wwPDB EM Validation Summary Report (i)

Nov 19, 2022 – 05:04 pm GMT

PDB ID	:	5NVU
EMDB ID	:	EMD-3705
Title	:	Full length human cytoplasmic dynein-1 in the phi-particle conformation
Authors	:	Zhang, K.; Foster, H.E.; Carter, A.P.
Deposited on	:	2017-05-04
Resolution	:	15.00 Å(reported)

This is a wwPDB EM Validation Summary Report for a publicly released PDB entry.

We welcome your comments at *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 (i) symbol.

The types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

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

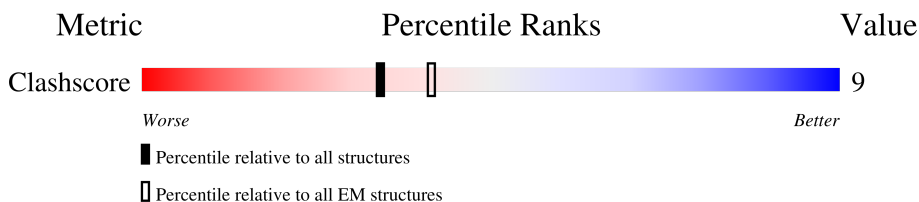|		
EMDB validation analysis	:	0.0.1.dev43
MolProbity	:	4.02b-467
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ	:	1.9.9
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.31.2

1 Overall quality at a glance ⓘ

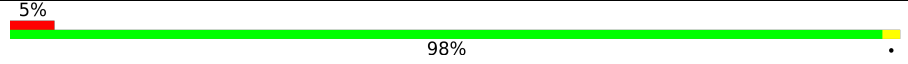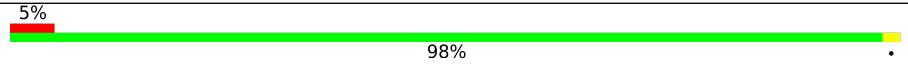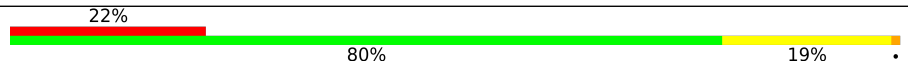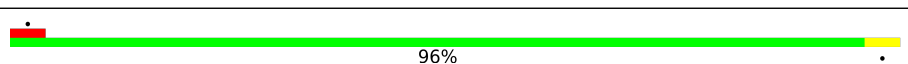The following experimental techniques were used to determine the structure:
ELECTRON MICROSCOPY
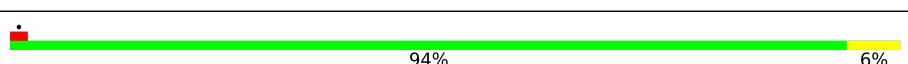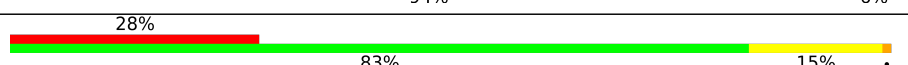
The reported resolution of this entry is 15.00 Å.

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.
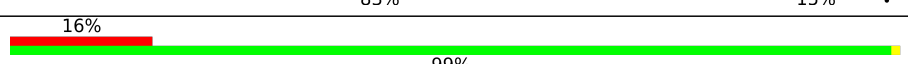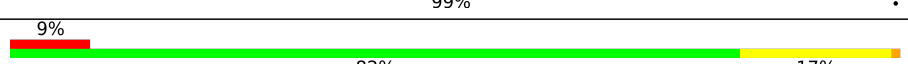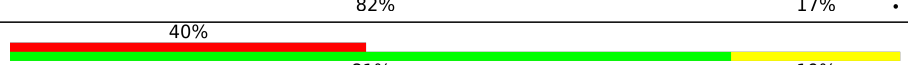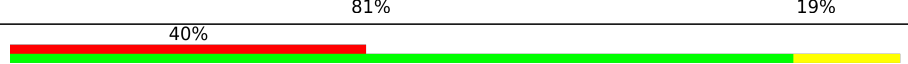
Metric	Percentile Ranks	Value
Clashscore		9

Worse *Better*

▌Percentile relative to all structures

▯Percentile relative to all EM structures

Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	158937	4297

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	A	3169	5% / 98% / •
1	B	3169	5% / 98% / •
2	C	932	22% / 80% / 19% / •
3	D	350	• / 96% / •
3	E	350	• / 94% / 6%
4	F	893	28% / 83% / 15% / •
5	G	298	16% / 99% / •
6	H	295	9% / 82% / 17% / •
7	I	125	40% / 81% / 19%
8	J	124	40% / 88% / 12%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
9	K	85	74% · 98%
9	L	85	86% · 98%
10	M	103	90% 8% 92%
11	N	104	97% 11% 89%
12	O	27	85% 100%
13	P	29	93% 100%
14	Q	120	6% 100%
14	R	120	5% · 98%

2 Entry composition ⓘ

There are 14 unique types of molecules in this entry. The entry contains 51478 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 Dynein motor domain.

Mol	Chain	Residues	Atoms				AltConf	Trace
1	A	3169	Total 15703	C 9365	N 3169	O 3169	0	0
1	B	3169	Total 15703	C 9365	N 3169	O 3169	0	0

- Molecule 2 is a protein called Dynein tail heavy chain.

Mol	Chain	Residues	Atoms				AltConf	Trace
2	C	932	Total 4654	C 2790	N 932	O 932	0	0

- Molecule 3 is a protein called Dynein intermediate chain.

Mol	Chain	Residues	Atoms				AltConf	Trace
3	D	350	Total 1723	C 1023	N 350	O 350	0	0
3	E	350	Total 1723	C 1023	N 350	O 350	0	0

- Molecule 4 is a protein called Dynein tail heavy chain.

Mol	Chain	Residues	Atoms				AltConf	Trace
4	F	893	Total 4459	C 2673	N 893	O 893	0	0

- Molecule 5 is a protein called Dynein light intermediate chain.

Mol	Chain	Residues	Atoms				AltConf	Trace
5	G	298	Total 1496	C 890	N 303	O 303	5	0

- Molecule 6 is a protein called Dynein light intermediate chain.

Mol	Chain	Residues	Atoms				AltConf	Trace
6	H	295	Total 1459	C 869	N 295	O 295	0	0

- Molecule 7 is a protein called N-terminal dimerization domain.

Mol	Chain	Residues	Atoms				AltConf	Trace
7	I	125	Total 625	C 375	N 125	O 125	0	0

- Molecule 8 is a protein called N-terminal dimerization domain.

Mol	Chain	Residues	Atoms				AltConf	Trace
8	J	124	Total 620	C 372	N 124	O 124	0	0

- Molecule 9 is a protein called LC8.

Mol	Chain	Residues	Atoms				AltConf	Trace
9	K	85	Total 421	C 251	N 85	O 85	0	0
9	L	85	Total 421	C 251	N 85	O 85	0	0

- Molecule 10 is a protein called Tctex.

Mol	Chain	Residues	Atoms				AltConf	Trace
10	M	103	Total 507	C 301	N 103	O 103	0	0

- Molecule 11 is a protein called Tctex.

Mol	Chain	Residues	Atoms				AltConf	Trace
11	N	104	Total 513	C 305	N 104	O 104	0	0

- Molecule 12 is a protein called Intermediate chain N-terminus peptides.

Mol	Chain	Residues	Atoms				AltConf	Trace
12	O	27	Total 134	C 80	N 27	O 27	0	0

- Molecule 13 is a protein called Intermediate chain N-terminus peptides.

Mol	Chain	Residues	Atoms				AltConf	Trace
13	P	29	Total 143	C 85	N 29	O 29	0	0

- Molecule 14 is a protein called Robl.

Mol	Chain	Residues	Atoms				AltConf	Trace
14	Q	120	Total 587	C 347	N 120	O 120	0	0
14	R	120	Total 587	C 347	N 120	O 120	0	0

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: Dynein motor domain

Chain A:

• Molecule 1: Dynein motor domain

Chain B:

• Molecule 2: Dynein tail heavy chain

• Molecule 3: Dynein intermediate chain

Chain D:

96%

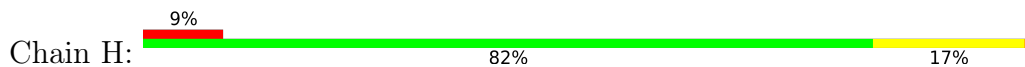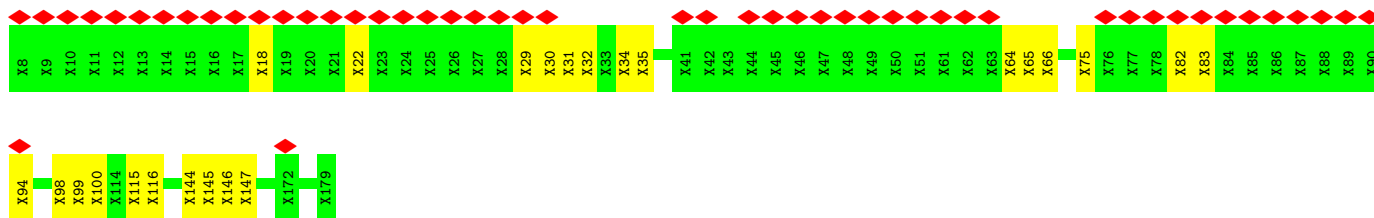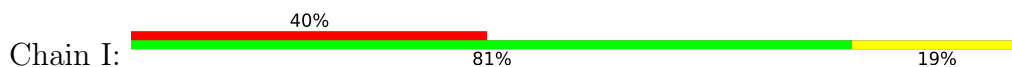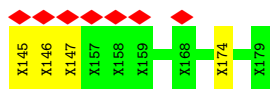X283 X287 X288 X289 X308 X309 X310 X344 X360 X365 X368 X382 X383 X441 X442 X443 X444 X445 X462 X463 X582 X592 X599 X626 X640 X641 X642 X710
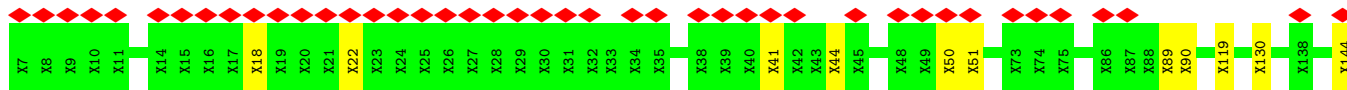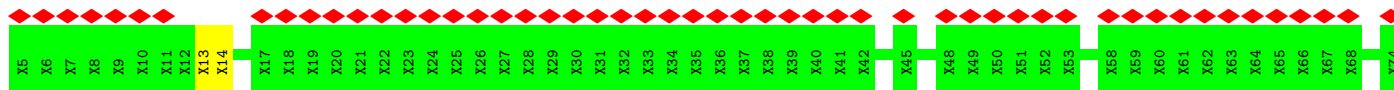
• Molecule 3: Dynein intermediate chain

Chain E:

94% 6%

X283 X287 X288 X289 X316 X317 X322 X330 X360 X365 X368 X441 X442 X443 X444 X445 X462 X463 X471 X472 X473 X474 X599 X626 X684 X687 X688 X689 X690 X710

• Molecule 4: Dynein tail heavy chain

28%

Chain F:

83% 15%

X181 X182 X183 X184 X185 X186 X187 X188 X189 X190 X191 X192 X193 X194 X195 X196 X197 X198 X199 X200 X201 X202 X203 X204 X205 X206 X207 X208 X209 X210 X211 X212 X213 X214 X215 X216 X217 X218 X219 X220 X221 X222 X223 X224 X225 X226 X227 X228 X229 X230 X231 X232 X233 X234 X235 X236 X237 X248 X249 X250

X251 X252 X253 X254 X255 X256 X257 X258 X259 X260 X261 X262 X263 X264 X265 X266 X267 X268 X269 X270 X271 X272 X273 X274 X275 X276 X277 X278 X279 X280 X281 X282 X283 X284 X285 X286 X287 X288 X289 X290 X291 X292 X293 X294 X295 X296 X297 X298 X299 X300 X301 X302 X303 X304 X305 X306 X307 X308 X309 X310

X311 X328 X329 X330 X331 X332 X333 X334 X335 X336 X337 X338 X339 X340 X341 X342 X343 X344 X345 X346 X347 X348 X349 X350 X351 X352 X353 X354 X355 X356 X357 X358 X359 X360 X361 X362 X363 X364 X365 X366 X367 X368 X369 X370 X371 X372 X373 X381 X382 X383 X384 X385 X386 X387 X397 X398 X399 X400 X401

X402 X403 X404 X405 X406 X407 X408 X409 X410 X411 X412 X413 X414 X415 X416 X417 X423 X424 X451 X452 X453 X456 X457 X458 X459 X487 X488 X497 X498 X499 X500 X501 X511 X512 X513 X514 X534 X535 X536 X566 X567 X568 X569 X591 X592 X601 X602 X603 X604 X611 X614

X618 X619 X620 X621 X622 X626 X630 X631 X632 X633 X634 X635 X640 X643 X644 X679 X680 X681 X682 X683 X684 X685 X718 X731 X732 X733 X734 X735 X736 X737 X738 X739 X740 X741 X742 X753 X754 X755 X756 X757 X758 X759 X760 X761 X773 X804 X805 X806 X807 X808 X809

X810 X811 X812 X816 X817 X818 X819 X820 X824 X825 X826 X827 X836 X840 X871 X872 X873 X874 X875 X876 X877 X878 X948 X949 X950 X968 X982 X983 X984 X985 X986 X987 X993 X994 X995 X1005 X1006 X1007 X1043 X1044 X1045 X1046 X1047 X1048 X1049 X1050 X1066 X1067 X1068

X1069 X1070 X1116 X1119 X1120 X1121 X1122 X1123 X1124 X1139 X1140 X1141 X1142 X1143 X1144 X1145 X1146 X1151 X1152 X1155 X1156 X1207 X1208 X1211 X1212 X1254 X1255 X1258 X1259 X1282 X1285 X1316 X1317 X1328 X1331 X1332 X1342 X1343 X1344 X1345 X1346 X1349 X1350 X1353

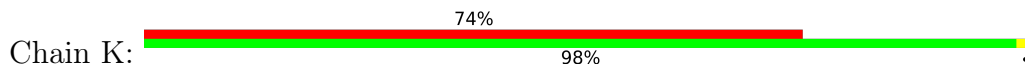X1369 X1373 X1408 X1409 X1410 X1411 X1412 X1416 X1417 X1418 X1419

• Molecule 5: Dynein light intermediate chain

16%

Chain G:

99%

X44 X95 X102 X193 X200 X201 X211 X212 X213 X214 X238 X239 X240 X241 X242 X243 X244 X245 X246 X321 X322 X323 X324 X325 X326 X327 X328 X329 X330 X331 X332 X333 X334 X335 X336 X337 X338 X339 X340 X341 X342 X343 X344 X345 X375 X376 X377 X378 X379 X380 X381 X388

X392 X393 X394

• Molecule 6: Dynein light intermediate chain

Chain H:

9%
82% 17%

X63 X81 X82 X83 X84 X87 X88 X89 X90 X91 X92 X93 X96 X97 X98 X99 X100 X101 X102 X103 X106 X107 X108 X111 X112 X113 X114 X115 X116 X117 X118 X119 X145 X151 X152 X153 X175 X176 X177 X181 X182 X183 X193 X197 X198 X199 X200 X201 X202

X217 X218 X221 X225 X229 X230 X255 X261 X288 X296 X300 X301 X306 X307 X308 X309 X310 X311 X312 X315 X318 X321 X322 X348 X354 X355 X356 X357 X358 X359 X360 X361 X362 X363 X364 X372

• Molecule 7: N-terminal dimerization domain

Chain I:

40%
81% 19%

X8 X9 X10 X11 X12 X13 X14 X15 X16 X17 X18 X19 X20 X21 X22 X23 X24 X25 X26 X27 X28 X29 X30 X31 X32 X33 X34 X35 X41 X42 X43 X44 X45 X46 X47 X48 X49 X50 X51 X61 X62 X63 X64 X65 X66 X75 X76 X77 X78 X82 X83 X84 X85 X86 X87 X88 X89 X90

X94 X98 X99 X100 X114 X115 X116 X144 X145 X146 X147 X172 X179

• Molecule 8: N-terminal dimerization domain

Chain J:

40%
88% 12%

X7 X8 X9 X10 X11 X14 X15 X16 X17 X18 X19 X20 X21 X22 X23 X24 X25 X26 X27 X28 X29 X30 X31 X32 X33 X34 X35 X38 X39 X40 X41 X42 X43 X44 X45 X48 X49 X50 X51 X73 X74 X75 X86 X87 X89 X90 X119 X130 X138 X144

X145 X146 X147 X157 X158 X159 X168 X174 X179

• Molecule 9: LC8

Chain K:

74%
98%

X5 X6 X7 X8 X9 X10 X11 X12 X13 X14 X17 X18 X19 X20 X21 X22 X23 X24 X25 X26 X27 X28 X29 X30 X31 X32 X33 X34 X35 X36 X37 X38 X39 X40 X41 X42 X45 X48 X49 X50 X51 X52 X53 X58 X59 X60 X61 X62 X63 X64 X65 X66 X67 X68 X74

• Molecule 9: LC8

Chain L:

• Molecule 10: Tctex

Chain M:

• Molecule 11: Tctex

Chain N:

• Molecule 12: Intermediate chain N-terminus peptides

Chain O:

• Molecule 13: Intermediate chain N-terminus peptides

Chain P:

• Molecule 14: Robl

Chain Q:

• Molecule 14: Robl

Chain R:

4   Experimental information ⓘ

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	28736	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 $(e^-/\text{Å}^2)$	1.6	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	FEI FALCON II (4k x 4k)	Depositor
Maximum map value	0.439	Depositor
Minimum map value	-0.264	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.011	Depositor
Recommended contour level	0.06	Depositor
Map size (Å)	792.00006, 792.00006, 792.00006	wwPDB
Map dimensions	300, 300, 300	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	2.64, 2.64, 2.64	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).

There are no protein, RNA or DNA chains available to summarize Z scores of covalent bonds and angles.

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
1	A	0	8
1	B	0	8
2	C	0	11
4	F	0	13
6	H	0	8
All	All	0	48

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

5 of 48 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	2170	UNK	Peptide
1	A	2570	UNK	Peptide
1	A	2964	UNK	Peptide
1	A	3069	UNK	Peptide
1	A	3084	UNK	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	A	15703	0	3145	36	0
1	B	15703	0	3143	43	0
2	C	4654	0	984	212	0
3	D	1723	0	360	9	0
3	E	1723	0	358	48	0
4	F	4459	0	955	152	0
5	G	1496	0	301	2	0
6	H	1459	0	295	48	0
7	I	625	0	146	19	0
8	J	620	0	142	15	0
9	K	421	0	94	1	0
9	L	421	0	95	1	0
10	M	507	0	108	6	0
11	N	513	0	112	7	0
12	O	134	0	30	0	0
13	P	143	0	31	0	0
14	Q	587	0	113	0	0
14	R	587	0	114	2	0
All	All	51478	0	10526	554	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 9.

The worst 5 of 554 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)
6:H:81:UNK:C	6:H:87:UNK:CB	1.85	1.53
2:C:1161:UNK:CB	2:C:1318:UNK:N	1.74	1.50
2:C:497:UNK:O	2:C:501:UNK:CB	1.66	1.43
2:C:817:UNK:O	2:C:819:UNK:N	1.58	1.37
4:F:817:UNK:O	4:F:819:UNK:N	1.58	1.36

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

There are no protein backbone outliers to report in this entry.

5.3.2   Protein sidechains ⓘ

There are no protein residues with a non-rotameric sidechain to report in this entry.

5.3.3   RNA ⓘ

There are no RNA molecules in this entry.

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 monosaccharides in this entry.

5.6   Ligand geometry ⓘ

There are no ligands in this entry.

5.7   Other polymers ⓘ

There are no such residues in this entry.

5.8   Polymer linkage issues ⓘ

The following chains have linkage breaks:

Mol	Chain	Number of breaks
4	F	29
2	C	27
1	A	14
1	B	14
7	I	7
8	J	7
5	G	3
3	D	3
3	E	3
6	H	3

The worst 5 of 110 chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	C	1161:UNK	C	1190:UNK	N	65.65
1	F	1161:UNK	C	1190:UNK	N	65.10
1	C	1354:UNK	C	1356:UNK	N	52.82
1	F	1354:UNK	C	1356:UNK	N	52.47
1	C	1389:UNK	C	1391:UNK	N	50.97

6 Map visualisation (i)

This section contains visualisations of the EMDB entry EMD-3705. 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 |
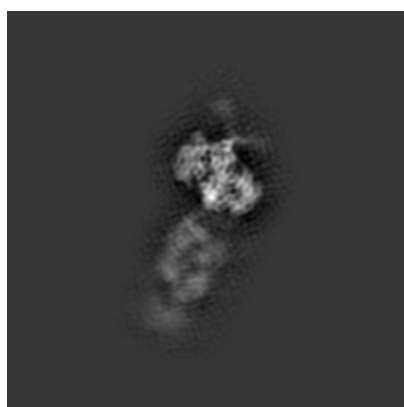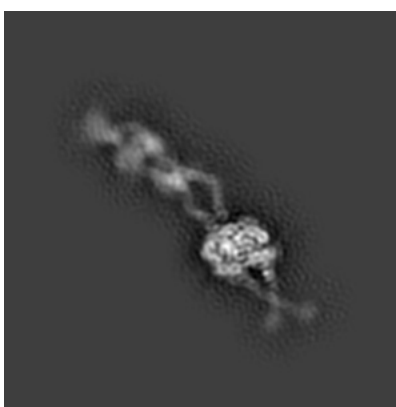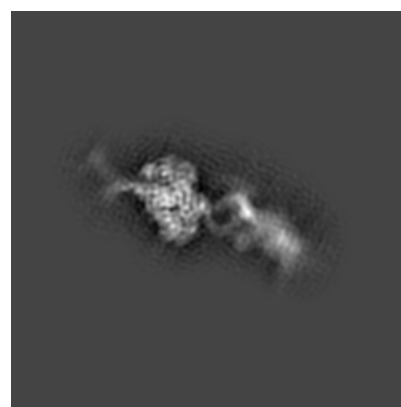
The images above show the map projected in three orthogonal directions.

6.2 Central slices (i)

6.2.1 Primary map
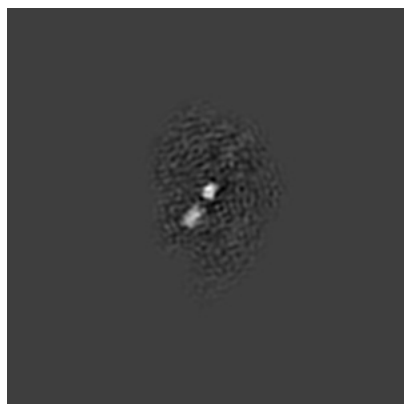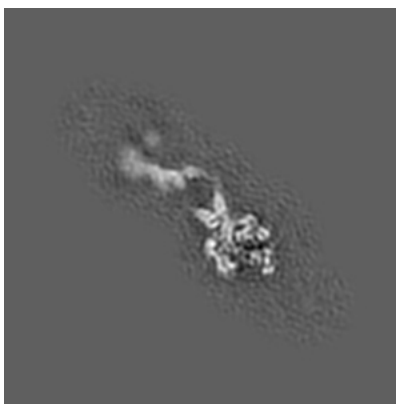
| X Index: 150 | Y Index: 150 | Z Index: 150 |
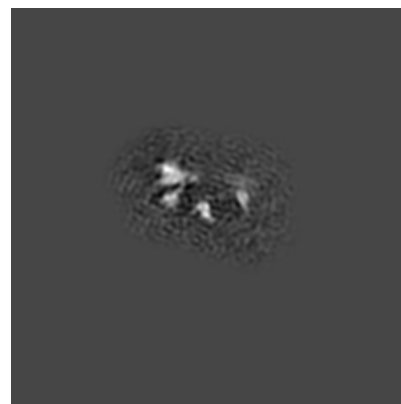
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices ⓘ

6.3.1 Primary map
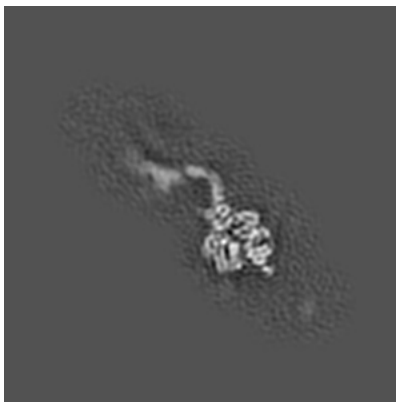
| X Index: 116 | Y Index: 154 | Z Index: 169 |
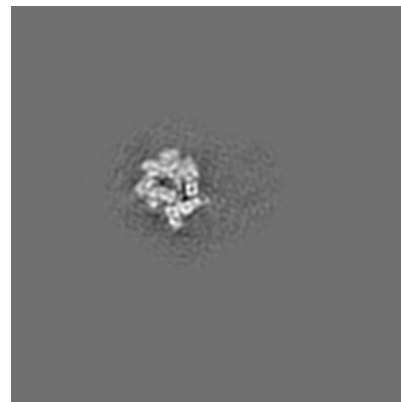
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal surface views ⓘ

6.4.1 Primary map

| X | Y | Z |
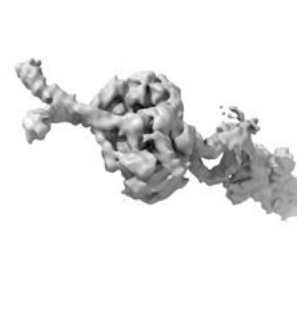
The images above show the 3D surface view of the map at the recommended contour level 0.06. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

WORLDWIDE
wwPDB
PROTEIN DATA BANK

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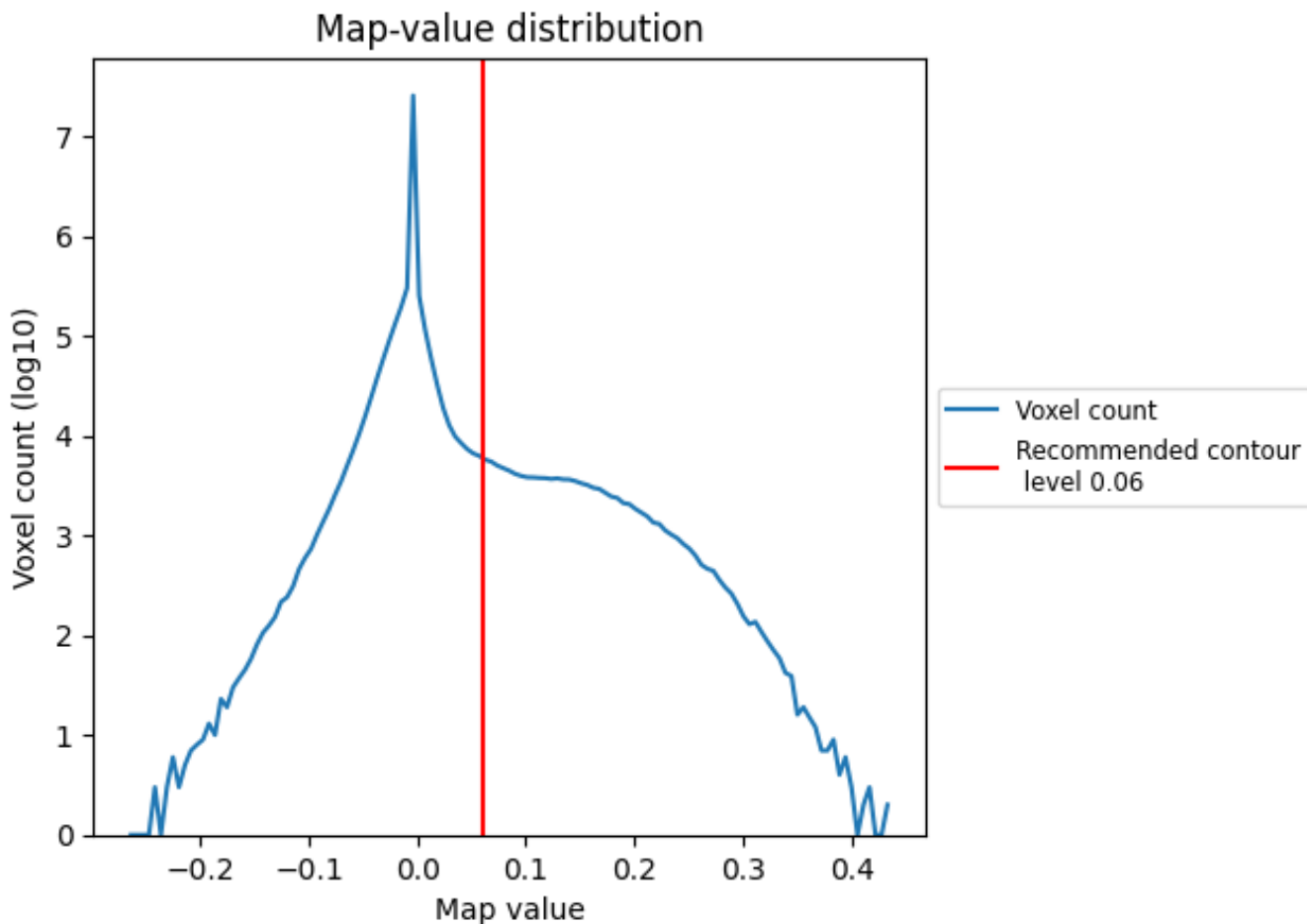
The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

7.2   Volume estimate ⓘ
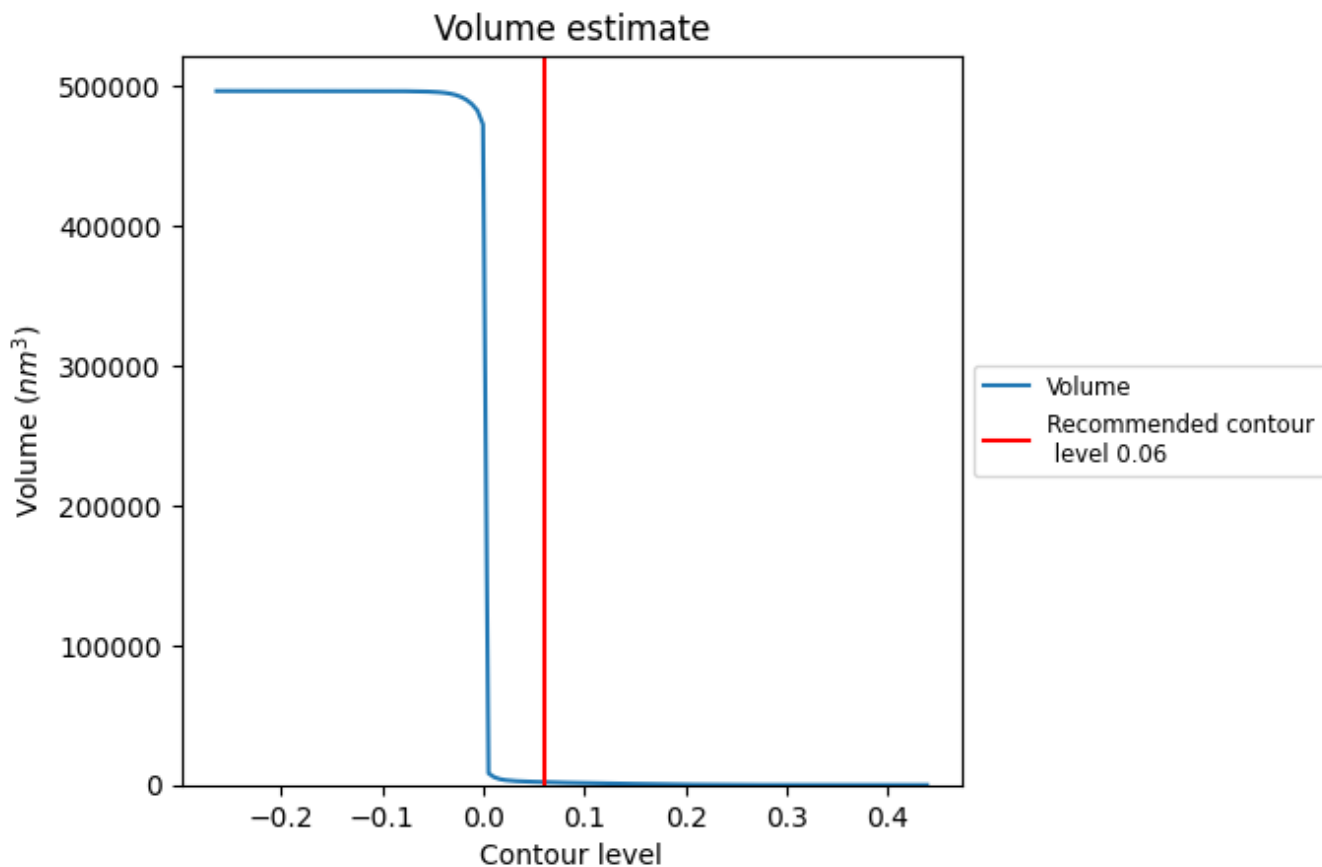
The volume at the recommended contour level is 2029 nm^3; this corresponds to an approximate mass of 1832 kDa.

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 ⓘ
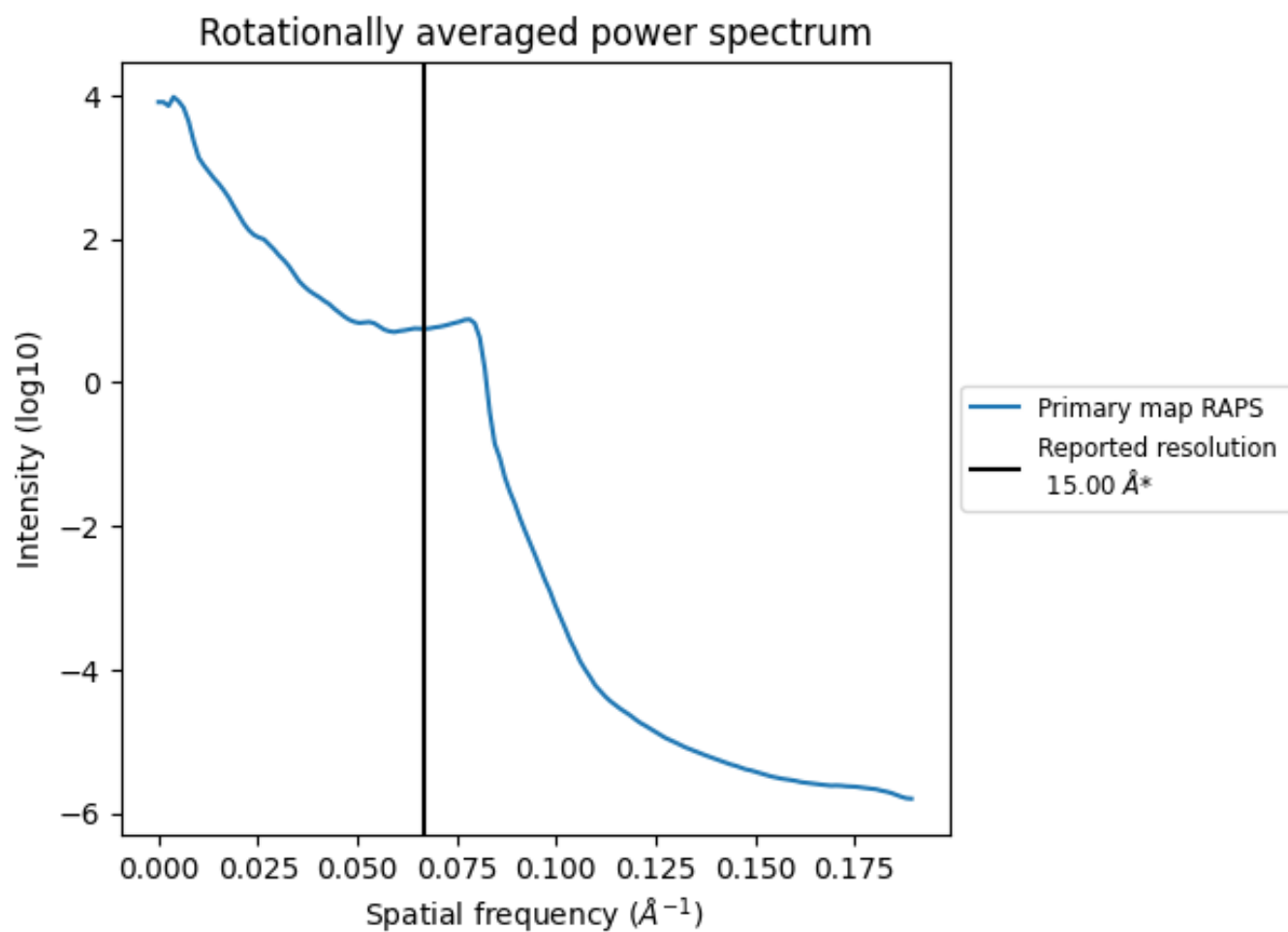
*Reported resolution corresponds to spatial frequency of 0.067 Å^{-1}

8   Fourier-Shell correlation ⓘ

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

9 Map-model fit ⓘ

This section contains information regarding the fit between EMDB map EMD-3705 and PDB model 5NVU. Per-residue inclusion information can be found in section 3 on page 7.

9.1 Map-model overlay ⓘ

| X | Y | Z |
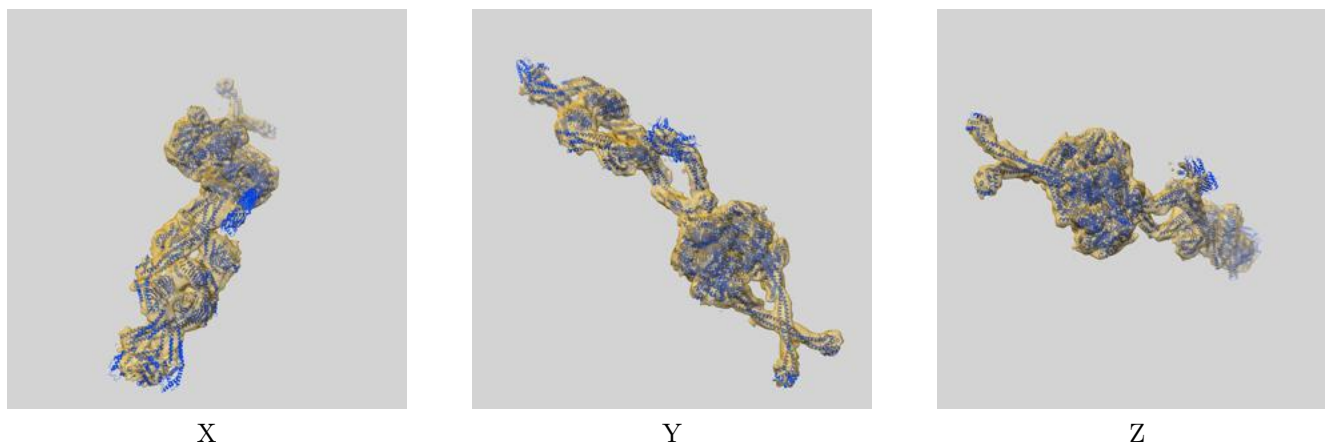
The images above show the 3D surface view of the map at the recommended contour level 0.06 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

9.2   Q-score mapped to coordinate model (i)
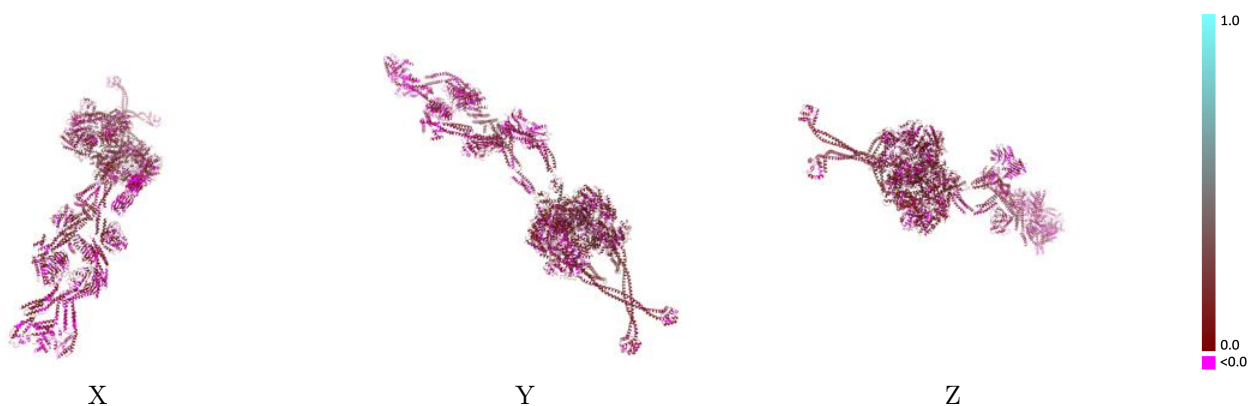
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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)
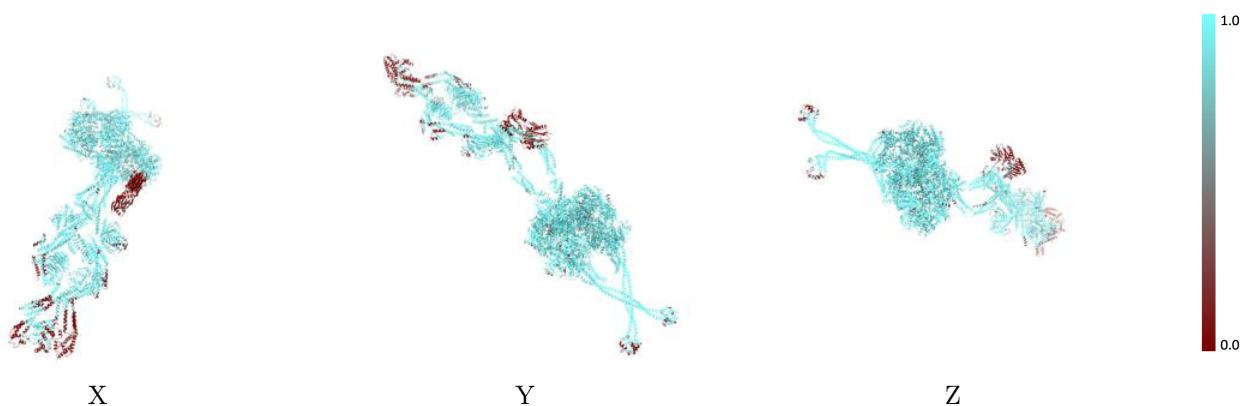
The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.06).

9.4 Atom inclusion ⓘ
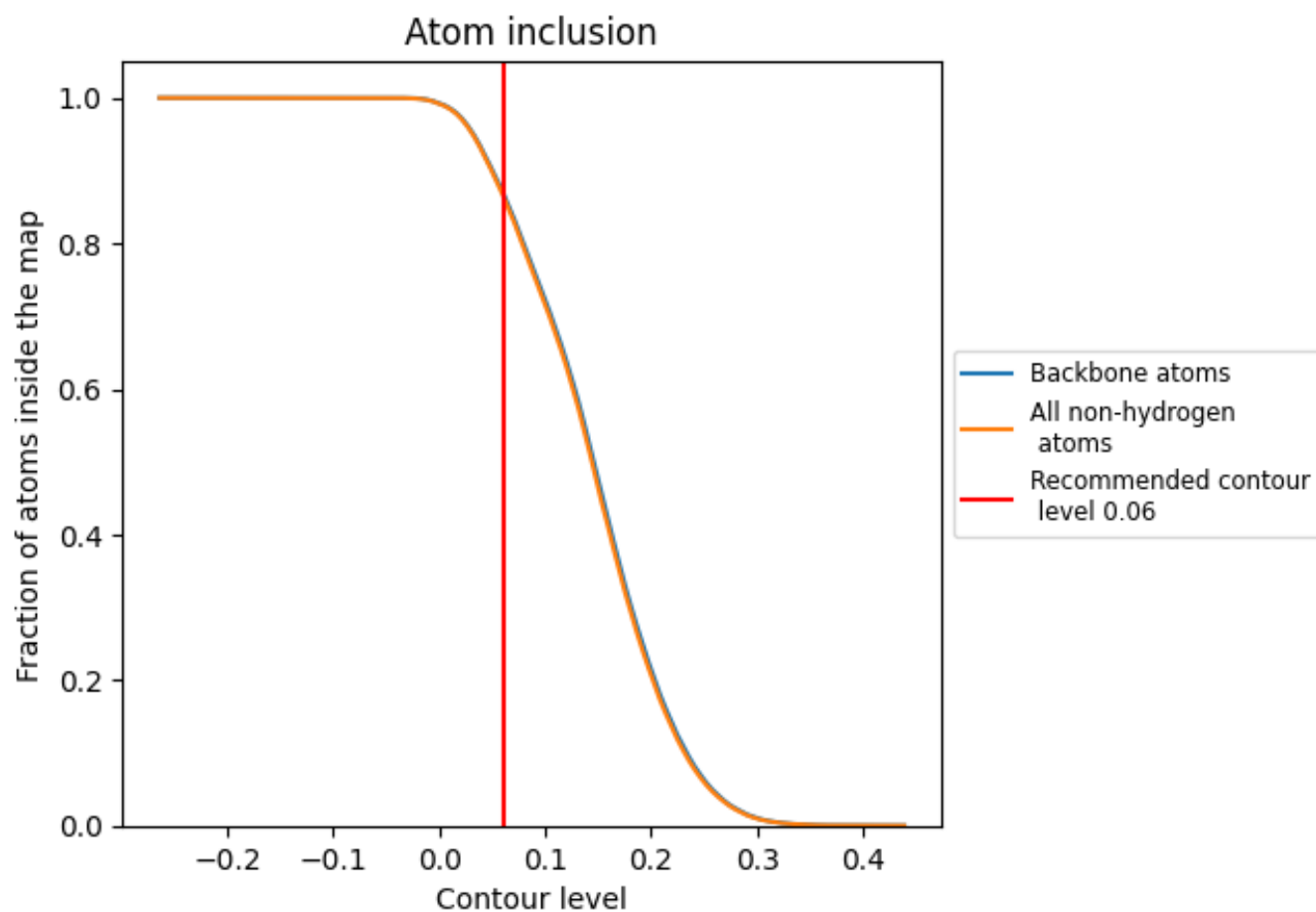
At the recommended contour level, 87% of all backbone atoms, 87% of all non-hydrogen atoms, are inside the map.

9.5   Map-model fit summary ⓘ

The table lists the average atom inclusion at the recommended contour level (0.06) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.8666	0.0870
A	0.9490	0.1130
B	0.9464	0.1010
C	0.7813	0.0960
D	0.9524	0.0450
E	0.9855	0.0560
F	0.7174	0.0540
G	0.8430	0.0480
H	0.9088	0.0750
I	0.5984	0.0040
J	0.5823	0.0010
K	0.2542	-0.0000
L	0.1330	0.0370
M	0.1045	0.0240
N	0.0273	-0.0050
O	0.1716	-0.0240
P	0.0629	-0.0020
Q	0.9319	0.0530
R	0.9250	0.0480

1.0

0.0
<0.0