



## Full wwPDB EM Validation Report ⓘ

Jun 16, 2025 – 07:53 PM JST

PDB ID : 8YWH / pdb\_00008ywh  
EMDB ID : EMD-39633  
Title : Cryo-EM structure of small and dead form SaCas9-RNA-DNA ternary complex (sdCas9)  
Authors : Kang, E.S.; Kim, N.H.; Thach, T.T.; Hyun, J.; Kim, Y.H.  
Deposited on : 2024-03-31  
Resolution : 2.97 Å (reported)  
Based on initial model : 5AXW

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.dev118  
MolProbity : 4-5-2 with Phenix2.0rc1  
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)  
MapQ : 1.9.13  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.44

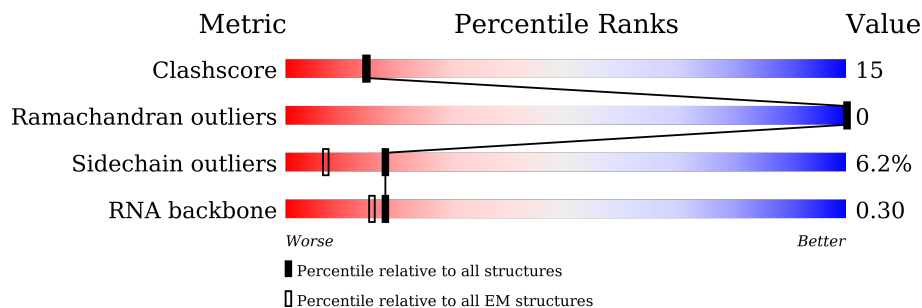
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*



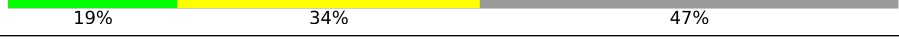

The reported resolution of this entry is 2.97 Å.

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



Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	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  $\geq 3$ , 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	886	
2	B	98	
3	C	59	
4	D	59	

## 2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 9957 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 sCas9 (Compact SaCas9).

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	845	Total	C	N	O	S	0	0
			6993	4451	1220	1313	9		

- Molecule 2 is a RNA chain called sgRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	98	Total	C	N	O	P	0	0
			2085	933	368	686	98		

- Molecule 3 is a DNA chain called Target DNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	31	Total	C	N	O	P	0	0
			630	299	115	185	31		

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	49	DT	DC	conflict	GB 887958

- Molecule 4 is a DNA chain called Non-target DNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	D	12	Total	C	N	O	P	0	0
			249	118	47	72	12		

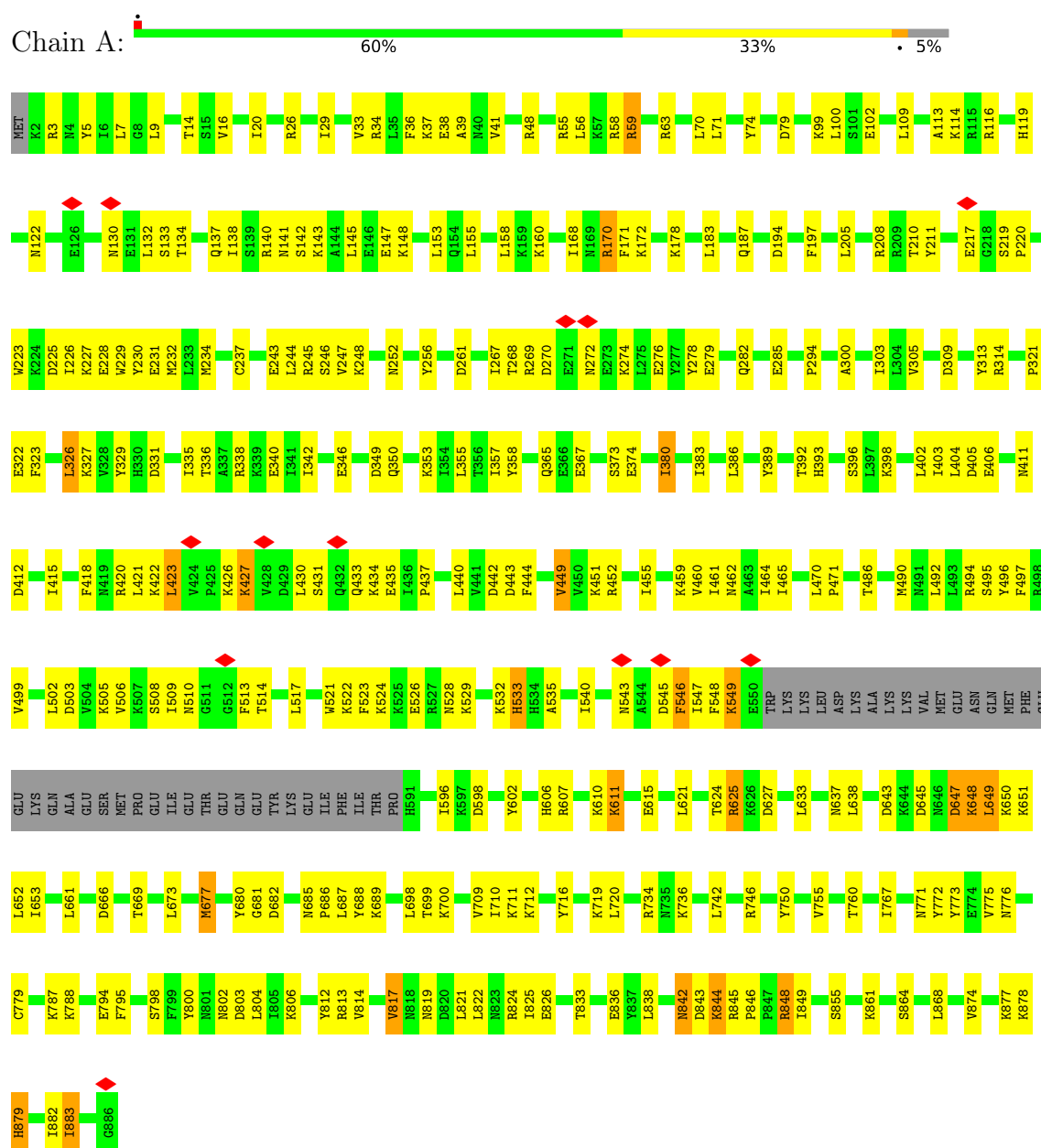
There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	11	DA	DG	conflict	GB 887958

### 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: sCas9 (Compact SaCas9)



Chain B:

G2  
 A3  
 U4  
 G7  
 A8  
 G9  
 U10  
 U15  
 A16  
 G17  
 C18  
 G19  
 C20  
 U21  
 A22  
 G23  
 U24  
 U25  
 U26  
 U27  
 A28  
 G29  
 U30  
 A31  
 C32  
 U33  
 C34  
 U35  
 G36  
 G37  
 A38  
 C41  
 A42  
 G43  
 C47  
 U48  
 A49  
 G50  
 U51  
 A52  
 A53  
 A54  
 A55  
 G56  
 A57  
 A62  
 A63  
 A64  
 A65  
 U66  
 G67  
 C68  
 C69  
 G70  
 U71  
 G72  
 U73  
 U74  
 U75  
 A76  
 U77  
 C78  
 U79  
 G80  
 U82  
 C83  
 A84  
 A85  
 C86  
 U87  
 U88  
 G89

[illegible][illegible]

## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	162748	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ( $e^-/\text{\AA}^2$ )	50	Depositor
Minimum defocus (nm)	700	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	0.062	Depositor
Minimum map value	-0.036	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.001	Depositor
Recommended contour level	0.00164	Depositor
Map size (Å)	249.59999, 249.59999, 249.59999	wwPDB
Map dimensions	256, 256, 256	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.97499996, 0.97499996, 0.97499996	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	0.21	0/7114	0.48	0/9561
2	B	0.22	0/2331	0.34	0/3629
3	C	0.26	0/705	0.43	0/1084
4	D	0.26	0/279	0.40	0/429
All	All	0.22	0/10429	0.44	0/14703

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	6993	0	7127	235	0
2	B	2085	0	1051	53	0
3	C	630	0	348	21	0
4	D	249	0	136	7	0
All	All	9957	0	8662	278	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 15.

All (278) 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:A:838:LEU:HD22	1:A:843:ASP:OD2	1.66	0.96
1:A:3:ARG:NH1	1:A:3:ARG:HB3	1.84	0.92
1:A:134:THR:O	1:A:138:ILE:HG22	1.74	0.87
3:C:23:DT:H2''	3:C:24:DA:H5'	1.60	0.83
2:B:78:C:H42	2:B:96:A:H61	1.30	0.79
1:A:138:ILE:HD13	1:A:171:PHE:HA	1.63	0.79
1:A:517:LEU:HD21	1:A:547:ILE:HG13	1.66	0.76
2:B:53:A:HO2'	2:B:54:A:H8	1.32	0.75
1:A:846:PRO:HG2	3:C:18:DT:C7	2.16	0.74
1:A:141:ASN:HB3	1:A:171:PHE:CE2	2.23	0.73
1:A:26:ARG:NH1	1:A:546:PHE:HB2	2.03	0.73
1:A:170:ARG:HG2	2:B:21:U:H4'	1.72	0.72
1:A:649:LEU:O	1:A:649:LEU:HD22	1.90	0.72
1:A:48:ARG:NH2	2:B:15:U:OP2	2.23	0.71
4:D:40:DG:H2''	4:D:41:DG:H5''	1.71	0.71
1:A:433:GLN:NE2	1:A:435:GLU:OE1	2.23	0.70
1:A:3:ARG:HB3	1:A:3:ARG:HH11	1.54	0.70
1:A:261:ASP:OD2	1:A:314:ARG:NH1	2.25	0.70
1:A:776:ASN:HB3	1:A:779:CYS:HB2	1.74	0.70
1:A:256:TYR:HE1	1:A:403:ILE:HG21	1.57	0.69
1:A:132:LEU:HD23	1:A:132:LEU:O	1.93	0.69
1:A:490:MET:HE2	1:A:508:SER:HB2	1.72	0.69
1:A:517:LEU:CD2	1:A:547:ILE:HG13	2.22	0.69
1:A:274:LYS:HB2	1:A:411:ASN:HB2	1.75	0.69
1:A:486:THR:O	1:A:490:MET:HG2	1.93	0.67
1:A:252:ASN:ND2	1:A:349:ASP:OD1	2.27	0.67
1:A:269:ARG:HE	1:A:305:VAL:HG21	1.59	0.67
1:A:14:THR:HG22	1:A:38:GLU:HB2	1.77	0.67
1:A:864:SER:HB2	1:A:874:VAL:HG11	1.76	0.67
1:A:846:PRO:HG2	3:C:18:DT:H71	1.77	0.66
1:A:677:MET:HE3	1:A:686:PRO:HD2	1.78	0.65
1:A:140:ARG:HA	1:A:143:LYS:HD2	1.77	0.65
1:A:700:LYS:NZ	2:B:32:C:O2	2.22	0.65
1:A:26:ARG:HH11	1:A:546:PHE:HB2	1.61	0.65
1:A:505:LYS:HE2	1:A:505:LYS:H	1.62	0.65
1:A:760:THR:HG23	1:A:817:VAL:HG11	1.79	0.64
1:A:234:MET:HE3	1:A:392:THR:HG21	1.79	0.64
4:D:41:DG:H2''	4:D:42:DA:C8	2.33	0.64
1:A:208:ARG:NH1	2:B:19:G:O2'	2.31	0.63
1:A:822:LEU:HB3	1:A:824:ARG:HE	1.64	0.63
4:D:39:DC:H2''	4:D:40:DG:C8	2.34	0.63
1:A:141:ASN:O	1:A:145:LEU:HD23	1.98	0.63

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:313:TYR:CD2	1:A:321:PRO:HB3	2.33	0.63
1:A:611:LYS:HB2	2:B:75:U:O4	1.98	0.62
1:A:846:PRO:HG2	3:C:18:DT:H72	1.80	0.61
1:A:329:TYR:HE1	1:A:342:ILE:HG23	1.66	0.61
1:A:116:ARG:HG2	1:A:205:LEU:HD12	1.81	0.61
1:A:755:VAL:HG23	1:A:855:SER:HA	1.82	0.60
1:A:26:ARG:HG3	1:A:26:ARG:O	2.02	0.60
1:A:434:LYS:H	1:A:434:LYS:HD2	1.66	0.60
2:B:7:G:O6	3:C:39:DA:N6	2.34	0.60
1:A:621:LEU:HD13	2:B:24:U:O2	2.02	0.60
1:A:497:PHE:HB3	1:A:503:ASP:HA	1.82	0.59
1:A:819:ASN:HB3	1:A:822:LEU:HB2	1.84	0.59
1:A:750:TYR:OH	1:A:879:HIS:NE2	2.36	0.59
1:A:338:ARG:NH1	1:A:340:GLU:OE1	2.35	0.59
1:A:237:CYS:HB2	1:A:396:SER:HB2	1.85	0.59
1:A:55:ARG:NH2	2:B:17:G:OP1	2.29	0.58
1:A:734:ARG:NH2	2:B:28:A:OP2	2.36	0.58
1:A:494:ARG:NH2	1:A:506:VAL:O	2.36	0.58
1:A:278:TYR:O	1:A:282:GLN:HG3	2.04	0.57
1:A:465:ILE:HG12	1:A:471:PRO:HD3	1.85	0.57
3:C:26:DC:H2''	3:C:27:DG:H5'	1.85	0.57
1:A:322:GLU:OE1	2:B:8:A:O2'	2.21	0.57
1:A:647:ASP:N	1:A:647:ASP:OD1	2.37	0.57
1:A:300:ALA:HA	1:A:303:ILE:HG22	1.86	0.57
1:A:643:ASP:O	1:A:685:ASN:ND2	2.38	0.57
1:A:248:LYS:HA	1:A:393:HIS:HB2	1.85	0.57
2:B:53:A:O2'	2:B:54:A:H8	1.88	0.56
2:B:37:G:O6	2:B:41:C:N4	2.37	0.56
1:A:228:GLU:O	1:A:232:MET:HG3	2.04	0.56
1:A:412:ASP:OD2	1:A:420:ARG:NH1	2.38	0.56
1:A:20:ILE:HG22	1:A:29:ILE:HD12	1.87	0.56
1:A:3:ARG:HB3	1:A:3:ARG:CZ	2.36	0.55
1:A:838:LEU:O	1:A:842:ASN:N	2.39	0.55
1:A:116:ARG:HD2	1:A:205:LEU:O	2.06	0.55
1:A:122:ASN:HB3	1:A:172:LYS:HG2	1.88	0.55
1:A:455:ILE:O	1:A:459:LYS:HG3	2.07	0.55
1:A:653:ILE:HD12	1:A:677:MET:HG2	1.89	0.55
4:D:45:DT:H2'	4:D:46:DG:C8	2.42	0.55
1:A:58:ARG:NH2	2:B:69:C:OP2	2.40	0.54
1:A:39:ALA:O	1:A:449:VAL:HG12	2.08	0.54
1:A:826:GLU:OE1	1:A:848:ARG:NH1	2.40	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:234:MET:HE1	1:A:245:ARG:O	2.08	0.54
1:A:637:ASN:HD22	1:A:712:LYS:HD2	1.73	0.53
2:B:26:U:H2'	2:B:27:U:C6	2.44	0.53
3:C:29:DT:H2'	3:C:30:DA:C8	2.44	0.53
1:A:147:GLU:OE2	1:A:147:GLU:N	2.42	0.53
1:A:661:LEU:HB3	2:B:47:C:H5''	1.91	0.52
1:A:549:LYS:O	1:A:549:LYS:HG2	2.09	0.52
1:A:464:ILE:HG12	1:A:868:LEU:HD21	1.90	0.52
1:A:510:ASN:O	1:A:514:THR:OG1	2.26	0.52
1:A:326:LEU:HD22	1:A:326:LEU:H	1.74	0.52
1:A:627:ASP:HB3	1:A:633:LEU:HD22	1.92	0.52
3:C:37:DT:H2''	3:C:38:DC:H5''	1.92	0.52
1:A:540:ILE:HA	1:A:543:ASN:HB2	1.92	0.52
1:A:355:LEU:HD21	1:A:383:ILE:HG22	1.92	0.52
1:A:9:LEU:HD11	1:A:461:ILE:HD11	1.92	0.51
1:A:71:LEU:HD21	1:A:109:LEU:HD12	1.91	0.51
1:A:99:LYS:HG3	1:A:100:LEU:N	2.25	0.51
1:A:217:GLU:CD	1:A:217:GLU:H	2.19	0.51
1:A:817:VAL:HG22	1:A:817:VAL:O	2.09	0.51
1:A:219:SER:HB2	2:B:68:C:O3'	2.11	0.51
1:A:211:TYR:CE2	3:C:29:DT:H2''	2.46	0.51
3:C:43:DC:H2'	3:C:44:DT:H71	1.93	0.51
1:A:20:ILE:HD11	1:A:464:ILE:HD13	1.93	0.50
1:A:270:ASP:OD2	1:A:272:ASN:HB3	2.12	0.50
4:D:41:DG:H2''	4:D:42:DA:H8	1.75	0.50
1:A:431:SER:HB2	1:A:499:VAL:HG12	1.93	0.50
1:A:141:ASN:HB3	1:A:171:PHE:HE2	1.70	0.50
1:A:358:TYR:CZ	1:A:367:GLU:HG3	2.46	0.50
1:A:494:ARG:HG2	1:A:494:ARG:HH11	1.76	0.50
1:A:624:THR:HG23	1:A:736:LYS:O	2.12	0.50
2:B:31:A:H2'	2:B:32:C:H5'	1.93	0.50
1:A:392:THR:OG1	3:C:32:DC:OP1	2.28	0.50
1:A:383:ILE:O	1:A:386:LEU:HB2	2.12	0.50
2:B:35:U:H2'	2:B:36:G:C8	2.47	0.50
1:A:59:ARG:NH2	2:B:68:C:OP1	2.42	0.49
3:C:41:DA:H4'	3:C:41:DA:OP1	2.12	0.49
4:D:43:DT:H1'	4:D:44:DC:H5'	1.94	0.49
1:A:673:LEU:HD21	1:A:687:LEU:HD21	1.92	0.49
2:B:4:U:O4	3:C:41:DA:N7	2.45	0.49
1:A:526:GLU:HG2	1:A:529:LYS:HG3	1.95	0.49
2:B:41:C:H2'	2:B:42:A:O4'	2.13	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:331:ASP:HB3	1:A:386:LEU:HD21	1.94	0.49
1:A:720:LEU:HD22	4:D:42:DA:H5''	1.95	0.49
1:A:247:VAL:HG21	1:A:353:LYS:HA	1.95	0.49
1:A:329:TYR:CE1	1:A:342:ILE:HG23	2.47	0.49
1:A:59:ARG:NH1	2:B:18:C:OP1	2.35	0.48
1:A:234:MET:CE	1:A:245:ARG:O	2.61	0.48
1:A:137:GLN:HE22	1:A:168:ILE:HD12	1.79	0.48
3:C:24:DA:H2''	3:C:25:DG:H5''	1.96	0.48
1:A:529:LYS:HE3	1:A:533:HIS:HB2	1.95	0.48
1:A:773:TYR:HB2	1:A:883:ILE:HG23	1.94	0.48
1:A:373:SER:OG	1:A:374:GLU:N	2.45	0.48
1:A:522:LYS:HD2	1:A:524:LYS:HD2	1.96	0.48
1:A:648:LYS:HE2	1:A:648:LYS:HB3	1.36	0.48
1:A:607:ARG:HH21	2:B:74:U:H5''	1.78	0.47
1:A:806:LYS:HB3	1:A:861:LYS:HB2	1.95	0.47
1:A:421:LEU:O	1:A:422:LYS:HG3	2.14	0.47
1:A:649:LEU:HD22	1:A:649:LEU:C	2.39	0.47
1:A:267:ILE:HG13	1:A:303:ILE:HD11	1.96	0.47
1:A:3:ARG:CZ	1:A:3:ARG:CB	2.92	0.47
1:A:16:VAL:HG23	1:A:36:PHE:CE1	2.49	0.47
1:A:16:VAL:HG23	1:A:36:PHE:HE1	1.80	0.47
1:A:134:THR:HG22	1:A:170:ARG:NE	2.30	0.47
1:A:650:LYS:NZ	1:A:681:GLY:O	2.48	0.47
1:A:699:THR:HA	1:A:709:VAL:HA	1.97	0.46
1:A:63:ARG:NH1	1:A:113:ALA:O	2.47	0.46
1:A:746:ARG:HD2	1:A:798:SER:OG	2.15	0.46
1:A:134:THR:OG1	3:C:27:DG:H5''	2.16	0.46
1:A:268:THR:OG1	1:A:309:ASP:OD2	2.30	0.46
1:A:314:ARG:HA	3:C:39:DA:H1'	1.97	0.46
1:A:800:TYR:O	1:A:803:ASP:HB2	2.16	0.46
1:A:225:ASP:OD1	1:A:228:GLU:HB2	2.16	0.46
1:A:427:LYS:HD2	1:A:495:SER:HB2	1.98	0.46
1:A:772:TYR:CD2	1:A:882:ILE:HG23	2.51	0.46
1:A:155:LEU:HD12	1:A:158:LEU:HD23	1.98	0.45
1:A:227:LYS:HD2	1:A:227:LYS:O	2.16	0.45
1:A:234:MET:HG3	1:A:244:LEU:HD22	1.98	0.45
1:A:460:VAL:O	1:A:464:ILE:HG13	2.16	0.45
2:B:64:A:H4'	2:B:65:A:H3'	1.99	0.45
1:A:452:ARG:NH2	2:B:73:U:OP1	2.50	0.45
1:A:598:ASP:N	1:A:598:ASP:OD2	2.49	0.45
1:A:274:LYS:HB2	1:A:411:ASN:CB	2.43	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:25:U:H2'	2:B:26:U:C6	2.52	0.45
1:A:119:HIS:HA	1:A:122:ASN:ND2	2.32	0.45
1:A:596:ILE:HD12	1:A:596:ILE:H	1.81	0.45
1:A:505:LYS:H	1:A:505:LYS:CE	2.29	0.45
1:A:142:SER:HA	1:A:145:LEU:HB2	1.98	0.45
1:A:437:PRO:HG2	1:A:440:LEU:HD13	1.98	0.45
1:A:625:ARG:HB3	1:A:716:TYR:HE1	1.81	0.45
1:A:633:LEU:HD12	1:A:719:LYS:HB3	1.97	0.45
1:A:423:LEU:H	1:A:423:LEU:HD22	1.82	0.45
1:A:220:PRO:HD2	2:B:69:C:H5''	1.98	0.44
1:A:427:LYS:HB2	1:A:499:VAL:HG21	1.98	0.44
1:A:817:VAL:HA	1:A:825:ILE:HA	1.98	0.44
1:A:844:LYS:H	1:A:844:LYS:HG3	1.46	0.44
3:C:14:DC:H4'	3:C:15:DA:OP1	2.17	0.44
1:A:230:TYR:CD2	1:A:357:ILE:HD13	2.52	0.44
1:A:403:ILE:HG13	1:A:418:PHE:CZ	2.52	0.44
1:A:404:LEU:HD12	1:A:405:ASP:N	2.32	0.44
2:B:54:A:HO2'	2:B:55:A:H8	1.63	0.44
1:A:528:ASN:HB3	1:A:836:GLU:HB3	2.00	0.44
1:A:803:ASP:O	1:A:814:VAL:HG22	2.17	0.44
1:A:335:ILE:HG13	1:A:336:THR:N	2.32	0.44
1:A:526:GLU:H	1:A:529:LYS:HD3	1.83	0.44
2:B:33:U:H2'	2:B:34:C:C6	2.52	0.44
2:B:31:A:C2'	2:B:32:C:H5'	2.47	0.44
1:A:398:LYS:O	1:A:402:LEU:HG	2.17	0.44
2:B:28:A:H2'	2:B:29:G:H8	1.83	0.44
1:A:532:LYS:HB2	1:A:602:TYR:CD2	2.53	0.44
1:A:680:TYR:CE1	1:A:689:LYS:HG2	2.53	0.44
1:A:819:ASN:CB	1:A:822:LEU:HB2	2.48	0.44
1:A:877:LYS:O	1:A:878:LYS:HD2	2.18	0.44
1:A:153:LEU:HD23	1:A:171:PHE:CZ	2.53	0.44
1:A:223:TRP:CG	1:A:229:TRP:HB2	2.53	0.44
1:A:226:ILE:HG13	1:A:229:TRP:CE3	2.53	0.44
1:A:227:LYS:HE3	1:A:231:GLU:OE1	2.18	0.43
1:A:274:LYS:HB3	1:A:274:LYS:HE2	1.80	0.43
1:A:327:LYS:HE2	1:A:389:TYR:CZ	2.52	0.43
1:A:365:GLN:HG2	1:A:380:ILE:HG22	1.99	0.43
1:A:546:PHE:CD1	1:A:546:PHE:C	2.95	0.43
1:A:183:LEU:HD23	1:A:187:GLN:HG2	1.99	0.43
1:A:225:ASP:OD1	1:A:228:GLU:CB	2.66	0.43
1:A:804:LEU:HD23	1:A:813:ARG:HB3	2.00	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:56:LEU:HD21	2:B:20:C:H5	1.83	0.43
1:A:513:PHE:CD1	1:A:548:PHE:HZ	2.37	0.43
1:A:434:LYS:O	1:A:496:TYR:OH	2.33	0.43
1:A:58:ARG:HD2	2:B:68:C:C5	2.54	0.43
1:A:220:PRO:HD2	2:B:69:C:C5'	2.49	0.43
1:A:666:ASP:OD1	1:A:669:THR:HG22	2.19	0.43
1:A:734:ARG:HH22	2:B:28:A:P	2.42	0.43
2:B:20:C:H2'	2:B:21:U:C6	2.54	0.43
1:A:134:THR:HG22	1:A:170:ARG:CD	2.49	0.43
1:A:421:LEU:HB3	1:A:423:LEU:HD22	2.01	0.43
1:A:521:TRP:HE3	1:A:523:PHE:CE2	2.37	0.43
1:A:682:ASP:N	1:A:682:ASP:OD1	2.52	0.43
1:A:346:GLU:O	1:A:350:GLN:HG3	2.19	0.42
1:A:794:GLU:HG3	1:A:878:LYS:HZ1	1.84	0.42
1:A:74:TYR:CZ	1:A:197:PHE:HB2	2.54	0.42
1:A:610:LYS:HG2	1:A:800:TYR:CG	2.55	0.42
1:A:5:TYR:CD2	1:A:20:ILE:HG23	2.55	0.42
1:A:509:ILE:HD12	1:A:509:ILE:O	2.19	0.42
1:A:119:HIS:HB2	1:A:208:ARG:CZ	2.49	0.42
1:A:269:ARG:HD2	1:A:270:ASP:N	2.35	0.42
2:B:21:U:H2'	2:B:22:A:O4'	2.19	0.42
2:B:42:A:O2'	2:B:43:G:C8	2.71	0.42
2:B:91:U:H2'	2:B:92:G:H5''	2.02	0.42
1:A:79:ASP:OD1	1:A:79:ASP:N	2.53	0.42
1:A:223:TRP:CD1	1:A:229:TRP:HB2	2.54	0.42
1:A:607:ARG:NH2	2:B:74:U:H5''	2.35	0.42
1:A:710:ILE:HG22	2:B:48:U:O2'	2.20	0.42
1:A:37:LYS:O	1:A:452:ARG:NH1	2.52	0.42
2:B:28:A:H2'	2:B:29:G:C8	2.55	0.42
1:A:246:SER:O	1:A:393:HIS:N	2.52	0.42
1:A:33:VAL:HG22	1:A:535:ALA:HB2	2.02	0.41
1:A:276:GLU:HB2	1:A:279:GLU:HB2	2.02	0.41
1:A:294:PRO:HG2	1:A:323:PHE:HB2	2.02	0.41
1:A:335:ILE:HD13	1:A:383:ILE:HG13	2.02	0.41
1:A:845:ARG:HA	1:A:846:PRO:HD3	1.90	0.41
2:B:26:U:H2'	2:B:27:U:H6	1.84	0.41
1:A:444:PHE:HE2	1:A:492:LEU:HB2	1.85	0.41
1:A:711:LYS:HE2	2:B:49:A:H5'	2.01	0.41
1:A:160:LYS:HD3	1:A:160:LYS:HA	1.87	0.41
1:A:621:LEU:O	2:B:24:U:O2'	2.37	0.41
1:A:59:ARG:HH12	2:B:18:C:P	2.43	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:130:ASN:HA	1:A:140:ARG:NH1	2.36	0.41
1:A:826:GLU:CD	1:A:848:ARG:HH11	2.27	0.41
1:A:145:LEU:HD13	1:A:148:LYS:O	2.20	0.41
3:C:21:DG:H2'	3:C:22:DC:C6	2.55	0.41
1:A:55:ARG:HG2	1:A:58:ARG:NH2	2.35	0.41
1:A:243:GLU:HG3	1:A:398:LYS:HD2	2.01	0.41
1:A:606:HIS:HB3	1:A:802:ASN:ND2	2.35	0.41
1:A:34:ARG:HH21	1:A:607:ARG:HD2	1.86	0.41
1:A:327:LYS:HE2	1:A:389:TYR:CE2	2.56	0.41
1:A:435:GLU:HB3	1:A:462:ASN:CG	2.46	0.41
1:A:698:LEU:HD23	1:A:710:ILE:HD11	2.02	0.41
2:B:98:A:H3'	2:B:99:U:H5''	2.03	0.41
1:A:412:ASP:OD1	1:A:412:ASP:N	2.52	0.41
1:A:647:ASP:O	1:A:651:LYS:HG3	2.21	0.40
1:A:788:LYS:HB3	1:A:788:LYS:HE3	1.80	0.40
1:A:833:THR:HG23	1:A:836:GLU:H	1.86	0.40
1:A:521:TRP:HH2	1:A:547:ILE:HD11	1.86	0.40
1:A:795:PHE:HE2	1:A:879:HIS:N	2.20	0.40
2:B:19:G:C6	3:C:27:DG:C6	3.08	0.40
2:B:51:U:H2'	2:B:52:A:H8	1.86	0.40
1:A:490:MET:HG2	1:A:490:MET:H	1.72	0.40
1:A:685:ASN:ND2	1:A:688:TYR:HB2	2.37	0.40
2:B:82:U:O2	2:B:93:G:N2	2.54	0.40
3:C:30:DA:H2'	3:C:31:DC:C6	2.57	0.40
3:C:14:DC:H2''	3:C:15:DA:C8	2.57	0.40
1:A:70:LEU:HD12	1:A:70:LEU:HA	1.96	0.40
1:A:178:LYS:HB2	1:A:178:LYS:HE3	1.98	0.40
1:A:442:ASP:HA	1:A:451:LYS:HE2	2.04	0.40
1:A:510:ASN:HB3	1:A:513:PHE:CD1	2.57	0.40
1:A:771:ASN:ND2	2:B:86:C:OP1	2.55	0.40
1:A:787:LYS:HA	1:A:787:LYS:HD3	1.84	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	841/886 (95%)	815 (97%)	26 (3%)	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	772/811 (95%)	724 (94%)	48 (6%)	15	43

All (48) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	7	LEU
1	A	41	VAL
1	A	59	ARG
1	A	102	GLU
1	A	114	LYS
1	A	133	SER
1	A	170	ARG
1	A	194	ASP
1	A	210	THR
1	A	285	GLU
1	A	326	LEU
1	A	380	ILE
1	A	406	GLU
1	A	415	ILE
1	A	423	LEU
1	A	426	LYS
1	A	427	LYS
1	A	430	LEU
1	A	443	ASP
1	A	449	VAL
1	A	470	LEU

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Mol	Chain	Res	Type
1	A	502	LEU
1	A	533	HIS
1	A	545	ASP
1	A	546	PHE
1	A	549	LYS
1	A	611	LYS
1	A	615	GLU
1	A	625	ARG
1	A	638	LEU
1	A	645	ASP
1	A	647	ASP
1	A	648	LYS
1	A	649	LEU
1	A	652	LEU
1	A	677	MET
1	A	742	LEU
1	A	767	ILE
1	A	775	VAL
1	A	812	TYR
1	A	817	VAL
1	A	821	LEU
1	A	842	ASN
1	A	844	LYS
1	A	848	ARG
1	A	849	ILE
1	A	879	HIS
1	A	883	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (16) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	43	ASN
1	A	44	ASN
1	A	120	ASN
1	A	122	ASN
1	A	137	GLN
1	A	141	ASN
1	A	264	ASN
1	A	286	ASN
1	A	433	GLN
1	A	534	HIS
1	A	595	HIS

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Mol	Chain	Res	Type
1	A	696	ASN
1	A	771	ASN
1	A	776	ASN
1	A	819	ASN
1	A	842	ASN

### 5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
2	B	97/98 (98%)	39 (40%)	2 (2%)

All (39) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
2	B	7	G
2	B	8	A
2	B	9	G
2	B	10	U
2	B	22	A
2	B	32	C
2	B	33	U
2	B	36	G
2	B	37	G
2	B	38	A
2	B	42	A
2	B	43	G
2	B	54	A
2	B	55	A
2	B	57	A
2	B	62	A
2	B	63	A
2	B	64	A
2	B	65	A
2	B	67	G
2	B	71	U
2	B	72	G
2	B	73	U
2	B	74	U
2	B	75	U
2	B	76	A
2	B	79	U

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Mol	Chain	Res	Type
2	B	84	A
2	B	85	A
2	B	86	C
2	B	87	U
2	B	88	U
2	B	89	G
2	B	90	U
2	B	92	G
2	B	94	C
2	B	95	G
2	B	97	G
2	B	99	U

All (2) RNA pucker outliers are listed below:

Mol	Chain	Res	Type
2	B	88	U
2	B	89	G

## 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.

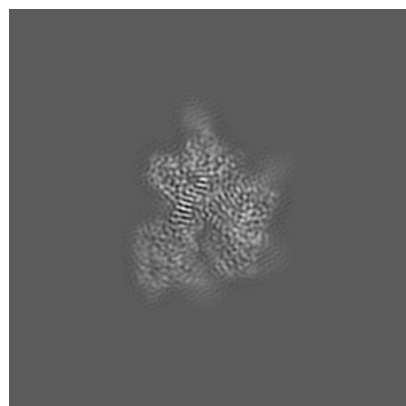
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-39633. These allow visual inspection of the internal detail of the map and identification of artifacts.

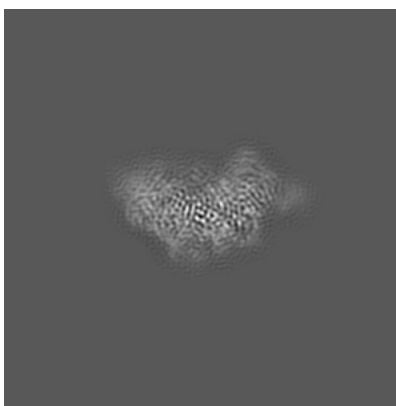
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

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

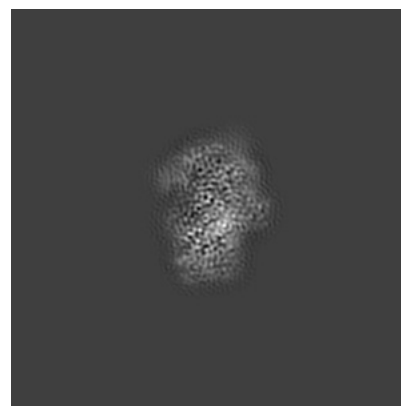
#### 6.1.1 Primary map



X

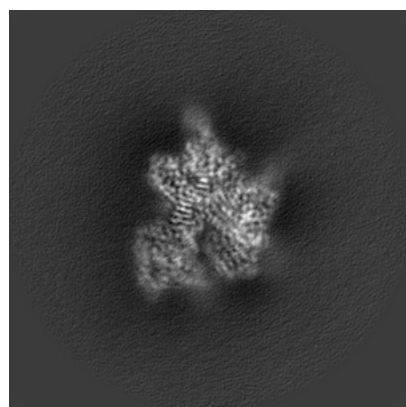


Y

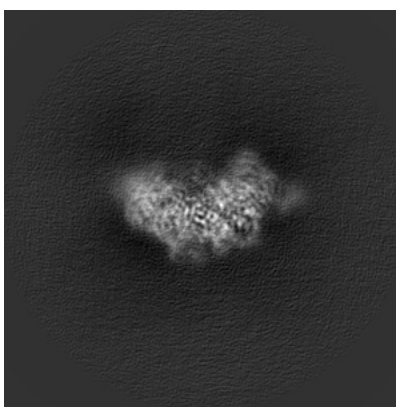


Z

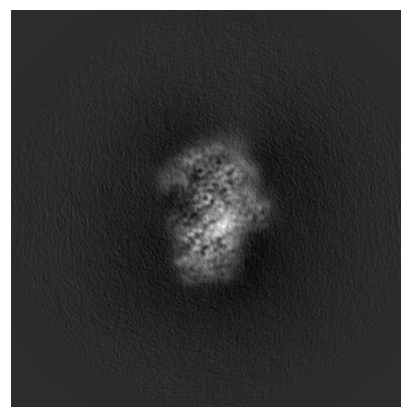
#### 6.1.2 Raw map



X



Y

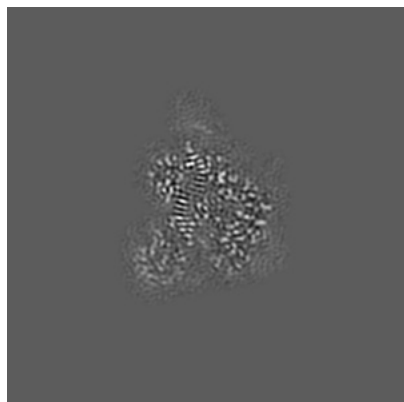


Z

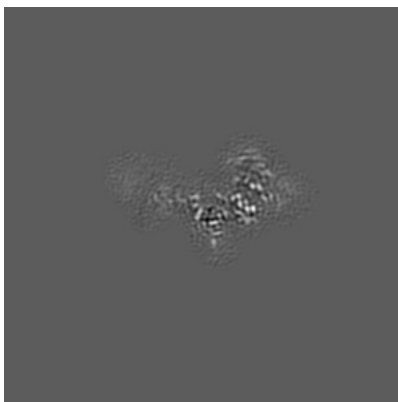
The images above show the map projected in three orthogonal directions.

## 6.2 Central slices [i](#)

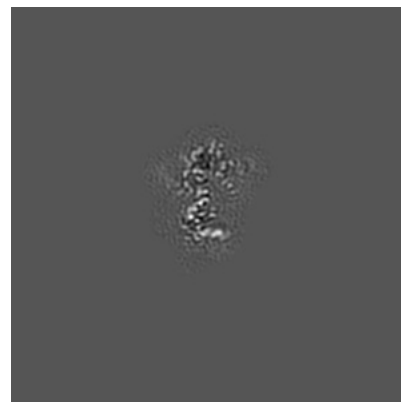
### 6.2.1 Primary map



X Index: 128

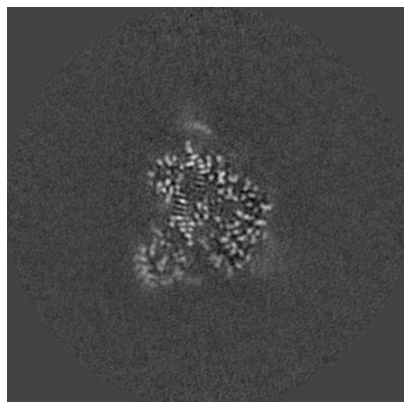


Y Index: 128

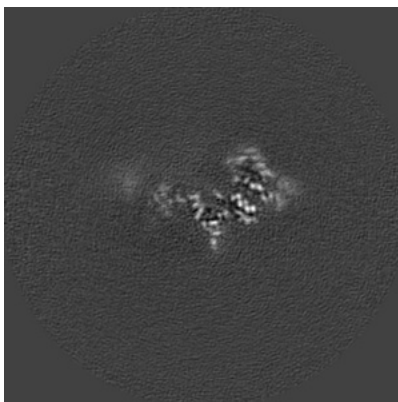


Z Index: 128

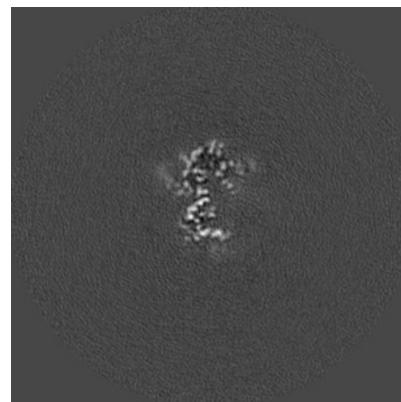
### 6.2.2 Raw map



X Index: 128



Y Index: 128

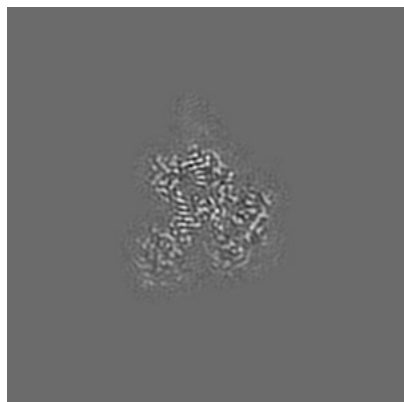


Z Index: 128

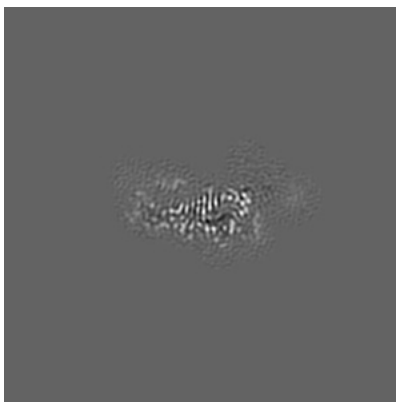
The images above show central slices of the map in three orthogonal directions.

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

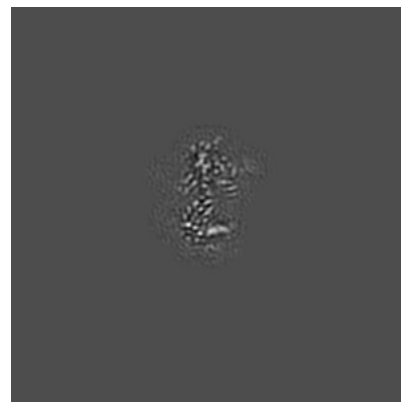
### 6.3.1 Primary map



X Index: 126

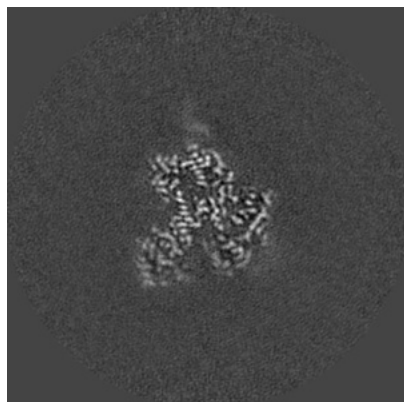


Y Index: 112

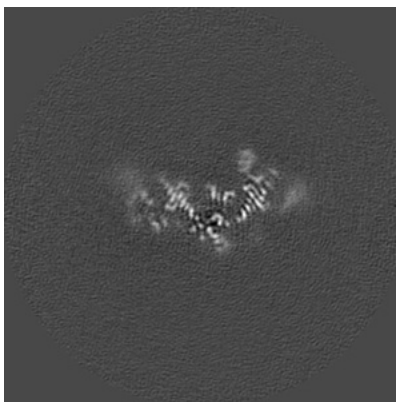


Z Index: 131

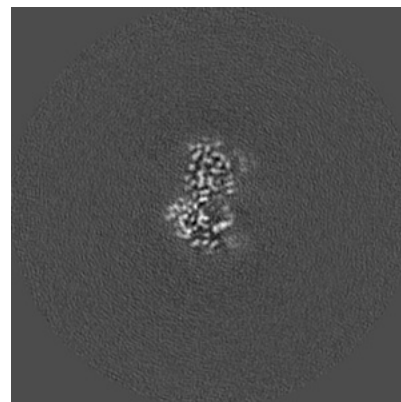
### 6.3.2 Raw map



X Index: 126



Y Index: 117

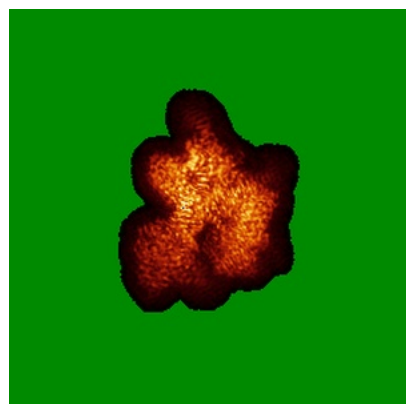


Z Index: 134

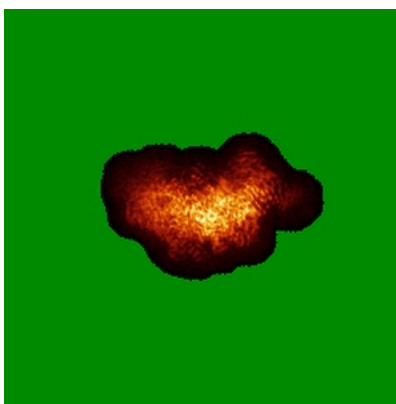
The images above show the largest variance slices of the map in three orthogonal directions.

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

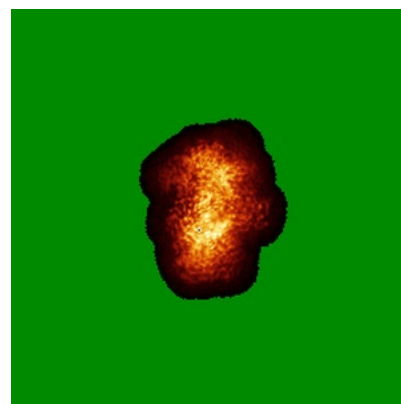
### 6.4.1 Primary map



X

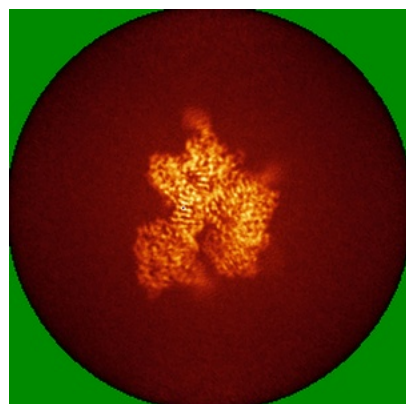


Y

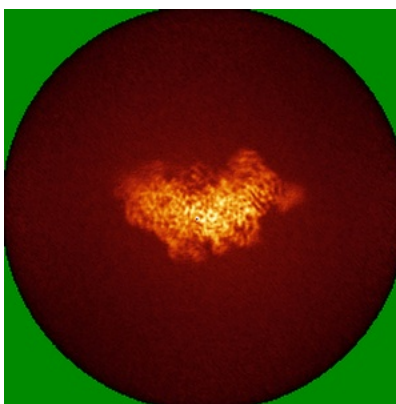


Z

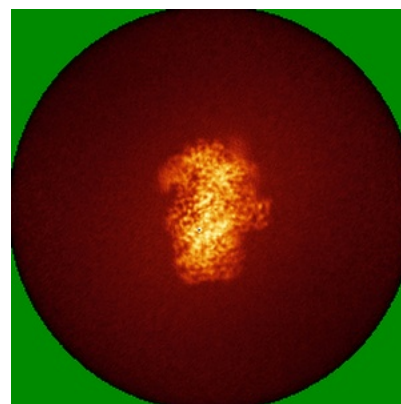
### 6.4.2 Raw map



X



Y

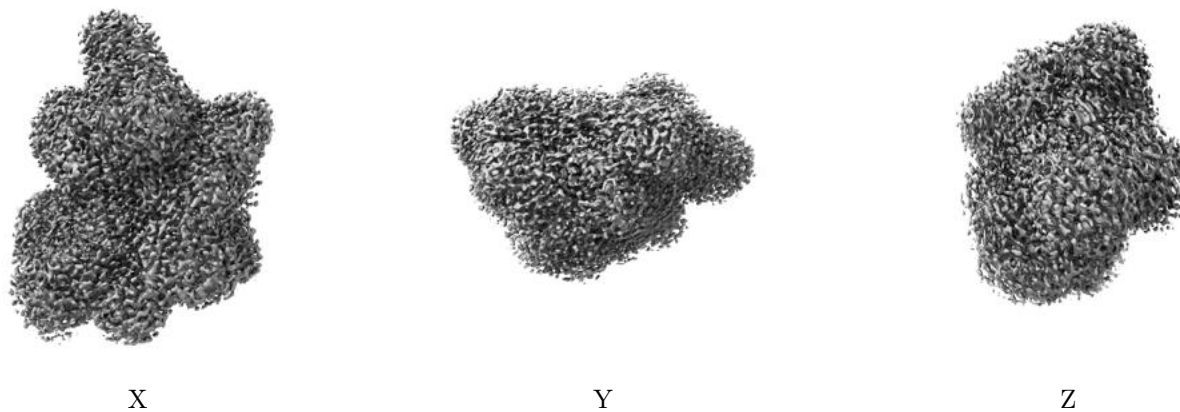


Z

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.

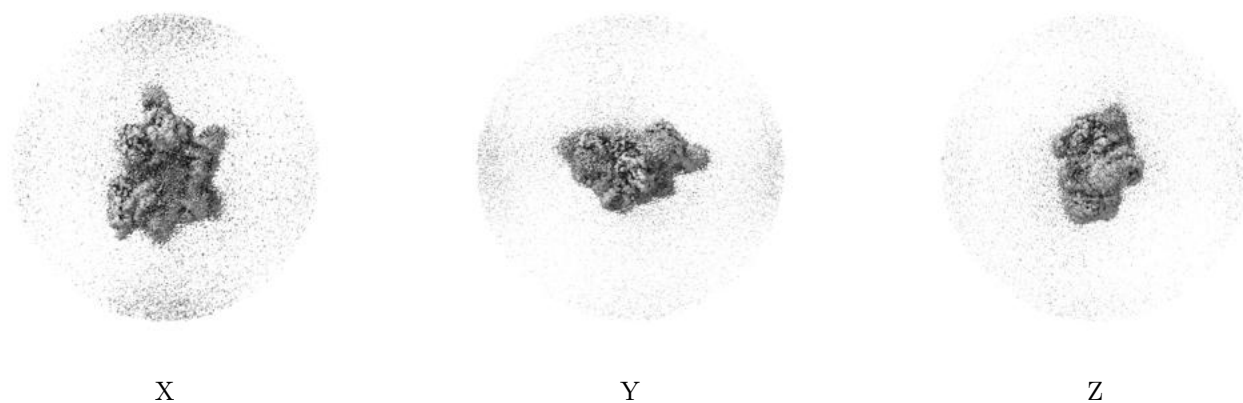
## 6.5 Orthogonal surface views [i](#)

### 6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.00164. 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.

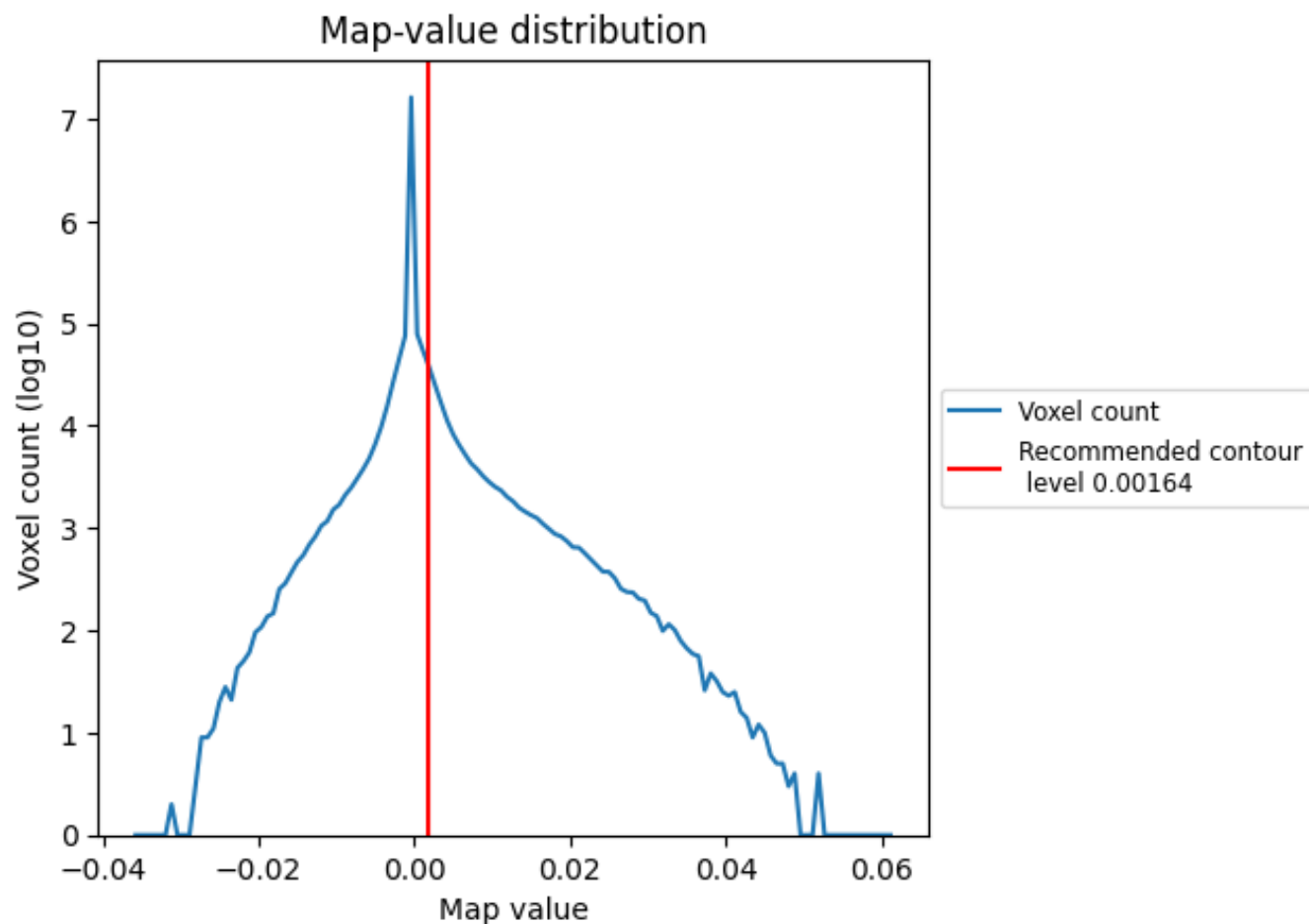
## 6.6 Mask visualisation [i](#)

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.

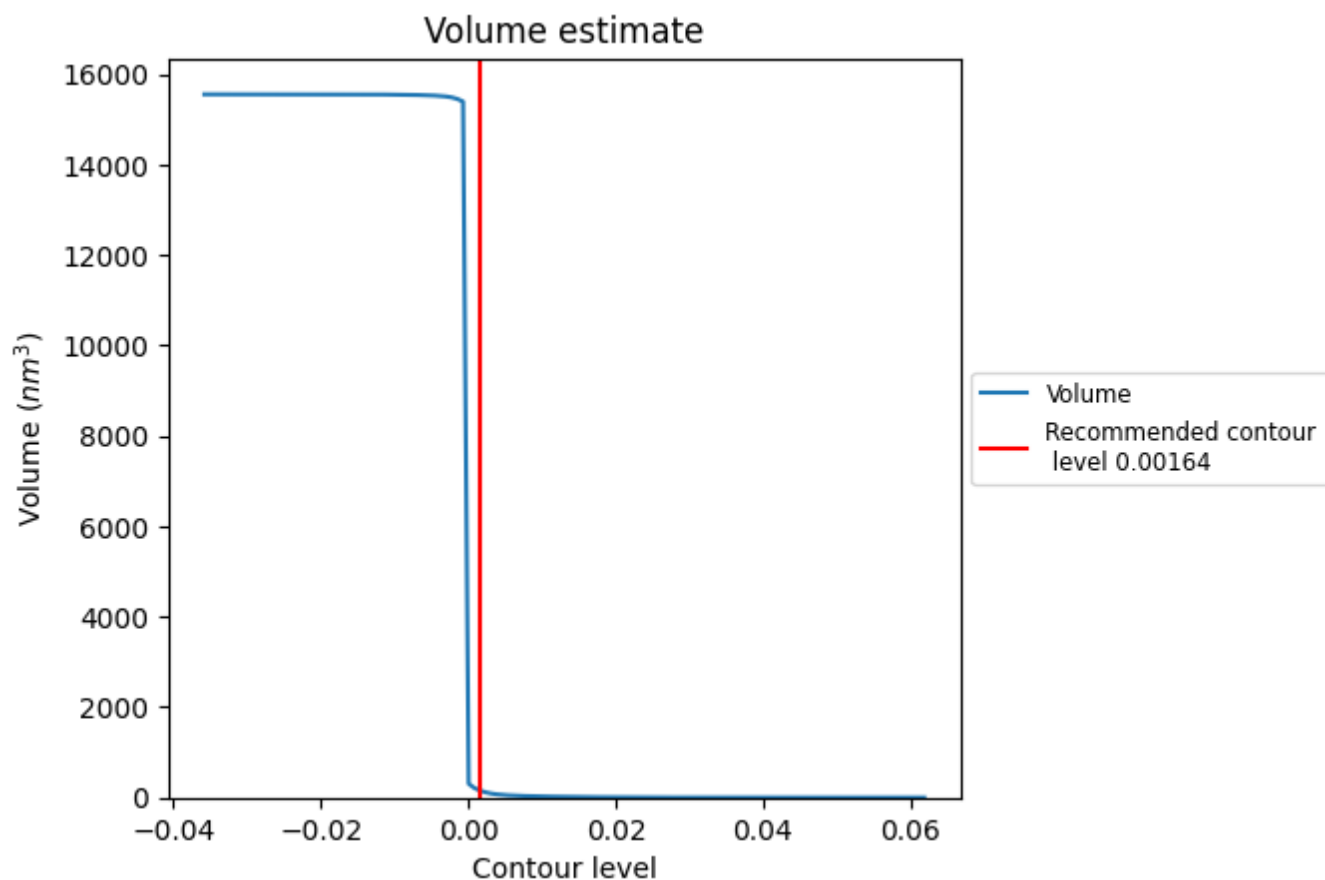
### 7.1 Map-value distribution [i](#)



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.



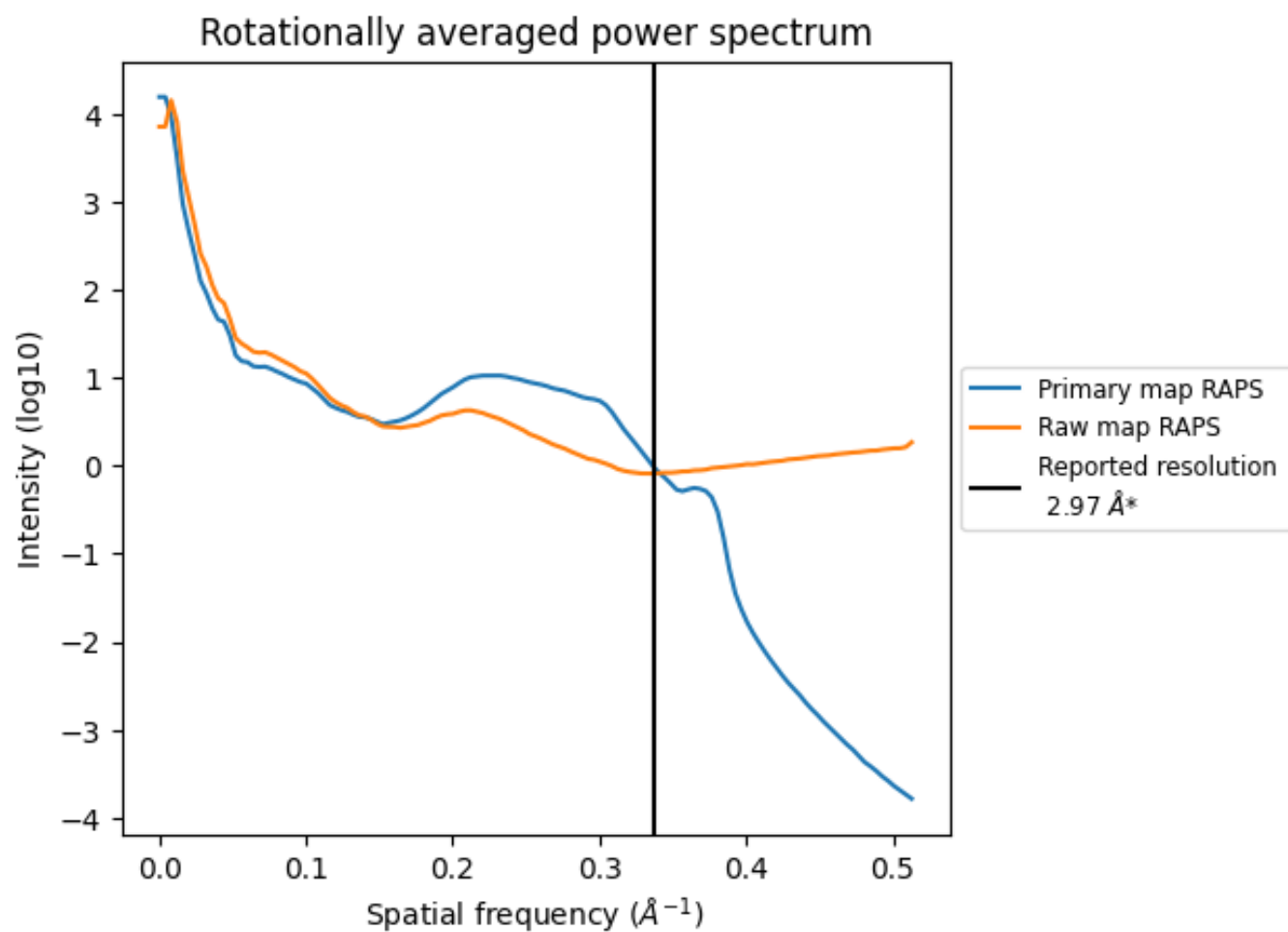
## 7.2 Volume estimate [i](#)



The volume at the recommended contour level is 154  $\text{nm}^3$ ; this corresponds to an approximate mass of 139 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 ⓘ

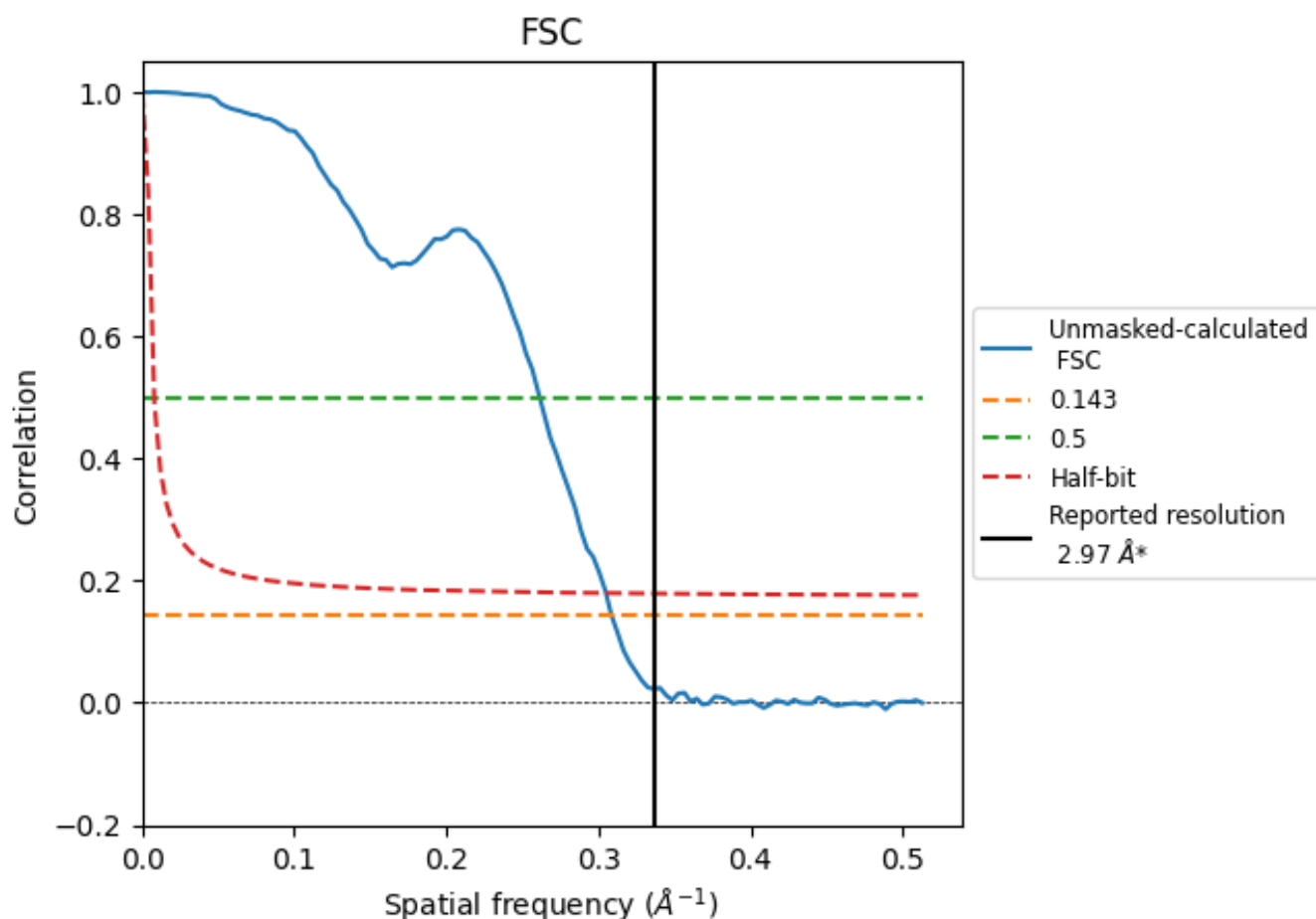


\*Reported resolution corresponds to spatial frequency of 0.337 Å<sup>-1</sup>

## 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  $0.337 \text{ \AA}^{-1}$

## 8.2 Resolution estimates [i](#)

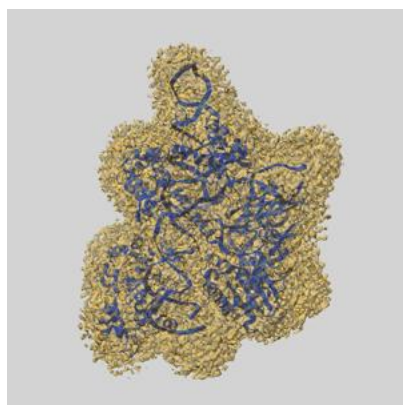
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.97	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	3.24	3.83	3.28

\*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps.

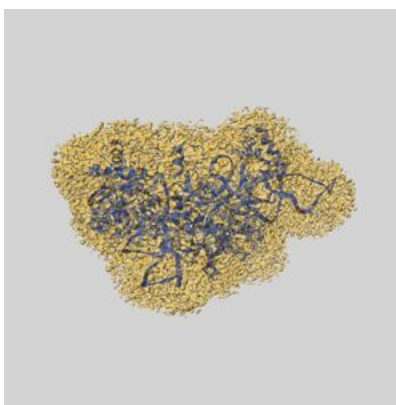
## 9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-39633 and PDB model 8YWH. Per-residue inclusion information can be found in [section 3](#) on [page 4](#).

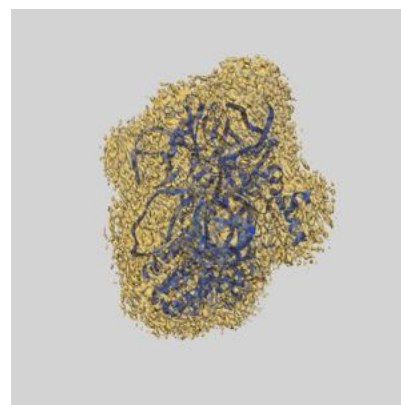
### 9.1 Map-model overlay [i](#)



X



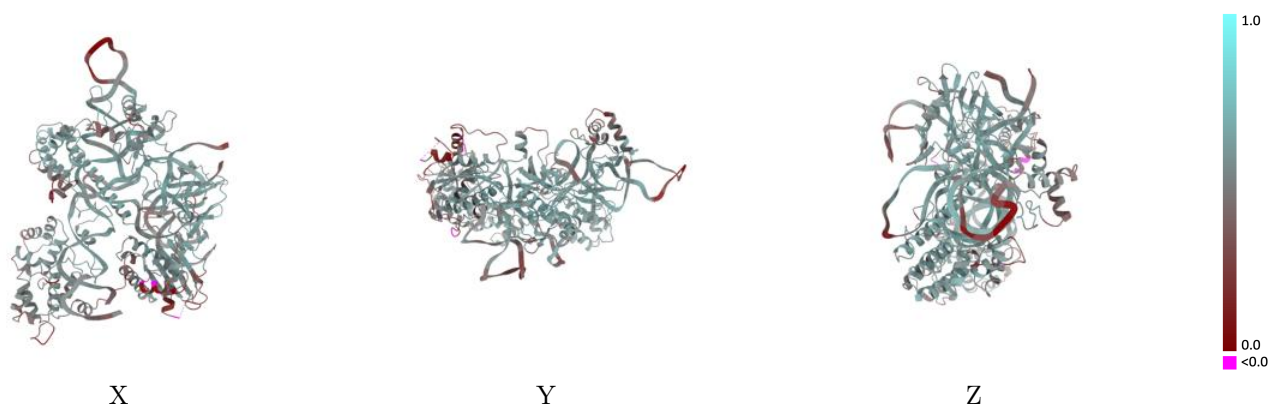
Y



Z

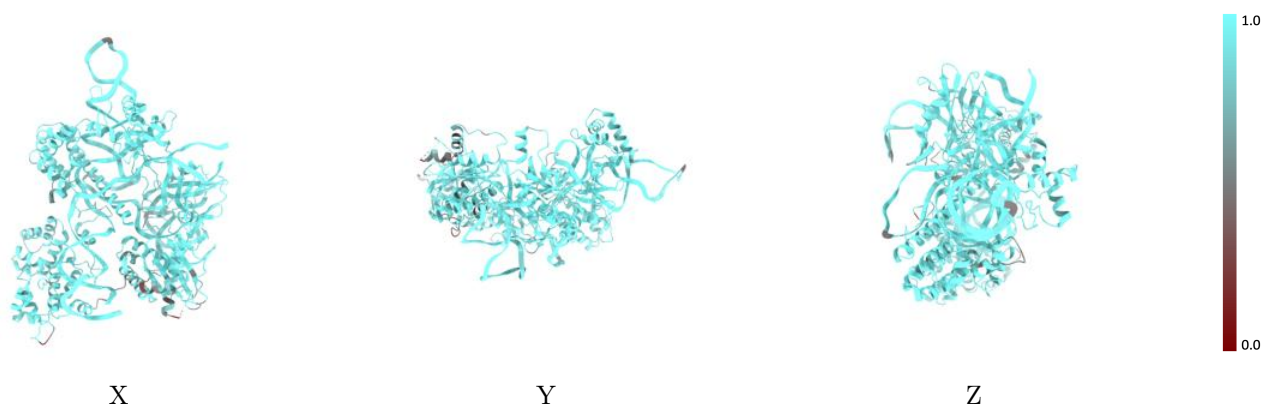
The images above show the 3D surface view of the map at the recommended contour level 0.00164 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

## 9.2 Q-score mapped to coordinate model [i](#)



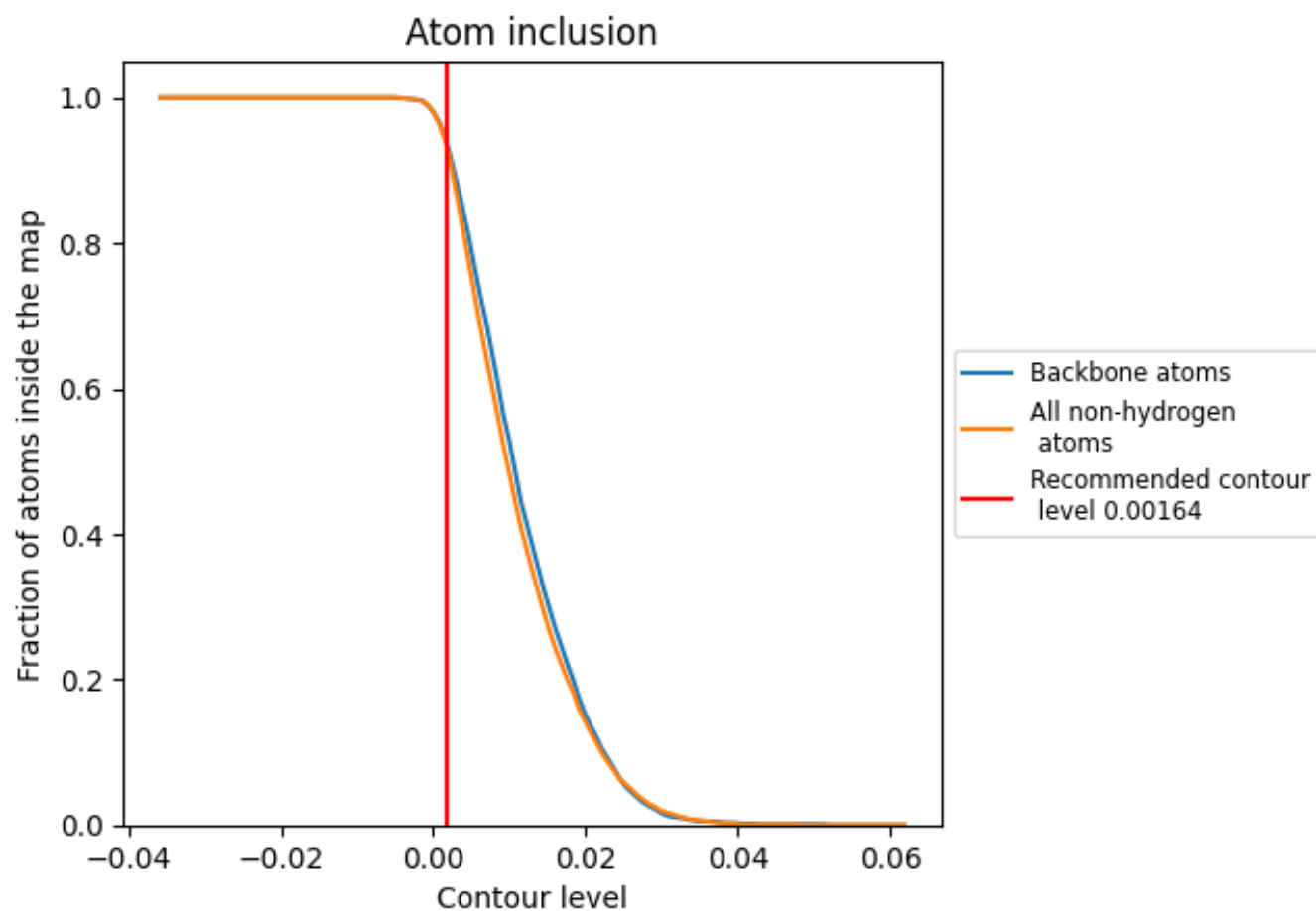
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions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



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 (0.00164).

## 9.4 Atom inclusion [i](#)



At the recommended contour level, 94% of all backbone atoms, 94% 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 (0.00164) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	<div></div> 0.9380	<div></div> 0.5140
A	<div></div> 0.9310	<div></div> 0.5150
B	<div></div> 0.9510	<div></div> 0.5050
C	<div></div> 0.9730	<div></div> 0.5430
D	<div></div> 0.9400	<div></div> 0.5030

