Q97Y90 |
| N | 0 | HIS | - | expression tag | UNP Q97Y90 |

- Molecule 2 is a protein called CRISPR-associated aCascade subunit Cas7/Csa2 2.

| Mol | Chain | Residues | Atoms | | | | | | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | B | 316 | Total 2448 | C 1567 | N 410 | O 463 | S 8 | | 0 | 0 |
| 2 | C | 316 | Total 2448 | C 1567 | N 410 | O 463 | S 8 | | 0 | 0 |
| 2 | D | 316 | Total 2448 | C 1567 | N 410 | O 463 | S 8 | | 0 | 0 |
| 2 | A | 316 | Total 2448 | C 1567 | N 410 | O 463 | S 8 | | 0 | 0 |
| 2 | E | 316 | Total 4959 | C 1567 | H 2511 | N 410 | O 463 | S 8 | 0 | 0 |
| 2 | F | 316 | Total 4959 | C 1567 | H 2511 | N 410 | O 463 | S 8 | 0 | 0 |
| 2 | G | 272 | Total 4282 | C 1353 | H 2169 | N 348 | O 404 | S 8 | 0 | 0 |

- Molecule 3 is a protein called CRISPR system aCascade subunit Cas5 1.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|
| 3 | H | 207 | Total 1666 | C 1086 | N 268 | O 307 | S 5 | 1 | 0 |

- Molecule 4 is a RNA chain called RNA (44-MER).

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|
| | | | Total | C | N | O | P | | |
| 4 | S | 44 | 926 | 417 | 160 | 306 | 43 | 0 | 0 |

- Molecule 5 is 2-AMINO-2-HYDROXYMETHYL-PROPANE-1,3-DIOL (CCD ID: TRS) (formula: $C_4H_{12}NO_3$).
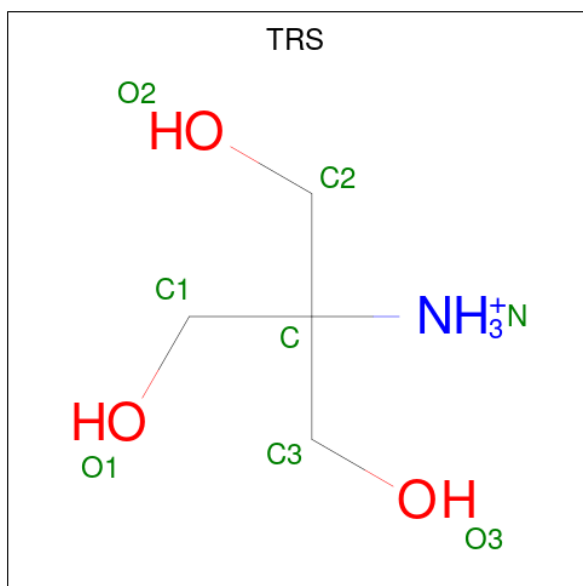


| Mol | Chain | Residues | Atoms | | | | | AltConf |
|---|---|---|---|---|---|---|---|---|
| | | | Total | C | H | N | O | |
| 5 | B | 1 | 20 | 4 | 12 | 1 | 3 | 0 |
| 5 | C | 1 | Total | C | H | N | O | 0 |
| | | | 20 | 4 | 12 | 1 | 3 | |
| 5 | D | 1 | Total | C | H | N | O | 0 |
| | | | 20 | 4 | 12 | 1 | 3 | |
| 5 | A | 1 | Total | C | H | N | O | 0 |
| | | | 20 | 4 | 12 | 1 | 3 | |
| 5 | S | 1 | Total | C | H | N | O | 0 |
| | | | 20 | 4 | 12 | 1 | 3 | |
| 5 | S | 1 | Total | C | H | N | O | 0 |
| | | | 20 | 4 | 12 | 1 | 3 | |
| 5 | E | 1 | Total | C | H | N | O | 0 |
| | | | 19 | 4 | 11 | 1 | 3 | |

# 3   Residue-property plots ⓘ

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.
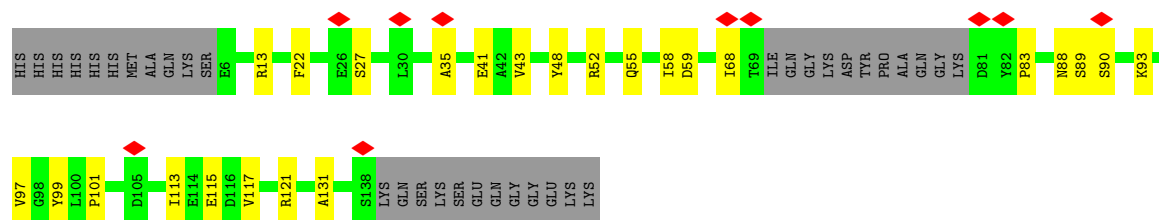
• Molecule 1: CRISPR type I-A cluster 2/Apern-associated protein Csa5-2

Chain J:



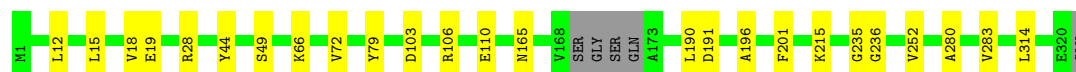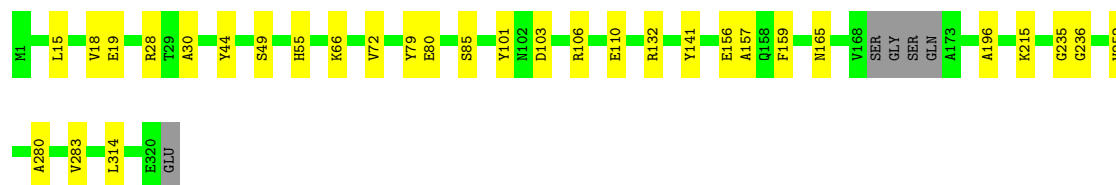• Molecule 1: CRISPR type I-A cluster 2/Apern-associated protein Csa5-2

Chain I:



• Molecule 1: CRISPR type I-A cluster 2/Apern-associated protein Csa5-2

Chain K:



• Molecule 1: CRISPR type I-A cluster 2/Apern-associated protein Csa5-2

Chain L:

63%    17%    19%

HIS HIS HIS HIS HIS MET ALA GLN LYS SER E6 R13 N16 F22 S25 E26 S27 D32 R33 F34 L38 V43 Y48 R52 Q55 M56 G57 I58 D59 I68 T69 ILE GLN GLY LYS ASP TYR PRO ALA GLN GLY LYS D81 Y82 P83 N88

K93 V96 V97 G98 Y99 L100 P101 V117 A131 L136 K142 SER GLU GLN GLY GLY GLU LYS LYS

• Molecule 1: CRISPR type I-A cluster 2/Apern-associated protein Csa5-2

Chain M:

68%    13%    19%

HIS HIS HIS HIS HIS MET ALA GLN LYS SER E6 R13 F22 S27 D32 E41 A42 V43 Y48 R52 Q55 I58 D59 I68 T69 ILE GLN GLY LYS ASP TYR PRO ALA GLN GLY LYS D81 Y82 P83 V97 G98 Y99 L100 P101 I113 V117

A131 L136 K142 SER GLU GLN GLY GLY GLU LYS LYS

• Molecule 1: CRISPR type I-A cluster 2/Apern-associated protein Csa5-2

Chain N:

6%

62%    16%    22%

HIS HIS HIS HIS HIS MET ALA GLN LYS SER E6 R13 F22 E26 S27 L30 A35 E41 A42 V43 Y48 R52 Q55 I58 D59 I68 T69 ILE GLN GLY LYS ASP TYR PRO ALA GLN GLY LYS D81 Y82 P83 N88 S89 S90 K93

V97 G98 Y99 L100 P101 D105 I113 E114 E115 D116 V117 R121 A131 S138 LYS GLN SER LYS SER GLU GLN GLY GLY GLU LYS LYS

• Molecule 2: CRISPR-associated aCascade subunit Cas7/Csa2 2

Chain B:

91%    8%

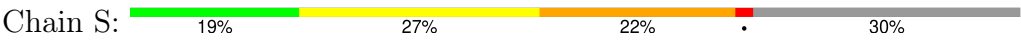M1 L12 L15 V18 E19 R28 Y44 S49 K66 V72 Y79 D103 R106 E110 N165 V168 SER GLY SER GLN A173 L190 D191 A196 F201 K215 G235 G236 V252 A280 V283 L314 E320 GLU

• Molecule 2: CRISPR-associated aCascade subunit Cas7/Csa2 2

Chain C:

89%    10%

M1 L15 V18 E19 R28 T29 A30 Y44 S49 H55 K66 V72 Y79 E80 S85 Y101 N102 D103 R106 E110 R132 Y141 E156 A157 Q158 F159 N165 V168 SER GLY SER GLN A173 A196 K215 G235 G236 V252

A280 V283 L314 E320 GLU

• Molecule 2: CRISPR-associated aCascade subunit Cas7/Csa2 2

Chain D:

90%   9%

M1 L12 L15 V18 E19 R28 Y44 S49 H55 K66 V72 Q78 Y79 E80 D103 R106 E110 R147 F159 N165 V168 SER GLY SER GLN A173 A196 K215 L229 G235 G236 V252 A280 V283 L314

E320 GLU

• Molecule 2: CRISPR-associated aCascade subunit Cas7/Csa2 2

Chain A:

91%   7%

M1 L15 V18 E19 S37 T38 L41 V47 H55 Q78 Y79 D103 R106 D119 R132 R133 T134 S135 R136 I143 F163 P167 V168 SER GLY SER GLN A173 G235 V252 E262 P263 R276 L314 E320 GLU

• Molecule 2: CRISPR-associated aCascade subunit Cas7/Csa2 2

Chain E:

90%   8%

M1 V18 E19 R28 T29 A30 T38 G39 Y40 H55 Y79 E80 R105 E108 D119 R133 T134 S135 R136 F159 V168 SER GLY SER GLN A173 I174 T200 F201 E210 R213 L250 V251 V252 A280 V283 L284 E312 E320 GLU

• Molecule 2: CRISPR-associated aCascade subunit Cas7/Csa2 2

Chain F:

91%   7%

M1 E13 V18 E19 S20 I21 R28 T38 H55 Y79 R105 E108 D119 R133 T134 S135 R136 F159 S164 N165 K166 P167 V168 SER GLY SER GLN A173 I174 T200 E210 R213 G236 L250 V251 V252 A280 V283 L284 E312

E320 GLU

• Molecule 2: CRISPR-associated aCascade subunit Cas7/Csa2 2

Chain G:

79%   6%   15%

M1 F8 L12 E13 V18 E19 SER ILE GLY ASN LEU T25 Y79 R105 E108 D119 R132 R133 T134 S135 R136 P152 ALA GLN LEU GLU ALA GLN PHE HIS VAL ARG PHE SER ASN LYS PRO VAL SER GLY SER GLN ALA ILE PHE ASN VAL E178 T200

E210 R213 N233 F234 GLY GLY LYS ARG SER ARG PHE LEU P243 S244 L250 V251 V252 D266 A280 V283 L284 E297 GLY ILE GLU VAL GLY GLU GLY VAL THR VAL L308 E312 E320 GLU
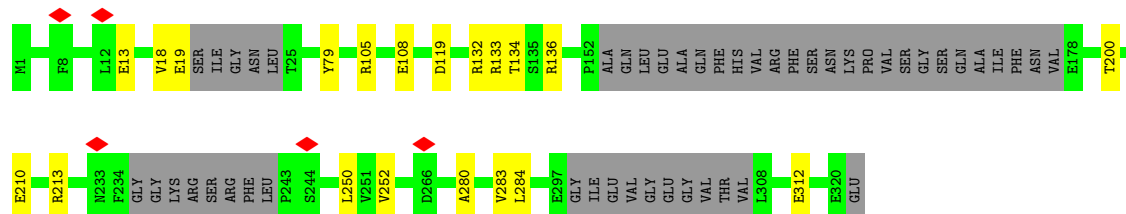
• Molecule 3: CRISPR system aCascade subunit Cas5 1

Chain H:

80%   6%   14%

M1 V6 H11 L20 ALA ALA LYS A24 L30 T34 T35 G38 D49 N52 LEU GLY ASN VAL Y57 I67 D82 ILE ILE ARG ASN VAL ILE SER TYR PHE GLN ARG LYS GLU ARG GLU ASN PRO ARG TYR ILE TYR GLY VAL ILE PRO T109 V121

T125 C137 E147 V155 R182 Y197 G200 L210 A226 S240

• Molecule 4: RNA (44-MER)

Chain S:

19%    27%    22%    •    30%

A1 U2 U3 G4 A7 G8 U9 U14 U15 U16 C17 G18 A19 A20 G21 A22 A25 C26 C27 C28 G29 U32 C33 A34 G35 A36 U37 U38 C39 A40 U41 U42 A43 U44 G G G A U A A U C U C U U A U A G A
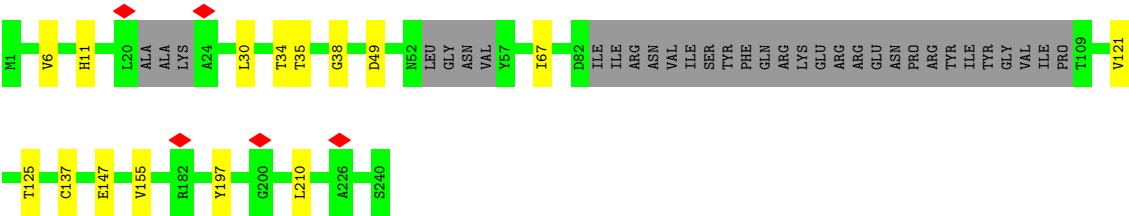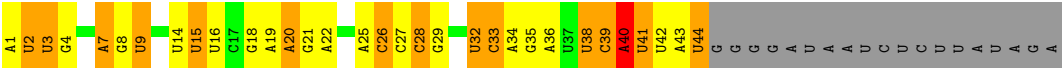
# 4 Experimental information ⓘ

| Property | Value | Source |
| --- | --- | --- |
| EM reconstruction method | SINGLE PARTICLE | Depositor |
| Imposed symmetry | POINT, C1 | Depositor |
| Number of particles used | 10791 | Depositor |
| Resolution determination method | FSC 0.143 CUT-OFF | Depositor |
| CTF correction method | PHASE FLIPPING AND AMPLITUDE CORRECTION | Depositor |
| Microscope | TFS TALOS | Depositor |
| Voltage (kV) | 200 | Depositor |
| Electron dose $(e^-/\text{Å}^2)$ | 55.3 | Depositor |
| Minimum defocus (nm) | 500 | Depositor |
| Maximum defocus (nm) | 2500 | Depositor |
| Magnification | 36000 | Depositor |
| Image detector | GATAN K3 (6k x 4k) | Depositor |
| Maximum map value | 1.029 | Depositor |
| Minimum map value | -0.491 | Depositor |
| Average map value | 0.000 | Depositor |
| Map value standard deviation | 0.035 | Depositor |
| Recommended contour level | 0.13 | Depositor |
| Map size (Å) | 363.52, 363.52, 363.52 | wwPDB |
| Map dimensions | 256, 256, 256 | wwPDB |
| Map angles (°) | 90.0, 90.0, 90.0 | wwPDB |
| Pixel spacing (Å) | 1.42, 1.42, 1.42 | Depositor |

# 5  Model quality  ⓘ

## 5.1  Standard geometry  ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: TRS

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 | I | 0.69 | 0/988 | 1.07 | 0/1334 |
| 1 | J | 0.68 | 0/988 | 1.06 | 0/1334 |
| 1 | K | 0.69 | 0/988 | 1.06 | 0/1334 |
| 1 | L | 0.69 | 0/988 | 1.07 | 0/1334 |
| 1 | M | 0.68 | 0/988 | 1.08 | 0/1334 |
| 1 | N | 0.69 | 0/955 | 1.11 | 1/1292 (0.1%) |
| 2 | A | 0.11 | 0/2489 | 0.27 | 0/3356 |
| 2 | B | 0.13 | 0/2489 | 0.28 | 0/3356 |
| 2 | C | 0.10 | 0/2489 | 0.25 | 0/3356 |
| 2 | D | 0.10 | 0/2489 | 0.25 | 0/3356 |
| 2 | E | 0.24 | 0/2489 | 0.35 | 0/3356 |
| 2 | F | 0.26 | 0/2489 | 0.36 | 0/3356 |
| 2 | G | 0.13 | 0/2145 | 0.30 | 0/2887 |
| 3 | H | 0.11 | 0/1709 | 0.28 | 0/2311 |
| 4 | S | 0.34 | 2/1034 (0.2%) | 0.34 | 0/1607 |
| All | All | 0.36 | 2/25717 (0.0%) | 0.58 | 1/34903 (0.0%) |

All (2) bond length outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed(Å) | Ideal(Å) |
|-----|-------|-----|------|-------|------|-------------|----------|
| 4 | S | 40 | A | C1'-N9 | -5.28 | 1.39 | 1.47 |
| 4 | S | 43 | A | C1'-N9 | -5.24 | 1.39 | 1.47 |

All (1) bond angle outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed($^o$) | Ideal($^o$) |
|-----|-------|-----|------|-------|------|----------------|-------------|
| 1 | N | 89 | SER | N-CA-C | -6.36 | 100.74 | 109.71 |

There are no chirality outliers.

There are no planarity outliers.

## 5.2 Too-close contacts ⓘ

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 | I | 977 | 0 | 997 | 29 | 0 |
| 1 | J | 977 | 0 | 997 | 11 | 0 |
| 1 | K | 977 | 0 | 997 | 22 | 0 |
| 1 | L | 977 | 0 | 997 | 27 | 0 |
| 1 | M | 977 | 0 | 997 | 17 | 0 |
| 1 | N | 944 | 0 | 958 | 18 | 0 |
| 2 | A | 2448 | 0 | 2510 | 23 | 0 |
| 2 | B | 2448 | 0 | 2510 | 23 | 0 |
| 2 | C | 2448 | 0 | 2510 | 43 | 0 |
| 2 | D | 2448 | 0 | 2510 | 35 | 0 |
| 2 | E | 2448 | 2511 | 2510 | 28 | 0 |
| 2 | F | 2448 | 2511 | 2510 | 18 | 0 |
| 2 | G | 2113 | 2169 | 2166 | 16 | 0 |
| 3 | H | 1666 | 0 | 1668 | 12 | 0 |
| 4 | S | 926 | 0 | 472 | 41 | 0 |
| 5 | A | 8 | 12 | 12 | 5 | 0 |
| 5 | B | 8 | 12 | 12 | 8 | 0 |
| 5 | C | 8 | 12 | 12 | 15 | 0 |
| 5 | D | 8 | 12 | 12 | 14 | 0 |
| 5 | E | 8 | 11 | 11 | 13 | 0 |
| 5 | S | 16 | 24 | 23 | 10 | 0 |
| All | All | 25278 | 7274 | 25391 | 308 | 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 6.

The worst 5 of 308 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:E:55:HIS:CE1 | 5:E:401:TRS:O2 | 1.63 | 1.48 |
| 2:E:55:HIS:CD2 | 5:E:401:TRS:O2 | 1.69 | 1.45 |
| 2:E:55:HIS:NE2 | 5:E:401:TRS:C2 | 1.91 | 1.32 |
| 1:I:14:ILE:CD1 | 1:I:109:PHE:CD1 | 2.25 | 1.20 |
| 4:S:44:U:O4 | 5:S:402:TRS:O2 | 1.58 | 1.18 |

There are no symmetry-related clashes.

## 5.3 Torsion angles ⓘ

### 5.3.1 Protein backbone ⓘ

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 | I | 122/156 (78%) | 122 (100%) | 0 | 0 | 100 | 100 |
| 1 | J | 122/156 (78%) | 122 (100%) | 0 | 0 | 100 | 100 |
| 1 | K | 122/156 (78%) | 122 (100%) | 0 | 0 | 100 | 100 |
| 1 | L | 122/156 (78%) | 122 (100%) | 0 | 0 | 100 | 100 |
| 1 | M | 122/156 (78%) | 122 (100%) | 0 | 0 | 100 | 100 |
| 1 | N | 118/156 (76%) | 115 (98%) | 2 (2%) | 1 (1%) | 16 | 51 |
| 2 | A | 312/321 (97%) | 305 (98%) | 7 (2%) | 0 | 100 | 100 |
| 2 | B | 312/321 (97%) | 307 (98%) | 5 (2%) | 0 | 100 | 100 |
| 2 | C | 312/321 (97%) | 307 (98%) | 5 (2%) | 0 | 100 | 100 |
| 2 | D | 312/321 (97%) | 307 (98%) | 5 (2%) | 0 | 100 | 100 |
| 2 | E | 312/321 (97%) | 303 (97%) | 9 (3%) | 0 | 100 | 100 |
| 2 | F | 312/321 (97%) | 306 (98%) | 5 (2%) | 1 (0%) | 37 | 68 |
| 2 | G | 262/321 (82%) | 258 (98%) | 4 (2%) | 0 | 100 | 100 |
| 3 | H | 200/240 (83%) | 191 (96%) | 9 (4%) | 0 | 100 | 100 |
| All | All | 3062/3423 (90%) | 3009 (98%) | 51 (2%) | 2 (0%) | 50 | 79 |

All (2) Ramachandran outliers are listed below:

| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 1 | N | 90 | SER |
| 2 | F | 19 | GLU |

### 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 | I | 106/130 (82%) | 105 (99%) | 1 (1%) | 75 | 86 |
| 1 | J | 106/130 (82%) | 105 (99%) | 1 (1%) | 75 | 86 |
| 1 | K | 106/130 (82%) | 105 (99%) | 1 (1%) | 75 | 86 |
| 1 | L | 106/130 (82%) | 105 (99%) | 1 (1%) | 75 | 86 |
| 1 | M | 106/130 (82%) | 105 (99%) | 1 (1%) | 75 | 86 |
| 1 | N | 102/130 (78%) | 101 (99%) | 1 (1%) | 73 | 84 |
| 2 | A | 267/271 (98%) | 267 (100%) | 0 | 100 | 100 |
| 2 | B | 267/271 (98%) | 265 (99%) | 2 (1%) | 81 | 89 |
| 2 | C | 267/271 (98%) | 267 (100%) | 0 | 100 | 100 |
| 2 | D | 267/271 (98%) | 267 (100%) | 0 | 100 | 100 |
| 2 | E | 267/271 (98%) | 267 (100%) | 0 | 100 | 100 |
| 2 | F | 267/271 (98%) | 267 (100%) | 0 | 100 | 100 |
| 2 | G | 232/271 (86%) | 232 (100%) | 0 | 100 | 100 |
| 3 | H | 180/208 (86%) | 180 (100%) | 0 | 100 | 100 |
| All | All | 2646/2885 (92%) | 2638 (100%) | 8 (0%) | 90 | 96 |

5 of 8 residues with a non-rotameric sidechain are listed below:

| Mol | Chain | Res | Type |
|---|---|---|---|
| 2 | B | 191 | ASP |
| 2 | B | 190 | LEU |
| 1 | M | 117 | VAL |
| 1 | L | 117 | VAL |
| 1 | N | 117 | VAL |

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 19 such sidechains are listed below:

| Mol | Chain | Res | Type |
|---|---|---|---|
| 2 | A | 27 | HIS |

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| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 2 | E | 165 | ASN |
| 2 | F | 160 | HIS |
| 3 | H | 11 | HIS |
| 2 | B | 154 | GLN |

#### 5.3.3 RNA ⓘ

| Mol | Chain | Analysed | Backbone Outliers | Pucker Outliers |
|-----|-------|----------|-------------------|-----------------|
| 4 | S | 43/63 (68%) | 23 (53%) | 0 |

5 of 23 RNA backbone outliers are listed below:

| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 4 | S | 2 | U |
| 4 | S | 3 | U |
| 4 | S | 7 | A |
| 4 | S | 9 | U |
| 4 | S | 15 | U |

There are no RNA pucker outliers to report.

## 5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

## 5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

## 5.6 Ligand geometry ⓘ

7 ligands are modelled in this entry.

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 | $\#\|Z\| > 2$ |
| 5 | TRS | S | 402 | - | 7,7,7 | 0.37 | 0 | 9,9,9 | 0.47 | 0 |
| 5 | TRS | A | 401 | - | 7,7,7 | 0.37 | 0 | 9,9,9 | 0.42 | 0 |
| 5 | TRS | S | 401 | - | 7,7,7 | 0.60 | 0 | 9,9,9 | 0.52 | 0 |
| 5 | TRS | B | 401 | - | 7,7,7 | 0.38 | 0 | 9,9,9 | 0.43 | 0 |
| 5 | TRS | C | 401 | - | 7,7,7 | 0.60 | 0 | 9,9,9 | 0.52 | 0 |
| 5 | TRS | D | 401 | - | 7,7,7 | 0.37 | 0 | 9,9,9 | 0.47 | 0 |
| 5 | TRS | E | 401 | - | 7,7,7 | 0.38 | 0 | 9,9,9 | 0.34 | 0 |

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 |
|-----|------|-------|-----|------|---------|----------|-------|
| 5 | TRS | S | 402 | - | - | 6/9/9/9 | - |
| 5 | TRS | A | 401 | - | - | 0/9/9/9 | - |
| 5 | TRS | S | 401 | - | - | 1/9/9/9 | - |
| 5 | TRS | B | 401 | - | - | 0/9/9/9 | - |
| 5 | TRS | C | 401 | - | - | 1/9/9/9 | - |
| 5 | TRS | D | 401 | - | - | 6/9/9/9 | - |
| 5 | TRS | E | 401 | - | - | 9/9/9/9 | - |

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

5 of 23 torsion outliers are listed below:

| Mol | Chain | Res | Type | Atoms |
|-----|-------|-----|------|-------|
| 5 | D | 401 | TRS | N-C-C2-O2 |
| 5 | S | 402 | TRS | N-C-C2-O2 |
| 5 | D | 401 | TRS | C2-C-C1-O1 |
| 5 | D | 401 | TRS | C1-C-C2-O2 |
| 5 | S | 402 | TRS | C2-C-C1-O1 |

There are no ring outliers.

7 monomers are involved in 65 short contacts:

| Mol | Chain | Res | Type | Clashes | Symm-Clashes |
|-----|-------|-----|------|---------|--------------|
| 5 | S | 402 | TRS | 5 | 0 |
| 5 | A | 401 | TRS | 5 | 0 |

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PROTEIN DATA BANK

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| Mol | Chain | Res | Type | Clashes | Symm-Clashes |
|-----|-------|-----|------|---------|--------------|
| 5 | S | 401 | TRS | 5 | 0 |
| 5 | B | 401 | TRS | 8 | 0 |
| 5 | C | 401 | TRS | 15 | 0 |
| 5 | D | 401 | TRS | 14 | 0 |
| 5 | E | 401 | TRS | 13 | 0 |

## 5.7 Other polymers ⓘ

There are no such residues in this entry.

## 5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

# 6   Map visualisation ⓘ

This section contains visualisations of the EMDB entry EMD-45873. 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 ⓘ
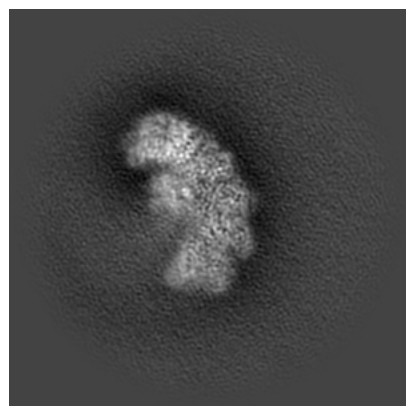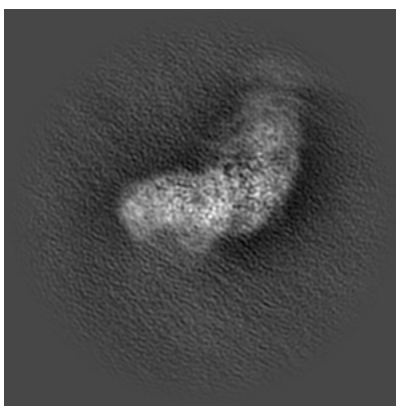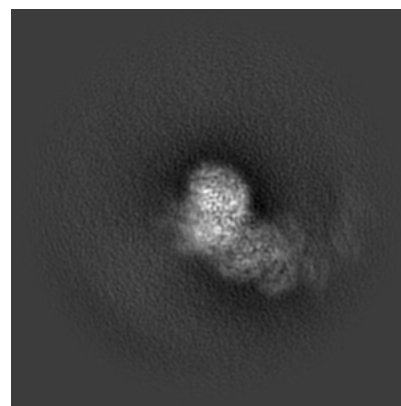
### 6.1.1   Primary map



X        Y        Z

### 6.1.2   Raw map



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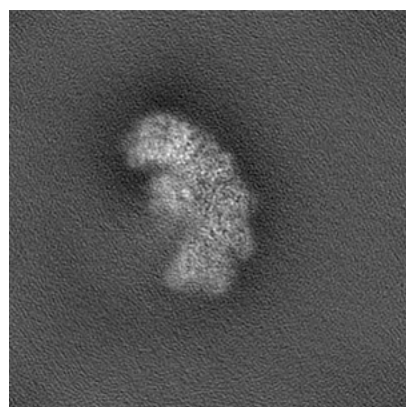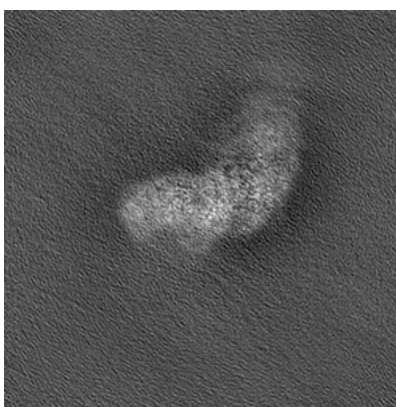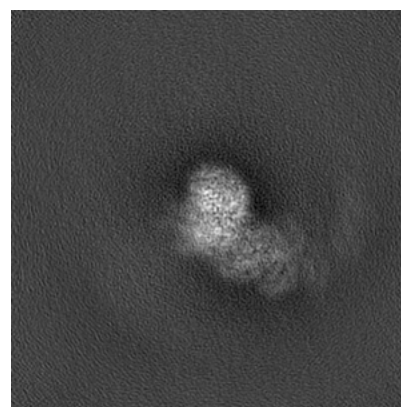
The images above show the map projected in three orthogonal directions.

## 6.2   Central slices  ⓘ
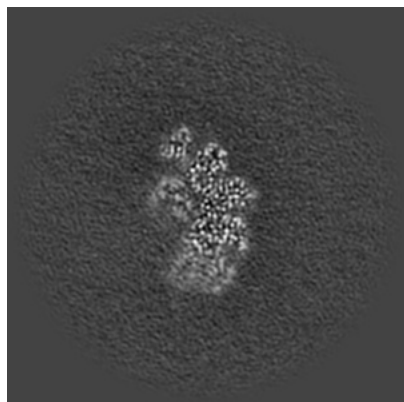
### 6.2.1   Primary map
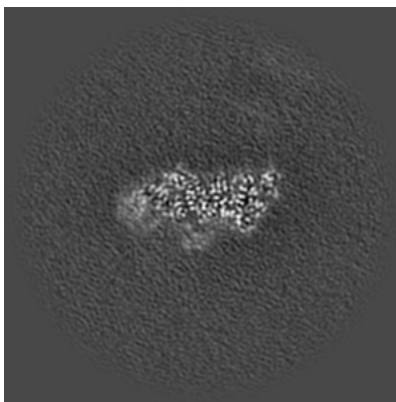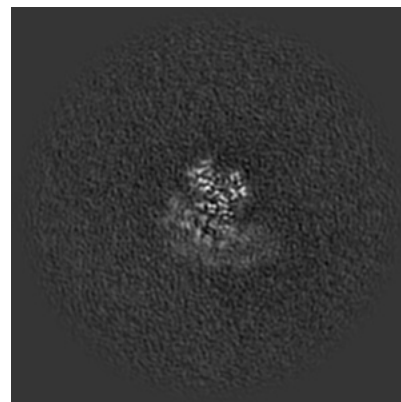


| X Index: 128 | Y Index: 128 | Z Index: 128 |

### 6.2.2   Raw map
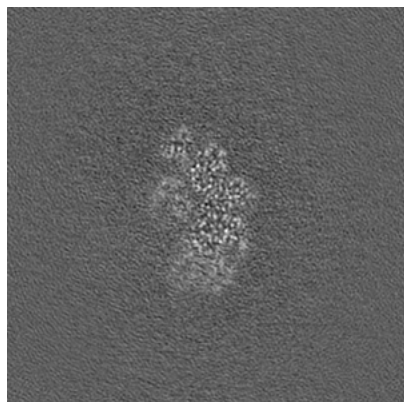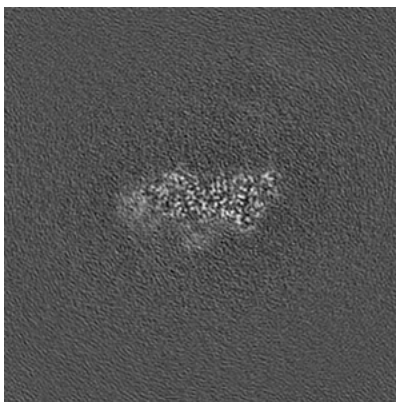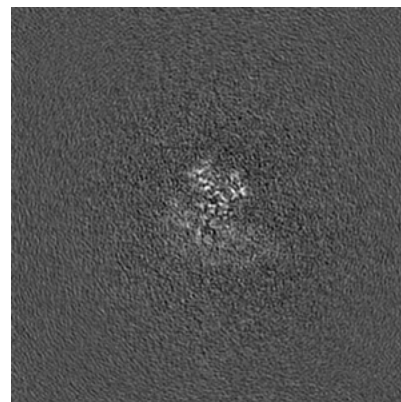


| X Index: 128 | Y Index: 128 | Z Index: 128 |

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

## 6.3 Largest variance slices ⓘ

### 6.3.1 Primary map
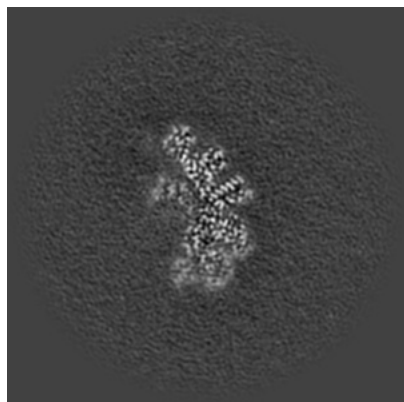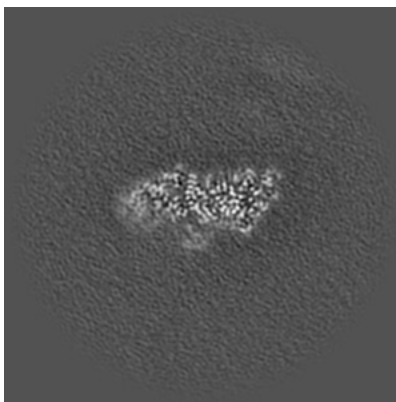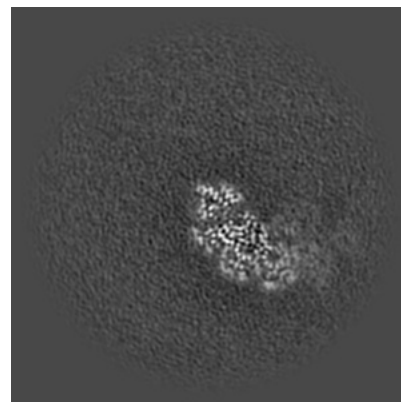


| X Index: 131 | Y Index: 129 | Z Index: 162 |

### 6.3.2 Raw map
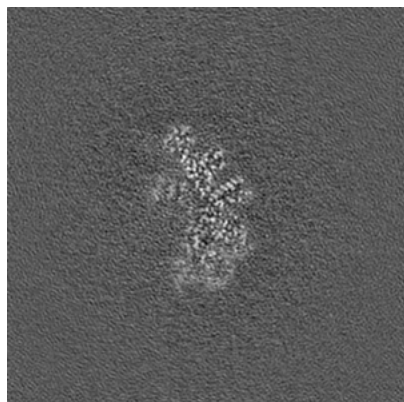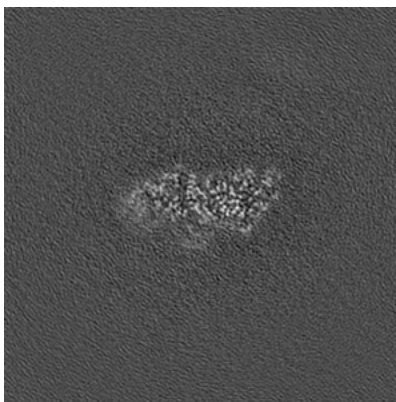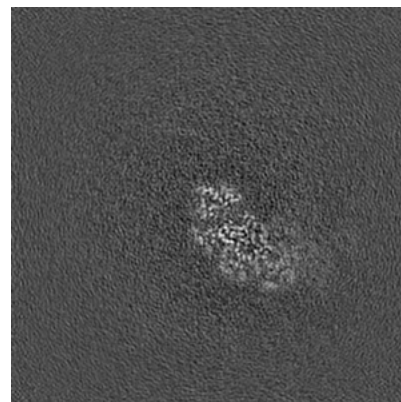


| X Index: 131 | Y Index: 129 | Z Index: 162 |

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

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

### 6.4.1 Primary map
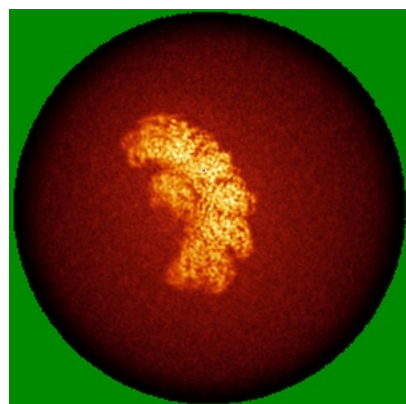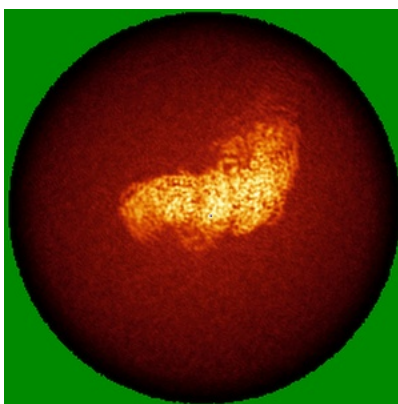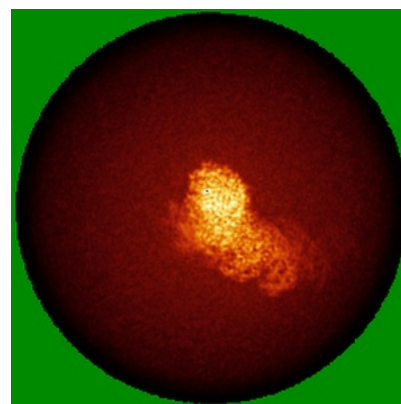


X          Y          Z

### 6.4.2 Raw map



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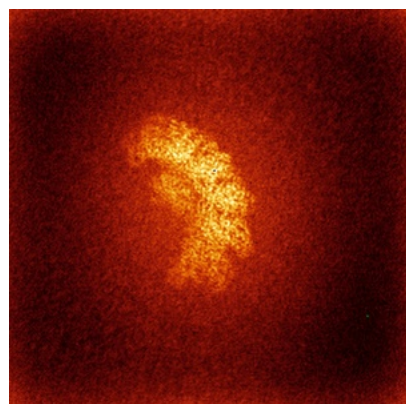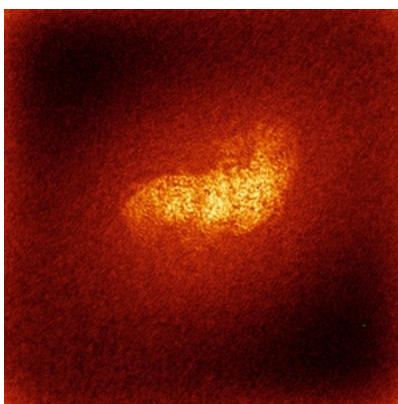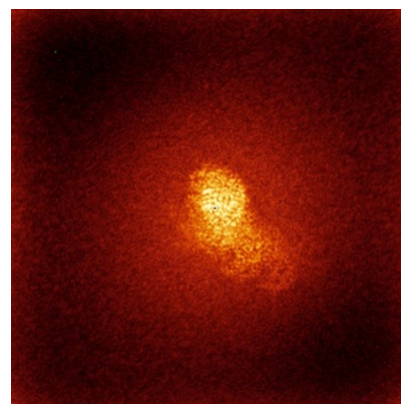
The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

## 6.5   Orthogonal surface views (i)

### 6.5.1   Primary map



|    X    |    Y    |    Z    |
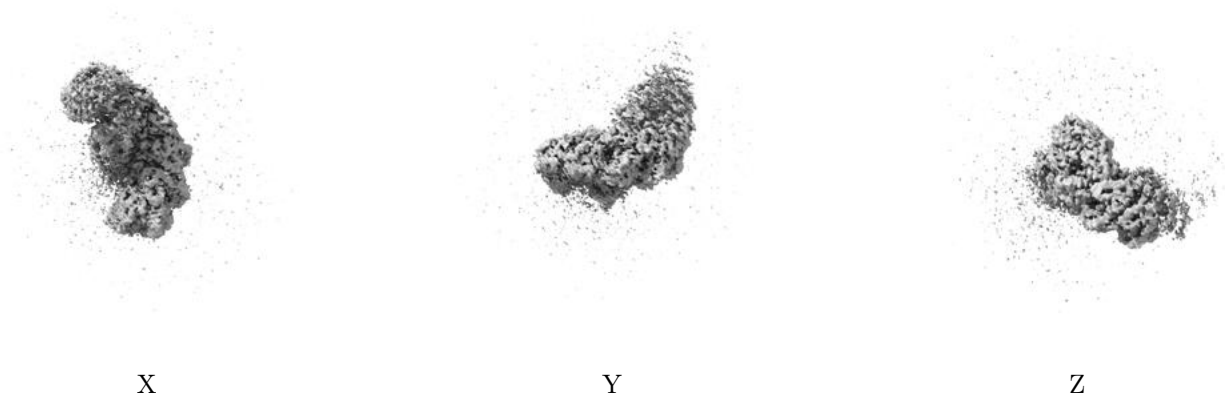
The images above show the 3D surface view of the map at the recommended contour level 0.13. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

### 6.5.2   Raw map



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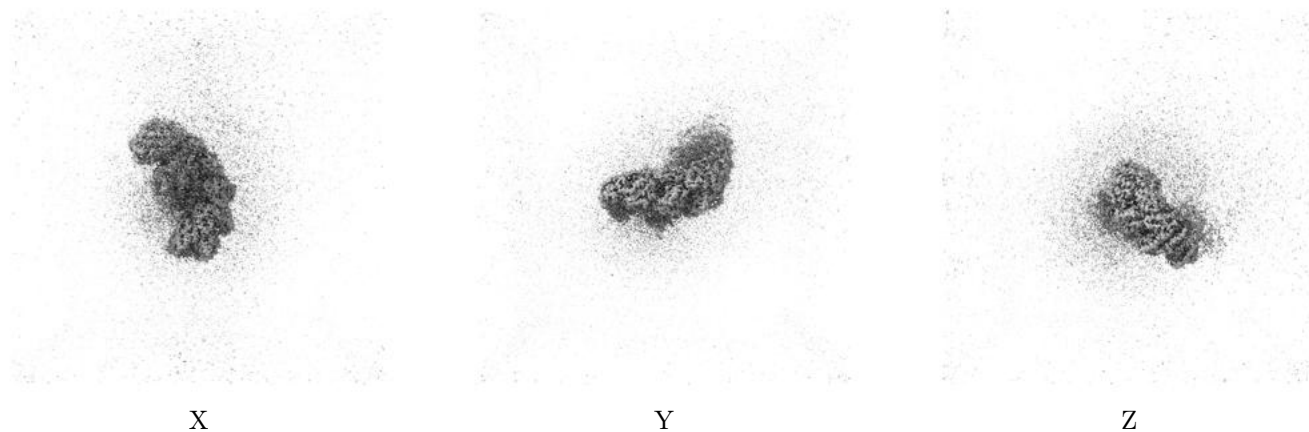
These images show the 3D surface of the raw map. The raw map's contour level was selected so that its surface encloses the same volume as the primary map does at its recommended contour level.

## 6.6   Mask visualisation (i)

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

# 7 Map analysis ⓘ

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

## 7.1 Map-value distribution ⓘ
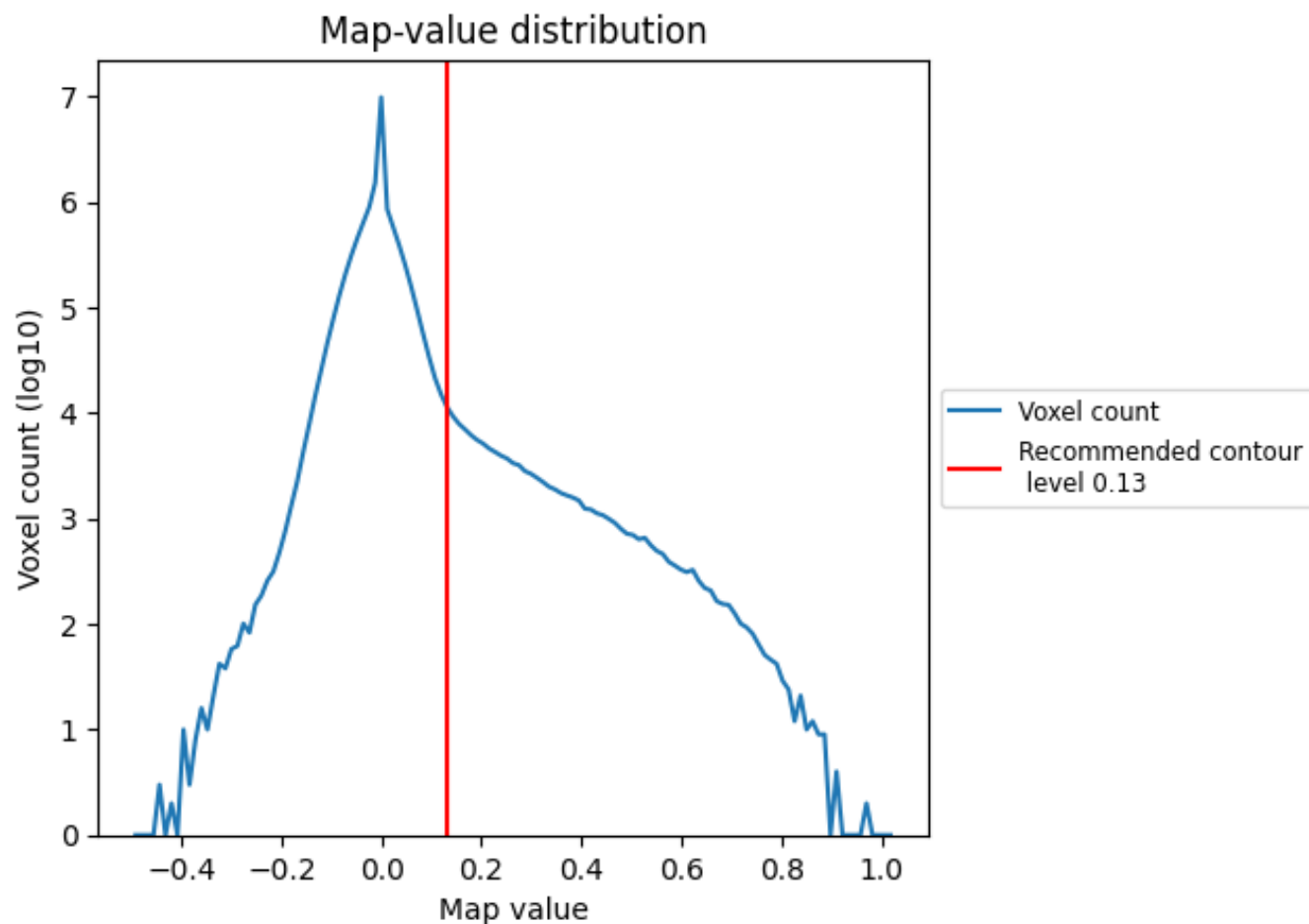


The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

## 7.2   Volume estimate ⓘ
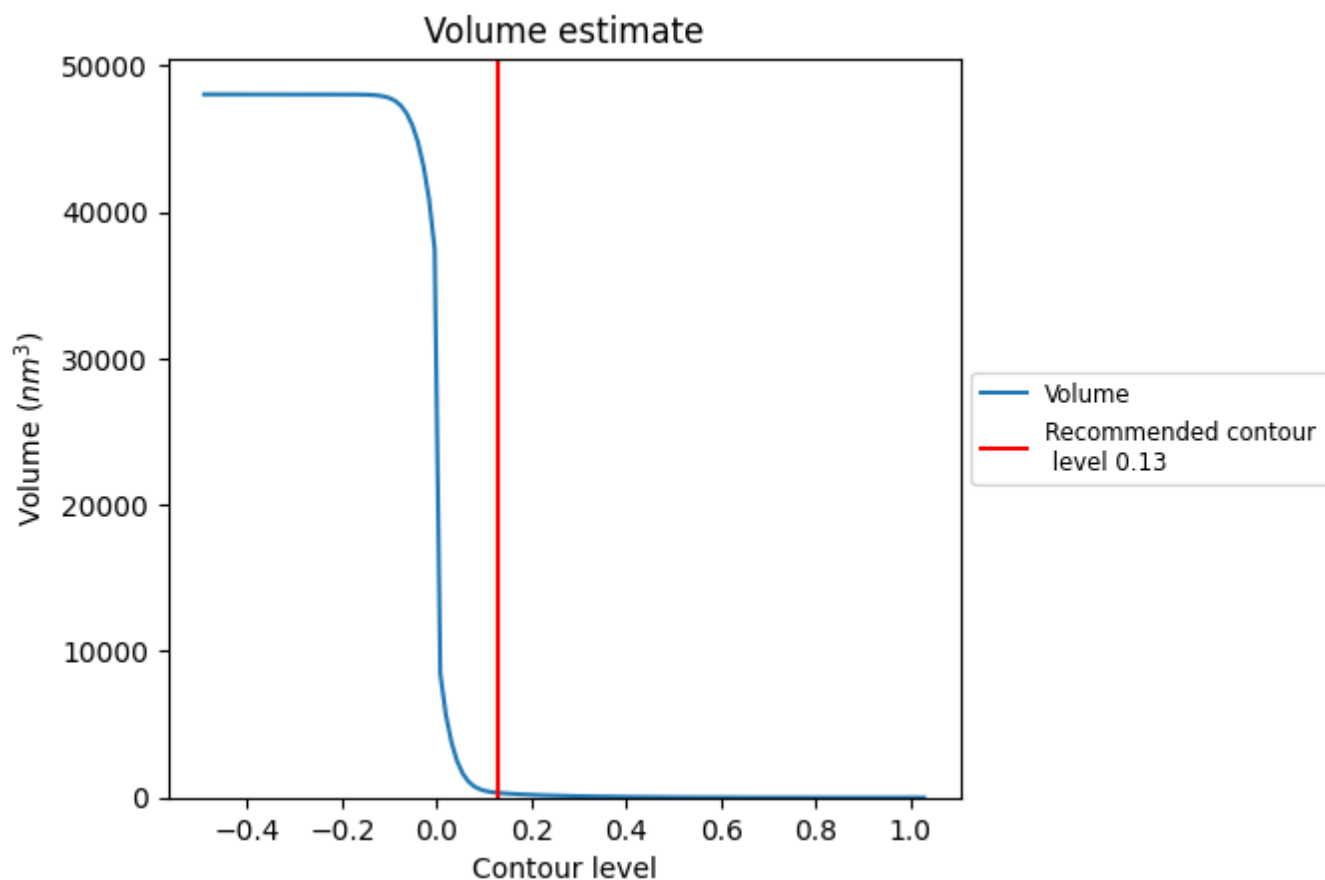


The volume at the recommended contour level is 324 nm$^3$; this corresponds to an approximate mass of 293 kDa.

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 ⓘ
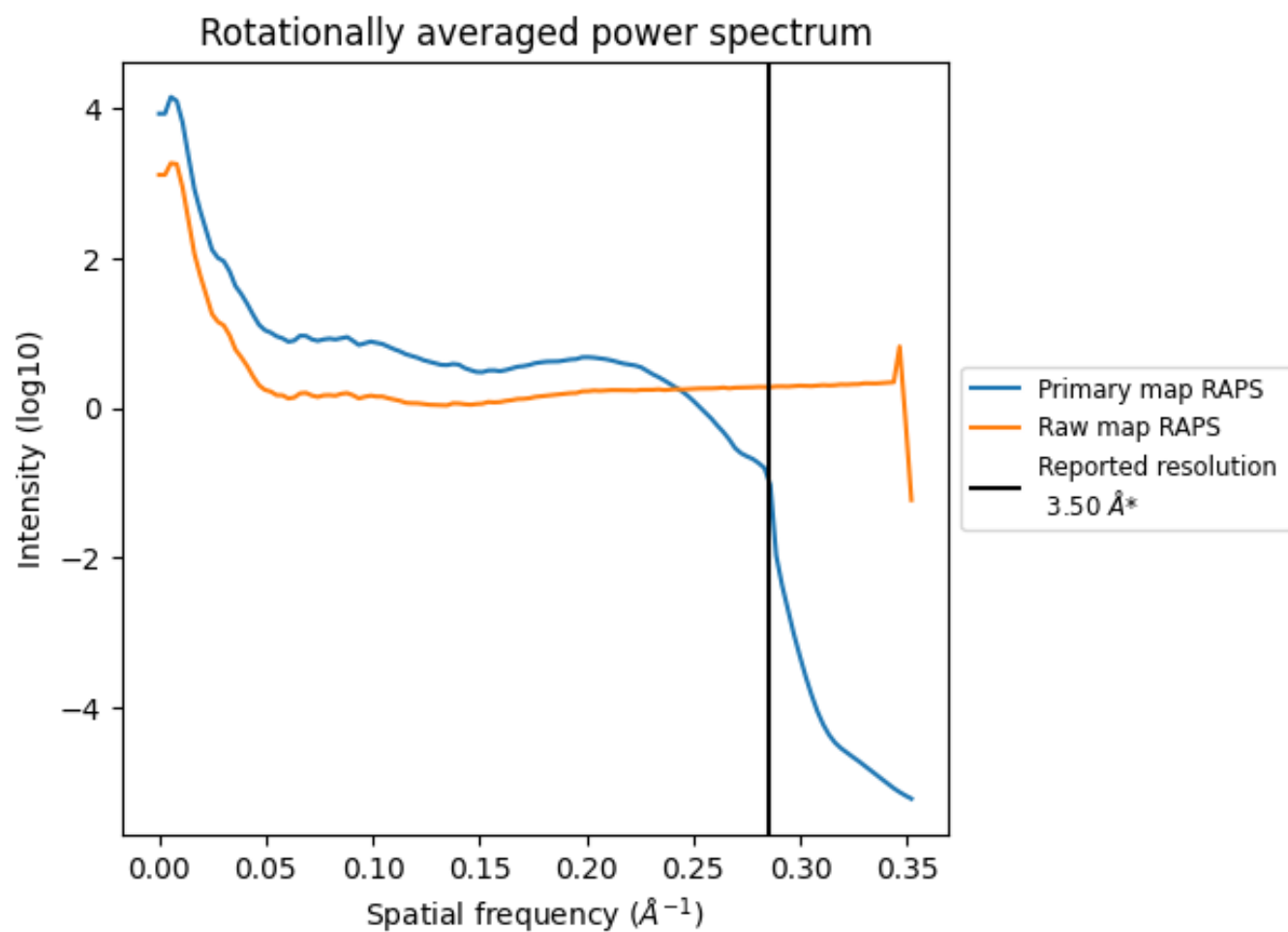


*Reported resolution corresponds to spatial frequency of 0.286 Å$^{-1}$

# 8 Fourier-Shell correlation ⓘ

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 ⓘ
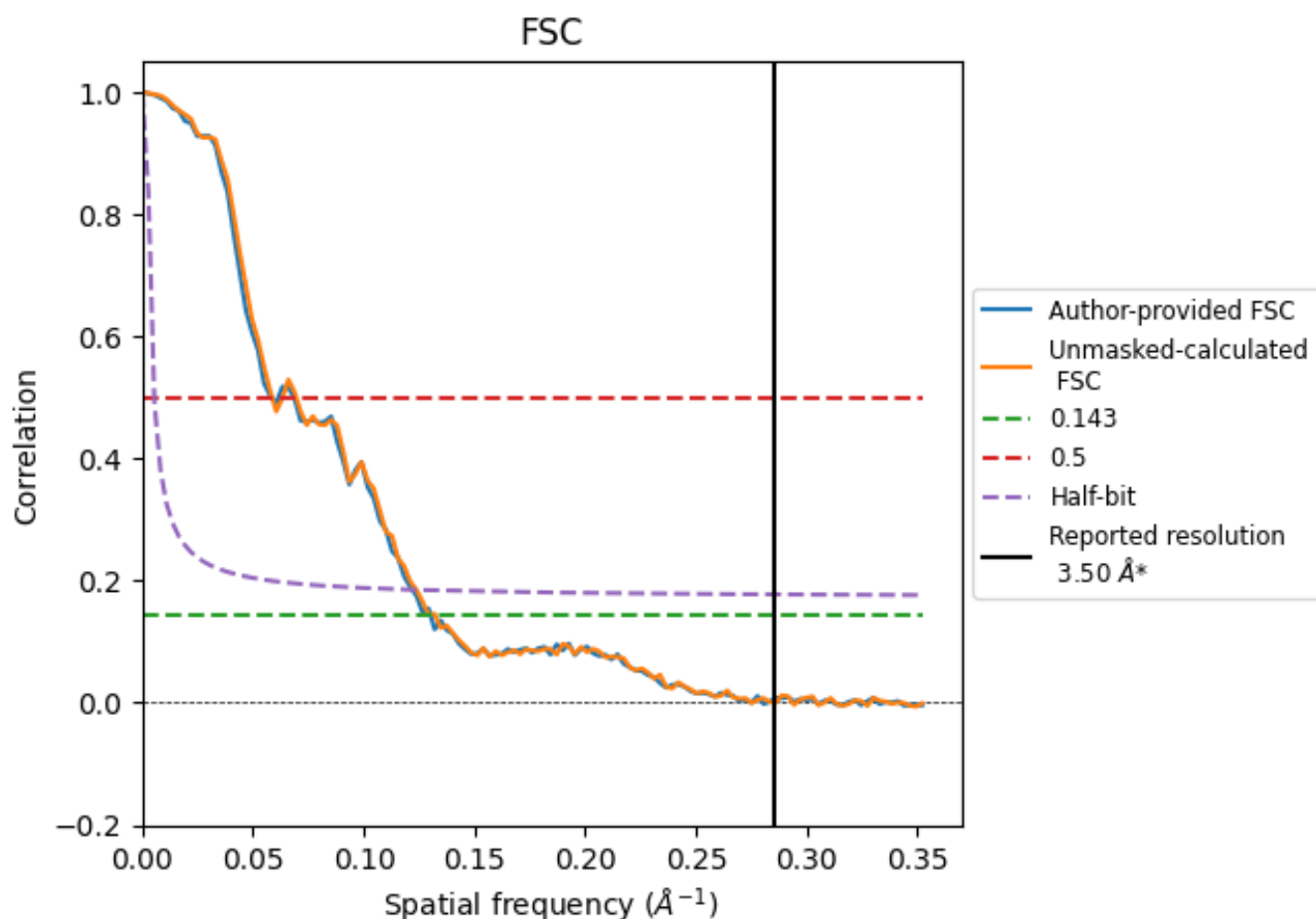


*Reported resolution corresponds to spatial frequency of 0.286 Å$^{-1}$

## 8.2   Resolution estimates ⓘ

| Resolution estimate (Å) | Estimation criterion (FSC cut-off) | | |
|---|---|---|---|
| | 0.143 | 0.5 | Half-bit |
| Reported by author | 3.50 | - | - |
| Author-provided FSC curve | 7.68 | 17.18 | 8.20 |
| Unmasked-calculated* | 7.56 | 17.06 | 8.08 |

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from author-provided FSC intersecting FSC 0.143 CUT-OFF 7.68 differs from the reported value 3.5 by more than 10 %

The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 7.56 differs from the reported value 3.5 by more than 10 %

# 9 Map-model fit ⓘ

This section contains information regarding the fit between EMDB map EMD-45873 and PDB model 9CRO. Per-residue inclusion information can be found in section 3 on page 7.

## 9.1 Map-model overlay ⓘ



|  |  |  |
|---|---|---|
| X | Y | Z |
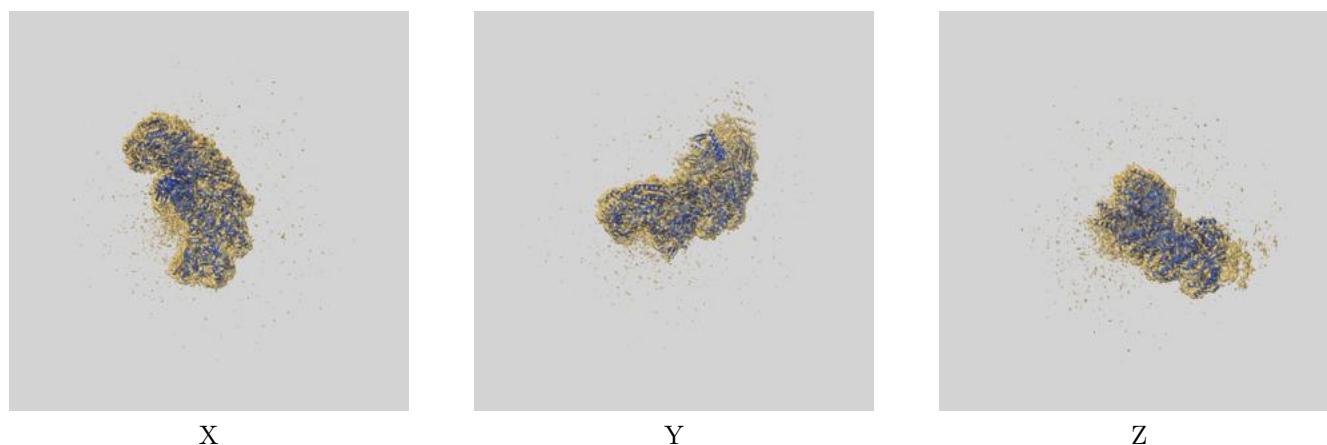
The images above show the 3D surface view of the map at the recommended contour level 0.13 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

## 9.2   Q-score mapped to coordinate model  ⓘ



X           Y           Z
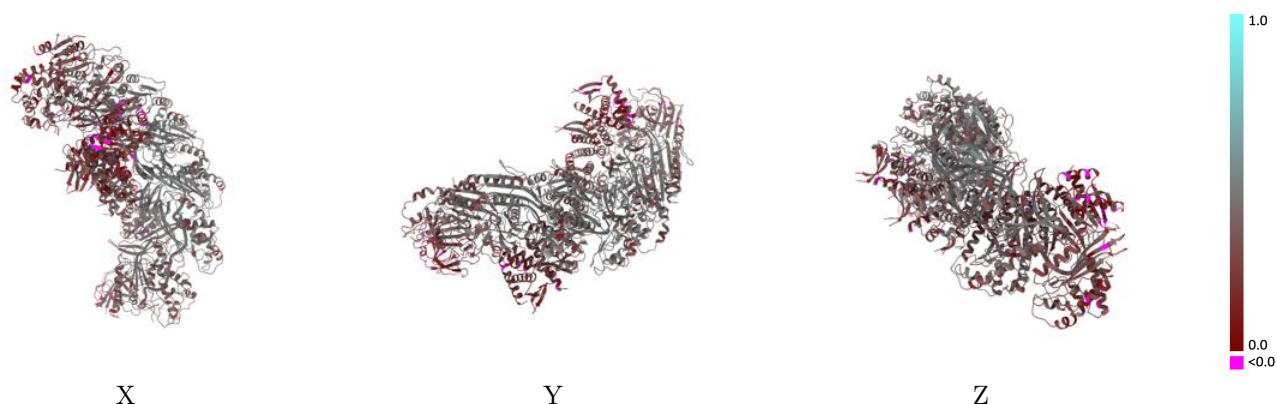
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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  ⓘ



X           Y           Z
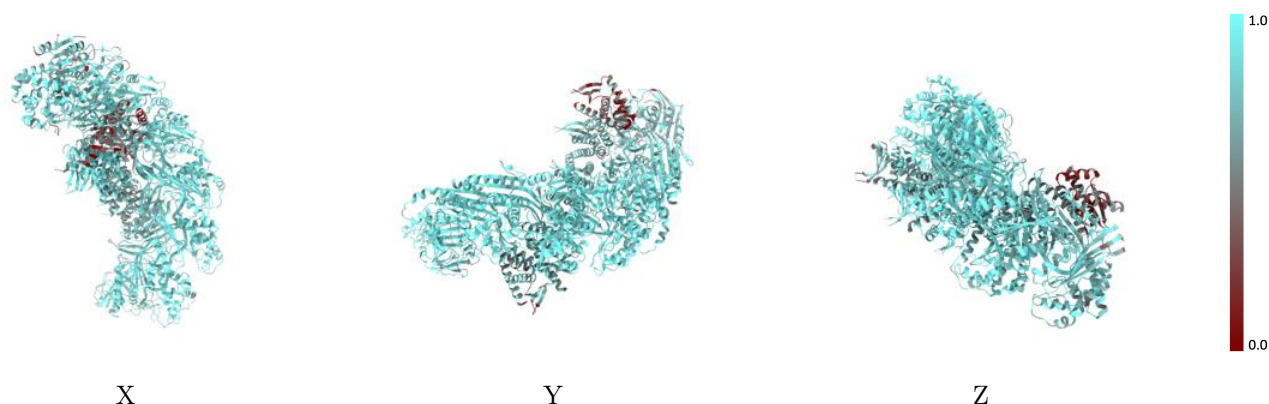
The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.13).

## 9.4    Atom inclusion ⓘ
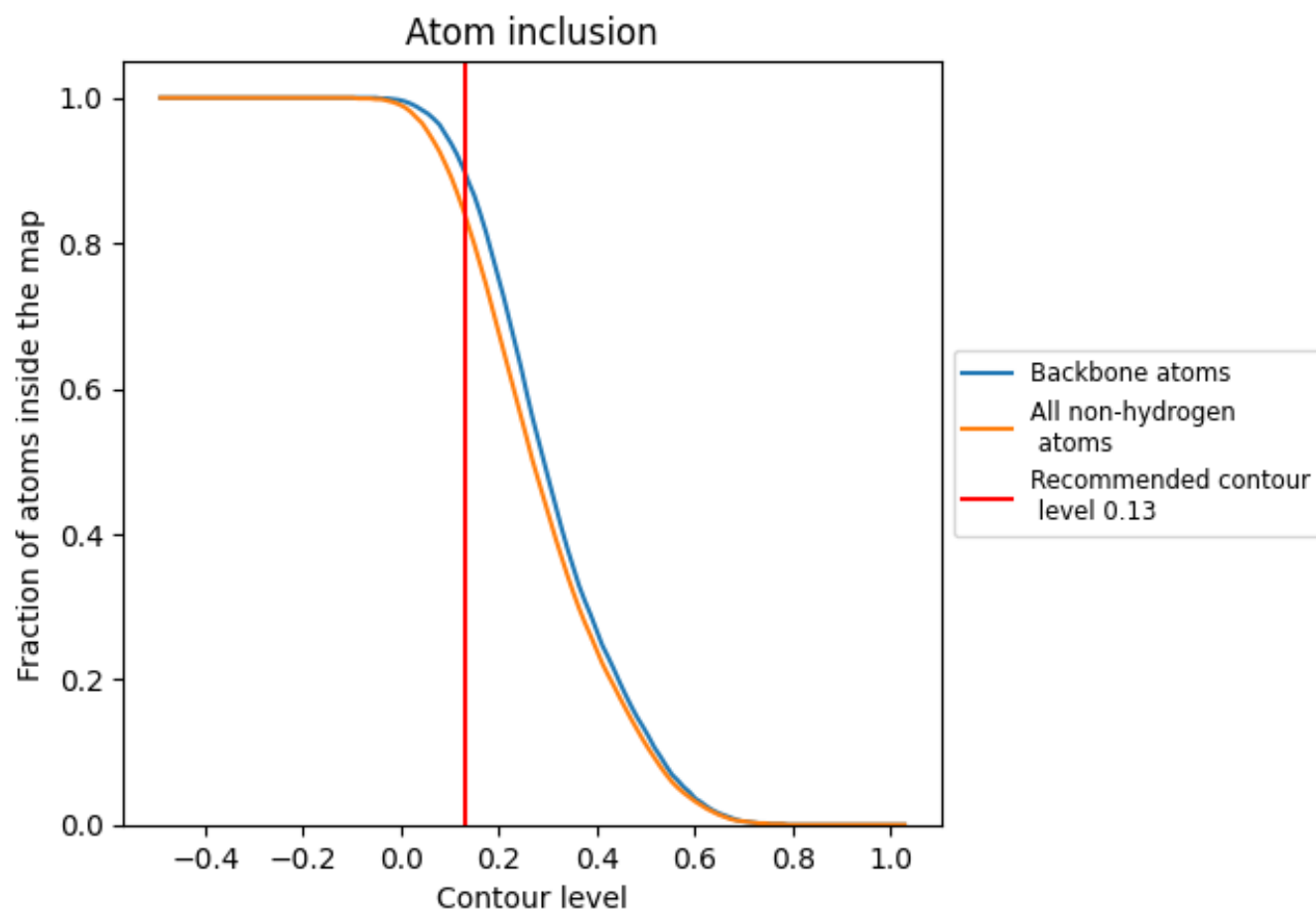


At the recommended contour level, 90% of all backbone atoms, 84% of all non-hydrogen atoms, are inside the map.

## 9.5 Map-model fit summary ⓘ

The table lists the average atom inclusion at the recommended contour level (0.13) and Q-score for the entire model and for each chain.

| Chain | Atom inclusion | Q-score |
|:-----:|:--------------:|:-------:|
| All | 0.8410 | 0.3570 |
| A | 0.9080 | 0.3850 |
| B | 0.9190 | 0.4320 |
| C | 0.9310 | 0.4460 |
| D | 0.9110 | 0.4410 |
| E | 0.8960 | 0.4250 |
| F | 0.8400 | 0.3820 |
| G | 0.7690 | 0.2800 |
| H | 0.8460 | 0.2480 |
| I | 0.7590 | 0.2610 |
| J | 0.3630 | 0.1590 |
| K | 0.8040 | 0.2810 |
| L | 0.8230 | 0.3050 |
| M | 0.7670 | 0.2730 |
| N | 0.6870 | 0.2230 |
| S | 0.9610 | 0.4190 |

1.0

0.0

<0.0