



wwPDB EM Validation Summary Report ⓘ

Dec 12, 2022 – 02:34 am GMT

PDB ID : 6TNT
EMDB ID : EMD-10536
Title : SUMOylated apoAPC/C with repositioned APC2 WHB domain
Authors : Barford, D.; Yatskevich, S.
Deposited on : 2019-12-10
Resolution : 3.78 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 ⓘ 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 ⓘ](#)) 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) : 2.31.3

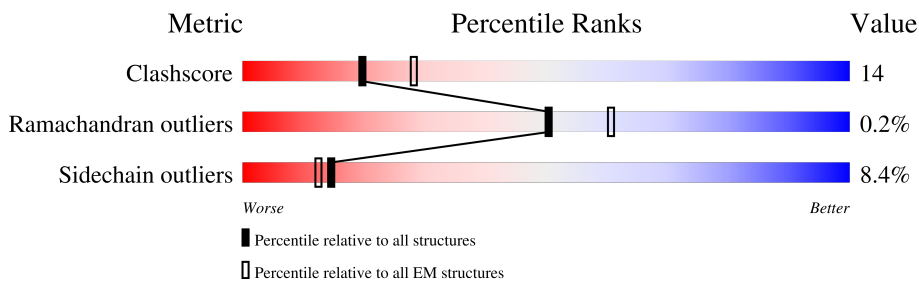
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.78 Å.

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



Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	158937	4297
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for ≥ 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	1944	
2	B	84	
3	C	597	
3	P	597	
4	D	121	
5	E	110	
6	F	824	
6	H	824	

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Mol	Chain	Length	Quality of chain
7	G	85	8% 19% 71%
7	W	85	18% 11% 69%
8	I	808	55% 31% 11%
9	J	620	53% 25% 19%
9	K	620	55% 22% 20%
10	L	185	59% 36% 5%
11	M	74	50% 24% 20% 5%
12	N	822	15% 49% 29% 18%
13	O	755	64% 22% 5% 9%
14	T	15	20% 80% 20%
15	X	599	10% 57% 22% 19%
15	Y	599	53% 25% 17%

2 Entry composition [i](#)

There are 16 unique types of molecules in this entry. The entry contains 63827 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 Anaphase-promoting complex subunit 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	1583	Total	C	N	O	S	0	0
			11990	7717	2035	2158	80		

- Molecule 2 is a protein called Anaphase-promoting complex subunit 11.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	84	Total	C	N	O	S	1	0
			649	416	117	99	17		

- Molecule 3 is a protein called Cell division cycle protein 23 homolog.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	C	524	Total	C	N	O	S	0	0
			4306	2774	727	781	24		
3	P	492	Total	C	N	O	S	0	0
			4046	2613	679	730	24		

- Molecule 4 is a protein called Anaphase-promoting complex subunit 15.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
4	D	55	Total	C	N	O	0	0
			436	277	73	86		

- Molecule 5 is a protein called Anaphase-promoting complex subunit 16.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	E	56	Total	C	N	O	S	0	0
			450	290	74	85	1		

- Molecule 6 is a protein called Cell division cycle protein 27 homolog.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	F	460	Total	C	N	O	S	0	0
			3618	2320	608	666	24		
6	H	488	Total	C	N	O	S	0	0
			3879	2489	655	709	26		

- Molecule 7 is a protein called Anaphase-promoting complex subunit CDC26.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	G	25	Total	C	N	O	S	0	0
			220	137	41	41	1		
7	W	26	Total	C	N	O	S	0	0
			218	136	41	40	1		

- Molecule 8 is a protein called Anaphase-promoting complex subunit 4.

Mol	Chain	Residues	Atoms					AltConf	Trace
8	I	723	Total	C	N	O	S	0	0
			5634	3619	940	1041	34		

- Molecule 9 is a protein called Cell division cycle protein 16 homolog.

Mol	Chain	Residues	Atoms					AltConf	Trace
9	J	504	Total	C	N	O	S	0	0
			4053	2604	687	737	25		
9	K	493	Total	C	N	O	S	0	0
			3988	2564	672	728	24		

- Molecule 10 is a protein called Anaphase-promoting complex subunit 10.

Mol	Chain	Residues	Atoms					AltConf	Trace
10	L	182	Total	C	N	O	S	0	0
			1435	898	263	268	6		

- Molecule 11 is a protein called Anaphase-promoting complex subunit 13.

Mol	Chain	Residues	Atoms					AltConf	Trace
11	M	59	Total	C	N	O	S	0	0
			481	304	79	96	2		

- Molecule 12 is a protein called Anaphase-promoting complex subunit 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
12	N	672	5313	3409	941	938	25	0	0

- Molecule 13 is a protein called Anaphase-promoting complex subunit 5.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
13	O	688	5400	3443	940	989	28	0	0

- Molecule 14 is a protein called UNIDENTIFIED PEPTIDE.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
14	T	15	79	47	16	16	0	0

- Molecule 15 is a protein called Anaphase-promoting complex subunit 7.

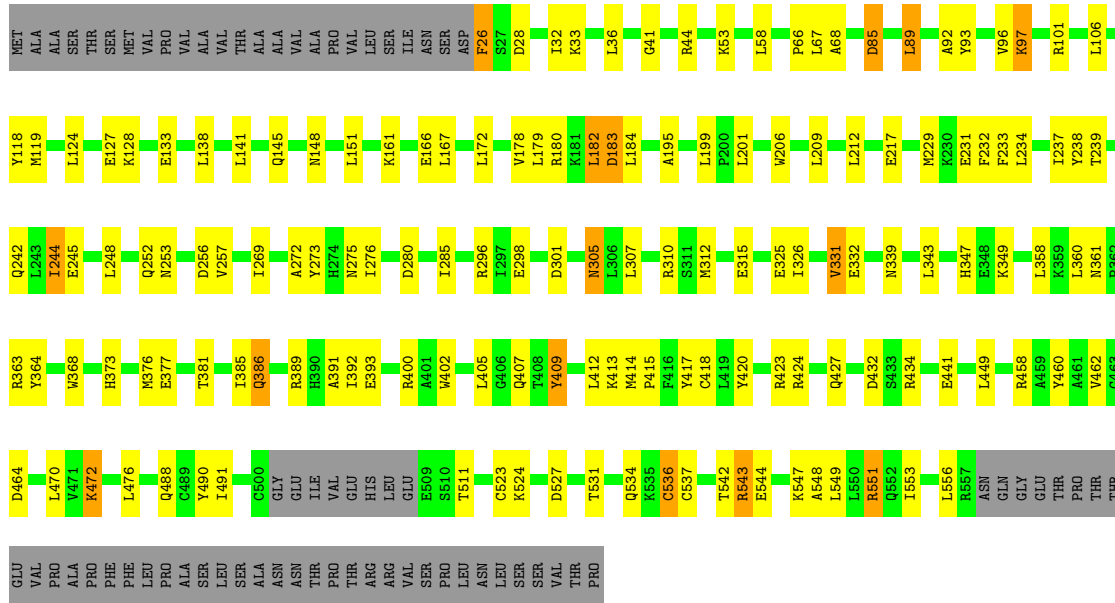
Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
15	X	484	3767	2390	649	704	24	0	0
15	Y	496	3862	2446	666	724	26	0	0

- Molecule 16 is ZINC ION (three-letter code: ZN) (formula: Zn).

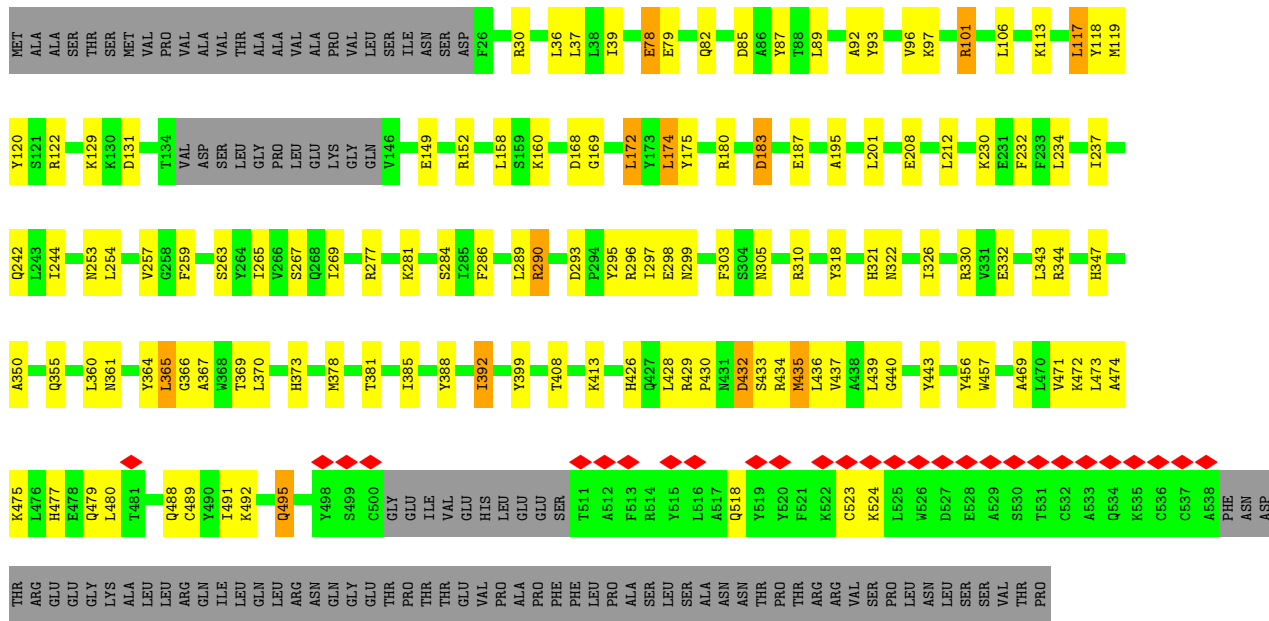
Mol	Chain	Residues	Atoms		AltConf
			Total	Zn	
16	B	3	3	3	0



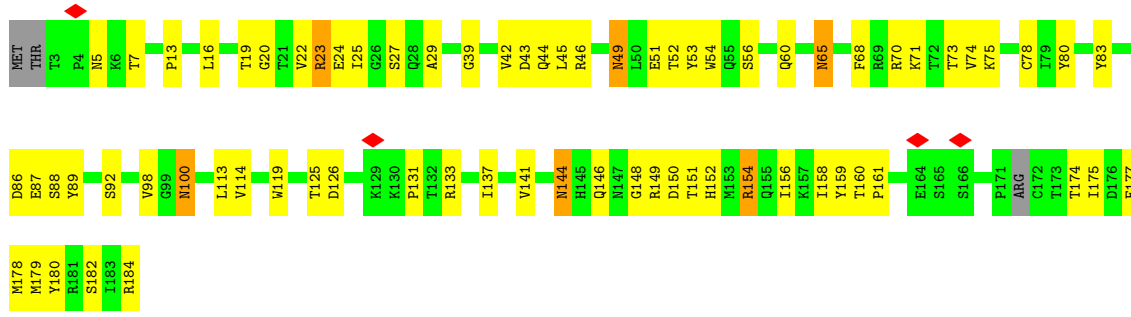
• Molecule 3: Cell division cycle protein 23 homolog



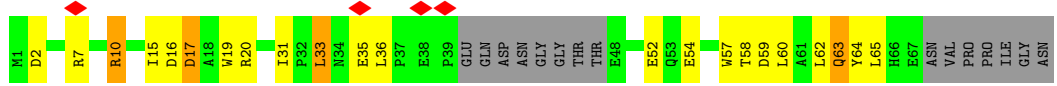
• Molecule 3: Cell division cycle protein 23 homolog



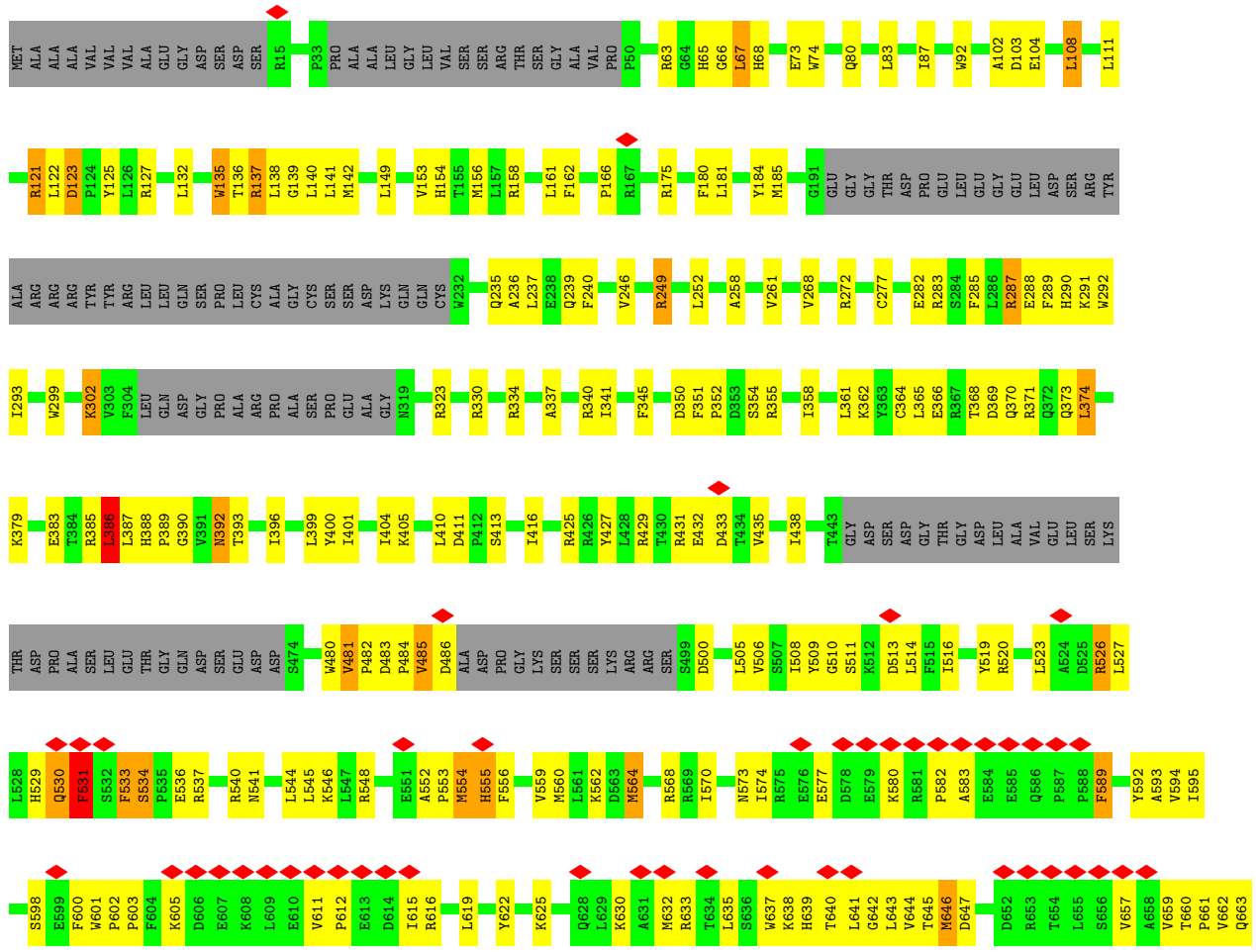
• Molecule 4: Anaphase-promoting complex subunit 15

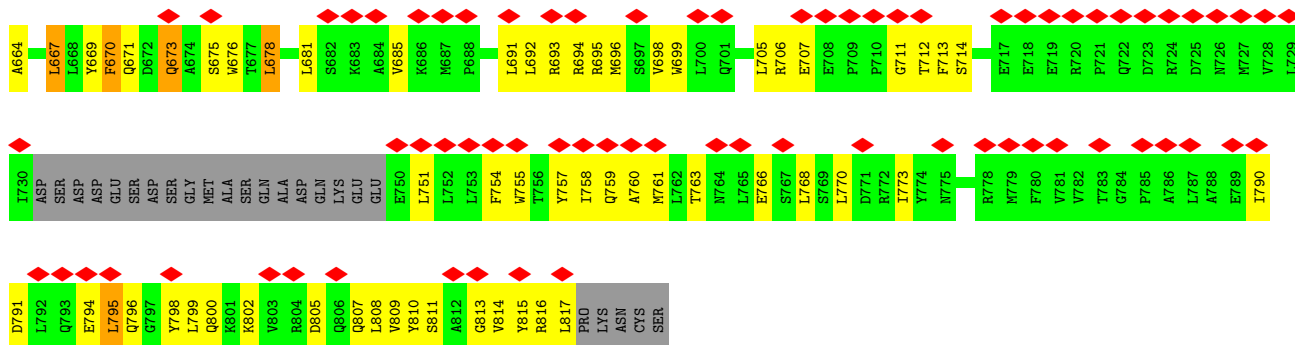


• Molecule 11: Anaphase-promoting complex subunit 13

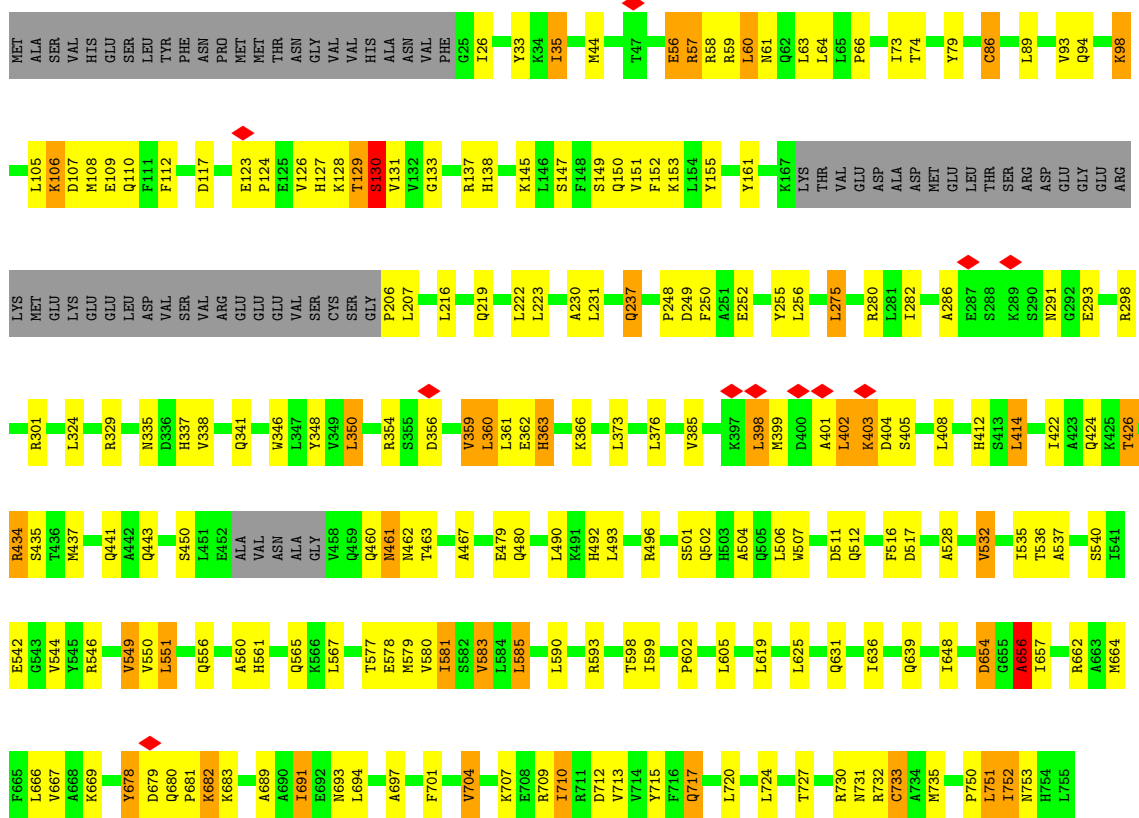


• Molecule 12: Anaphase-promoting complex subunit 2

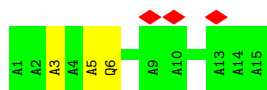
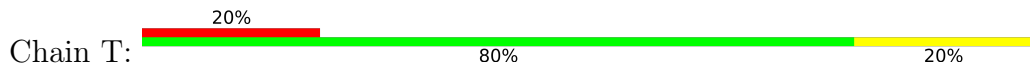




• Molecule 13: Anaphase-promoting complex subunit 5



• Molecule 14: UNIDENTIFIED PEPTIDE



• Molecule 15: Anaphase-promoting complex subunit 7



4 Experimental information i

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	137954	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 ($e^-/\text{\AA}^2$)	0.5	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	FEI FALCON III (4k x 4k)	Depositor
Maximum map value	0.060	Depositor
Minimum map value	-0.029	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.003	Depositor
Recommended contour level	0.0117	Depositor
Map size (Å)	366.73, 366.73, 366.73	wwPDB
Map dimensions	338, 338, 338	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.085, 1.085, 1.085	Depositor

5 Model quality [i](#)

5.1 Standard geometry [i](#)

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

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	0.33	0/12269	0.47	2/16722 (0.0%)
2	B	0.25	0/674	0.41	0/913
3	C	0.36	0/4404	0.43	0/5945
3	P	0.31	0/4141	0.41	0/5593
4	D	0.32	0/446	0.44	0/610
5	E	0.30	0/459	0.38	0/619
6	F	0.30	0/3704	0.38	0/5019
6	H	0.33	0/3969	0.42	0/5366
7	G	0.29	0/221	0.49	0/292
7	W	0.26	0/219	0.47	0/291
8	I	0.30	0/5754	0.45	1/7806 (0.0%)
9	J	0.31	0/4152	0.43	0/5623
9	K	0.31	0/4086	0.39	0/5533
10	L	0.31	0/1468	0.46	0/1993
11	M	0.30	0/490	0.47	0/665
12	N	0.27	0/5417	0.45	2/7341 (0.0%)
13	O	0.33	0/5499	0.45	0/7432
14	T	0.31	0/78	0.63	0/107
15	X	0.26	0/3827	0.40	0/5180
15	Y	0.26	0/3922	0.40	0/5304
All	All	0.31	0/65199	0.43	5/88354 (0.0%)

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

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1
2	B	0	1
8	I	0	1

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Mol	Chain	#Chirality outliers	#Planarity outliers
9	K	0	1
13	O	0	3
15	Y	0	1
All	All	0	8

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
12	N	121	ARG	C-N-CA	6.95	139.07	121.70
1	A	1168	LEU	CA-CB-CG	5.33	127.56	115.30
1	A	1032	LEU	CA-CB-CG	5.26	127.41	115.30
8	I	489	PRO	C-N-CD	-5.12	109.34	120.60
12	N	386	LEU	CA-CB-CG	5.03	126.87	115.30

There are no chirality outliers.

5 of 8 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	1455	GLU	Peptide
2	B	14	TRP	Peptide
8	I	451	PHE	Peptide
9	K	87	GLN	Peptide
13	O	129	THR	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	11990	0	11648	365	0
2	B	649	0	598	29	0
3	C	4306	0	4275	105	0
3	P	4046	0	3998	89	0
4	D	436	0	396	14	0
5	E	450	0	435	11	0
6	F	3618	0	3452	109	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	H	3879	0	3805	112	0
7	G	220	0	233	14	0
7	W	218	0	222	15	0
8	I	5634	0	5527	181	0
9	J	4053	0	3960	124	0
9	K	3988	0	3913	103	0
10	L	1435	0	1382	57	0
11	M	481	0	457	18	0
12	N	5313	0	5240	205	0
13	O	5400	0	5418	143	0
14	T	79	0	77	3	0
15	X	3767	0	3820	102	0
15	Y	3862	0	3915	124	0
16	B	3	0	0	0	0
All	All	63827	0	62771	1755	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 14.

The worst 5 of 1755 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)
10:L:89:TYR:HE2	10:L:150:ASP:CG	1.30	1.35
10:L:89:TYR:HE2	10:L:150:ASP:OD2	1.09	1.31
10:L:89:TYR:CE2	10:L:150:ASP:CG	2.12	1.22
10:L:89:TYR:CE2	10:L:150:ASP:OD2	1.95	1.20
10:L:89:TYR:CE2	10:L:150:ASP:OD1	2.02	1.12

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	1551/1944 (80%)	1377 (89%)	171 (11%)	3 (0%)	47	78
2	B	83/84 (99%)	78 (94%)	5 (6%)	0	100	100
3	C	520/597 (87%)	494 (95%)	26 (5%)	0	100	100
3	P	486/597 (81%)	459 (94%)	27 (6%)	0	100	100
4	D	53/121 (44%)	46 (87%)	7 (13%)	0	100	100
5	E	54/110 (49%)	54 (100%)	0	0	100	100
6	F	454/824 (55%)	428 (94%)	26 (6%)	0	100	100
6	H	484/824 (59%)	451 (93%)	31 (6%)	2 (0%)	34	69
7	G	23/85 (27%)	23 (100%)	0	0	100	100
7	W	24/85 (28%)	23 (96%)	1 (4%)	0	100	100
8	I	717/808 (89%)	664 (93%)	50 (7%)	3 (0%)	34	69
9	J	500/620 (81%)	469 (94%)	31 (6%)	0	100	100
9	K	489/620 (79%)	462 (94%)	27 (6%)	0	100	100
10	L	180/185 (97%)	163 (91%)	17 (9%)	0	100	100
11	M	55/74 (74%)	50 (91%)	5 (9%)	0	100	100
12	N	658/822 (80%)	587 (89%)	69 (10%)	2 (0%)	41	74
13	O	682/755 (90%)	644 (94%)	36 (5%)	2 (0%)	41	74
14	T	13/15 (87%)	10 (77%)	3 (23%)	0	100	100
15	X	480/599 (80%)	458 (95%)	21 (4%)	1 (0%)	47	78
15	Y	492/599 (82%)	471 (96%)	17 (4%)	4 (1%)	19	56
All	All	7998/10368 (77%)	7411 (93%)	570 (7%)	17 (0%)	50	78

5 of 17 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
8	I	452	LEU
1	A	276	SER
6	H	103	HIS
6	H	147	PHE
13	O	130	SER

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	1252/1720 (73%)	1108 (88%)	144 (12%)	5	28
2	B	65/75 (87%)	59 (91%)	6 (9%)	9	36
3	C	452/520 (87%)	423 (94%)	29 (6%)	17	49
3	P	422/520 (81%)	395 (94%)	27 (6%)	17	49
4	D	46/115 (40%)	42 (91%)	4 (9%)	10	39
5	E	47/89 (53%)	43 (92%)	4 (8%)	10	40
6	F	371/727 (51%)	347 (94%)	24 (6%)	17	48
6	H	408/727 (56%)	380 (93%)	28 (7%)	15	47
7	G	25/77 (32%)	21 (84%)	4 (16%)	2	16
7	W	23/77 (30%)	21 (91%)	2 (9%)	10	39
8	I	607/730 (83%)	562 (93%)	45 (7%)	13	44
9	J	425/548 (78%)	388 (91%)	37 (9%)	10	39
9	K	423/548 (77%)	395 (93%)	28 (7%)	16	48
10	L	155/170 (91%)	145 (94%)	10 (6%)	17	48
11	M	52/67 (78%)	44 (85%)	8 (15%)	2	17
12	N	547/724 (76%)	496 (91%)	51 (9%)	9	36
13	O	573/650 (88%)	514 (90%)	59 (10%)	7	31
14	T	1/2 (50%)	1 (100%)	0	100	100
15	X	406/513 (79%)	385 (95%)	21 (5%)	23	55
15	Y	417/513 (81%)	386 (93%)	31 (7%)	13	44
All	All	6717/9112 (74%)	6155 (92%)	562 (8%)	14	40

5 of 562 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
13	O	585	LEU
13	O	717	GLN
13	O	583	VAL
15	X	303	TYR
6	F	485	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 184 such sidechains are listed below:

Mol	Chain	Res	Type
12	N	239	GLN
13	O	680	GLN
12	N	541	ASN
13	O	342	HIS
3	P	299	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

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

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 3 ligands modelled in this entry, 3 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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.

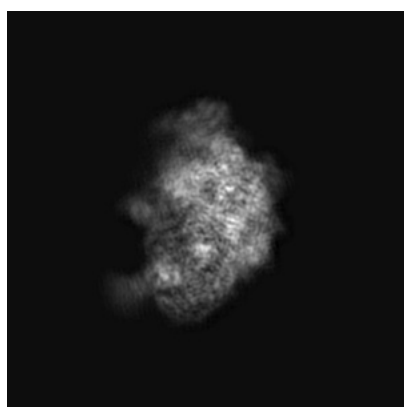
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-10536. These allow visual inspection of the internal detail of the map and identification of artifacts.

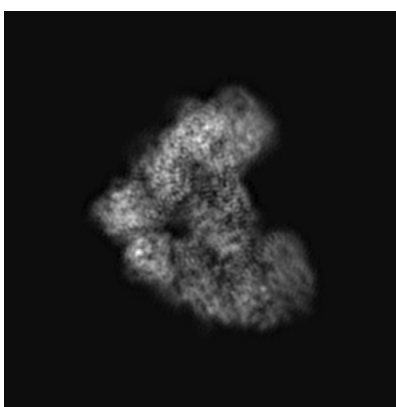
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections [i](#)

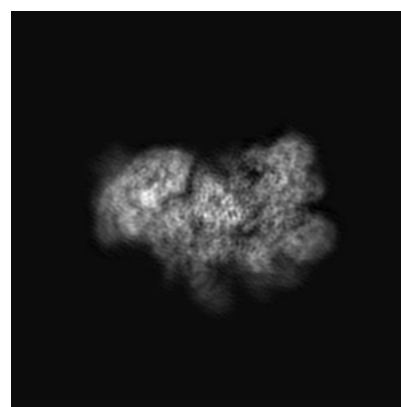
6.1.1 Primary map



X



Y

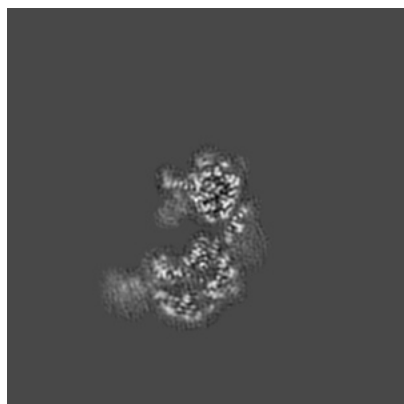


Z

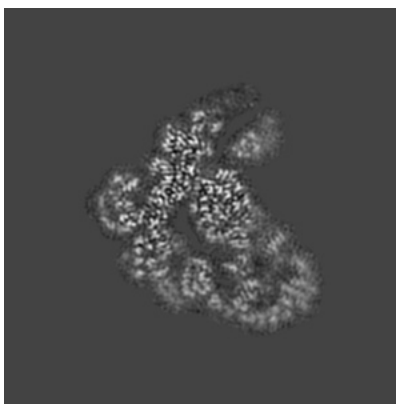
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

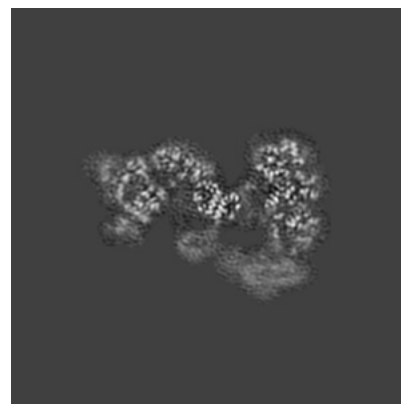
6.2.1 Primary map



X Index: 169



Y Index: 169

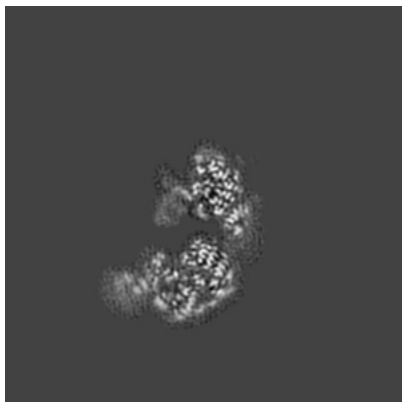


Z Index: 169

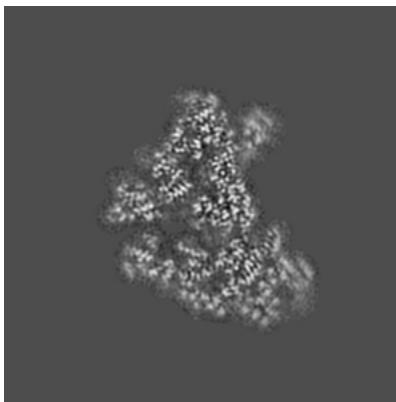
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

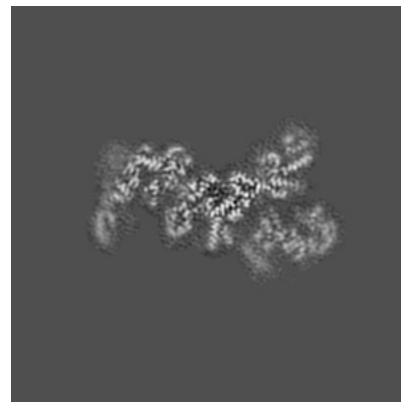
6.3.1 Primary map



X Index: 165



Y Index: 182

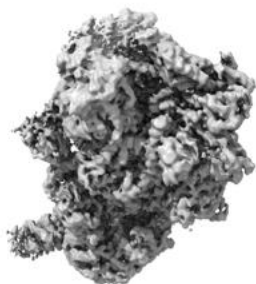


Z Index: 188

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

6.4 Orthogonal surface views [i](#)

6.4.1 Primary map



X



Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.0117. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

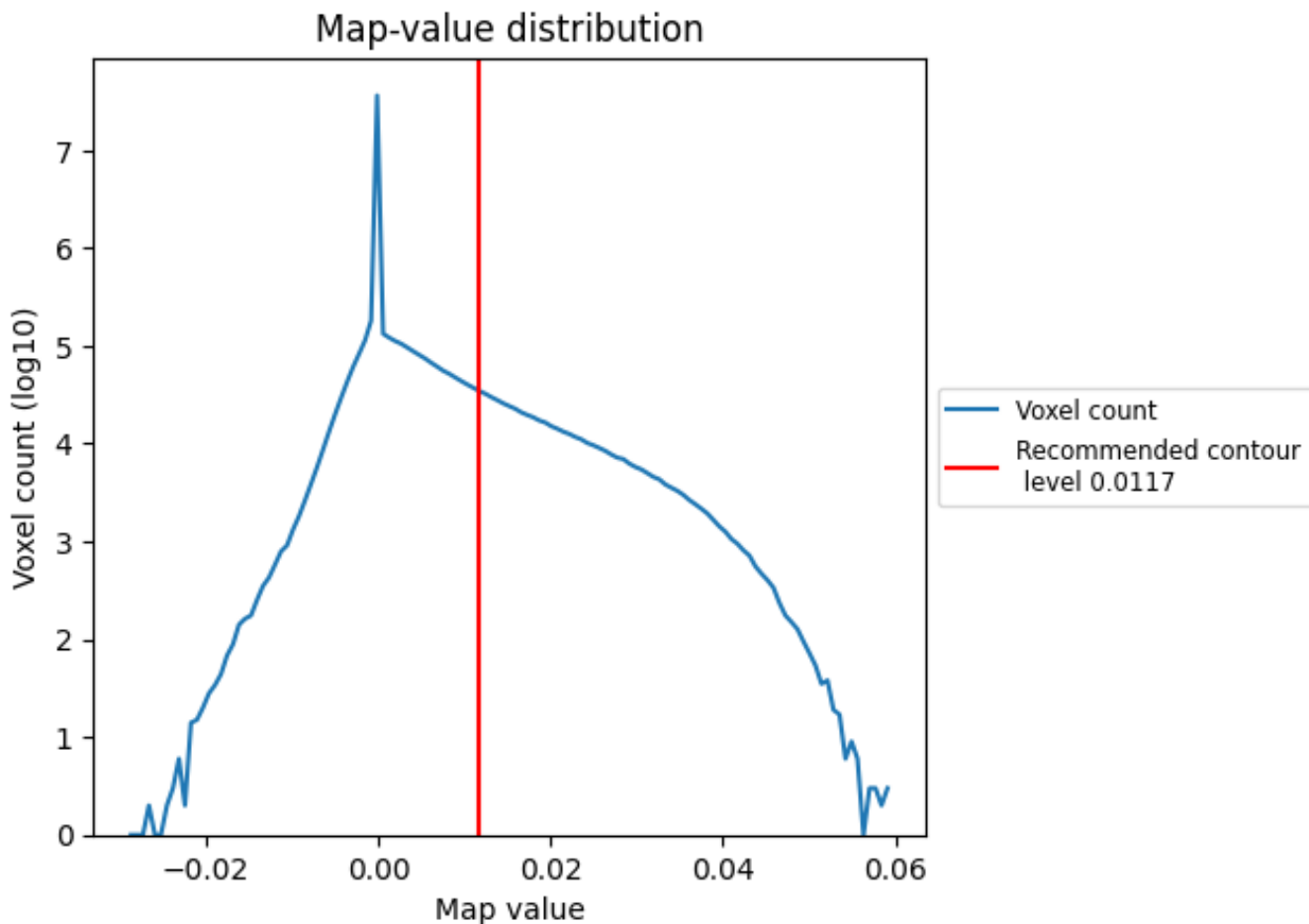
6.5 Mask visualisation

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

7 Map analysis [i](#)

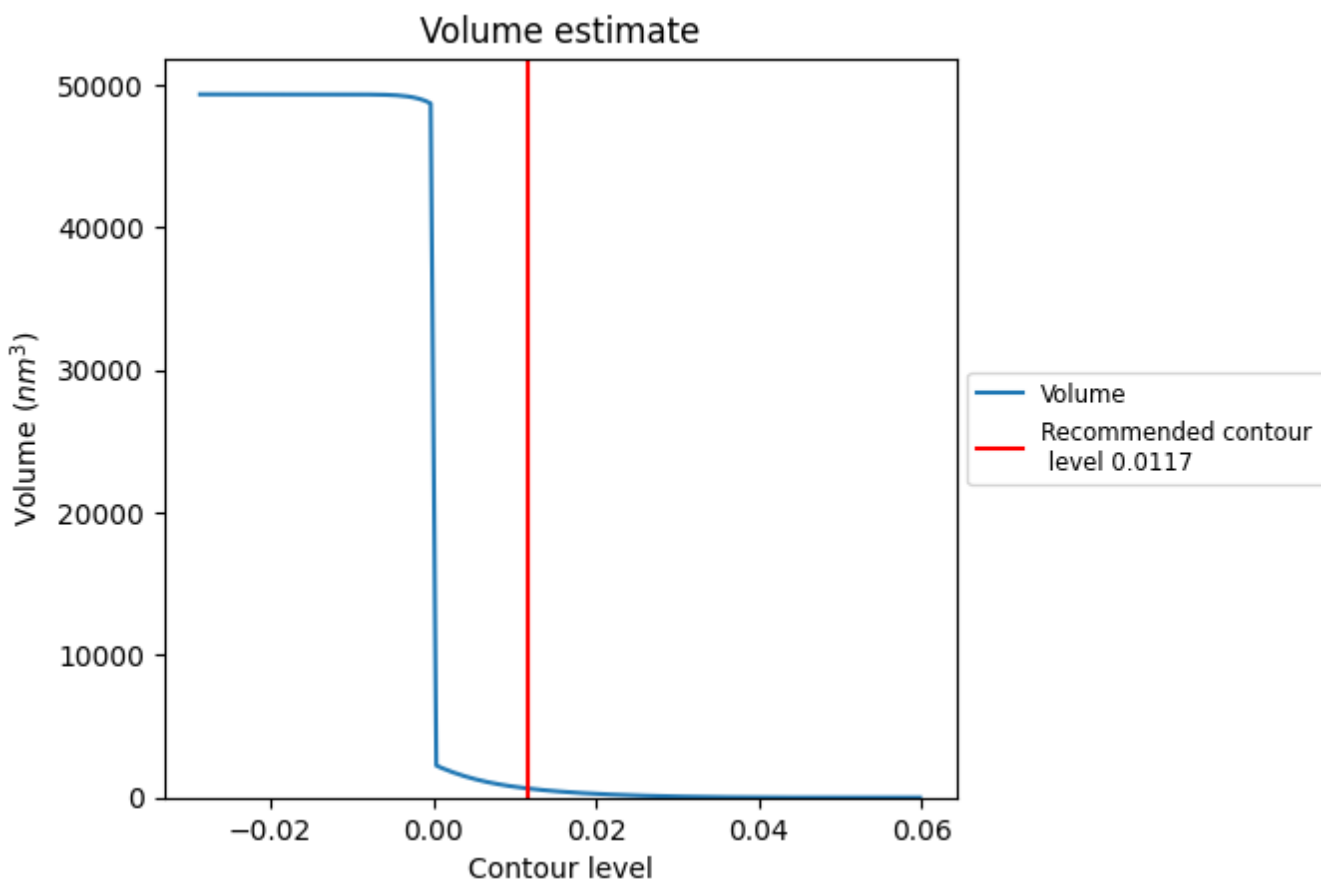
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution [i](#)



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

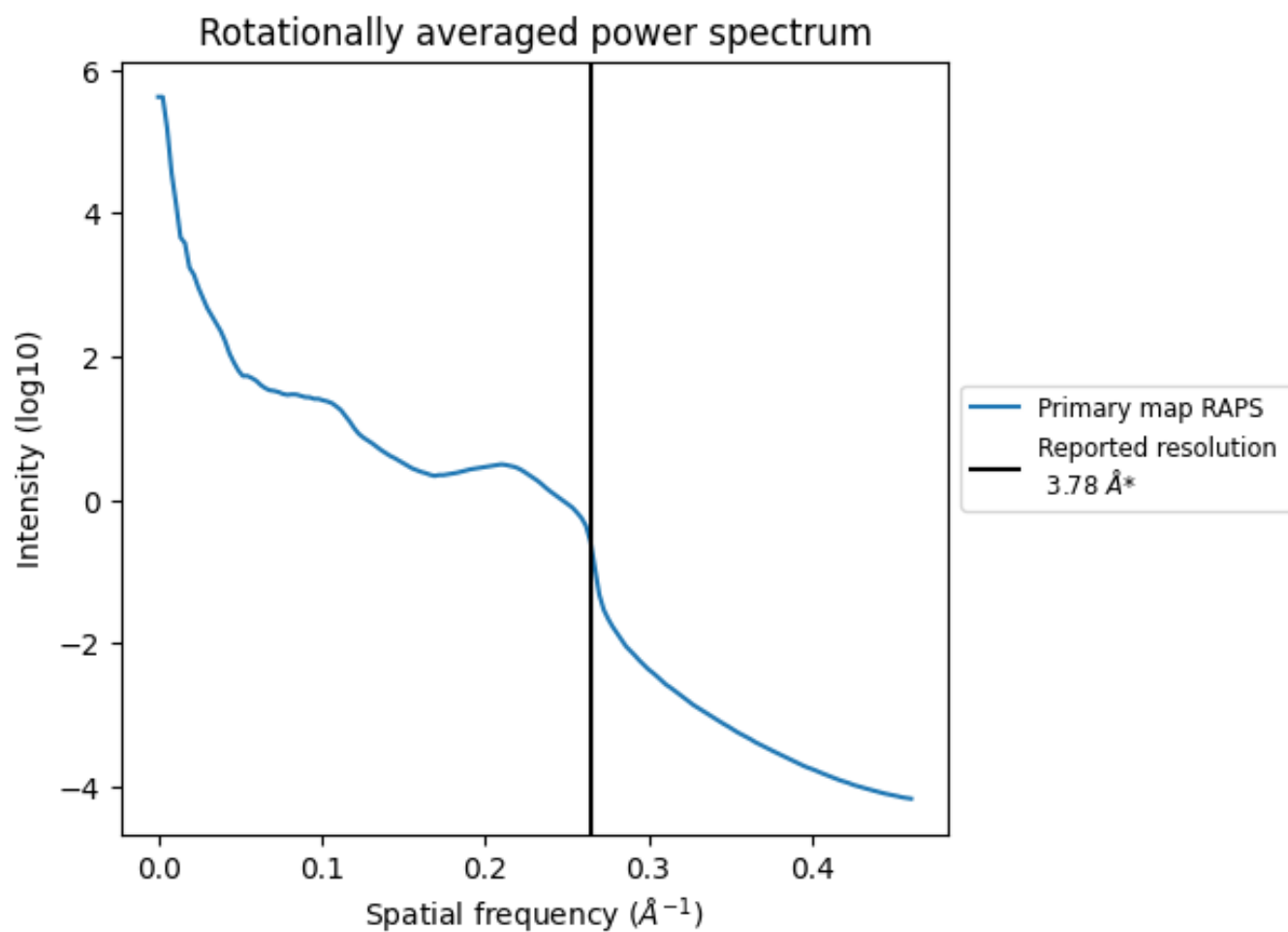
7.2 Volume estimate [\(i\)](#)



The volume at the recommended contour level is 632 nm³; this corresponds to an approximate mass of 571 kDa.

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

7.3 Rotationally averaged power spectrum [i](#)



*Reported resolution corresponds to spatial frequency of 0.265 Å⁻¹

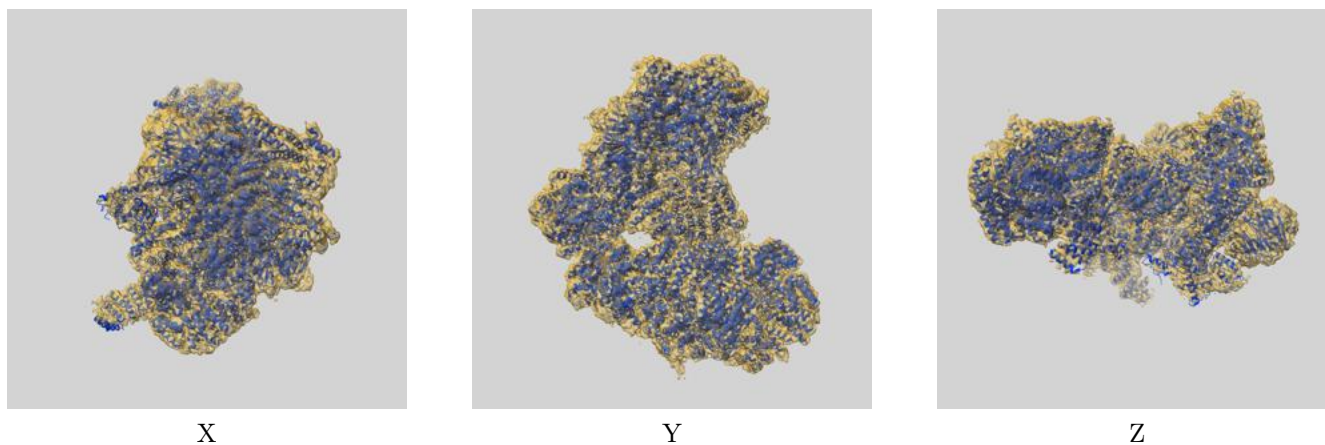
8 Fourier-Shell correlation

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

9 Map-model fit [i](#)

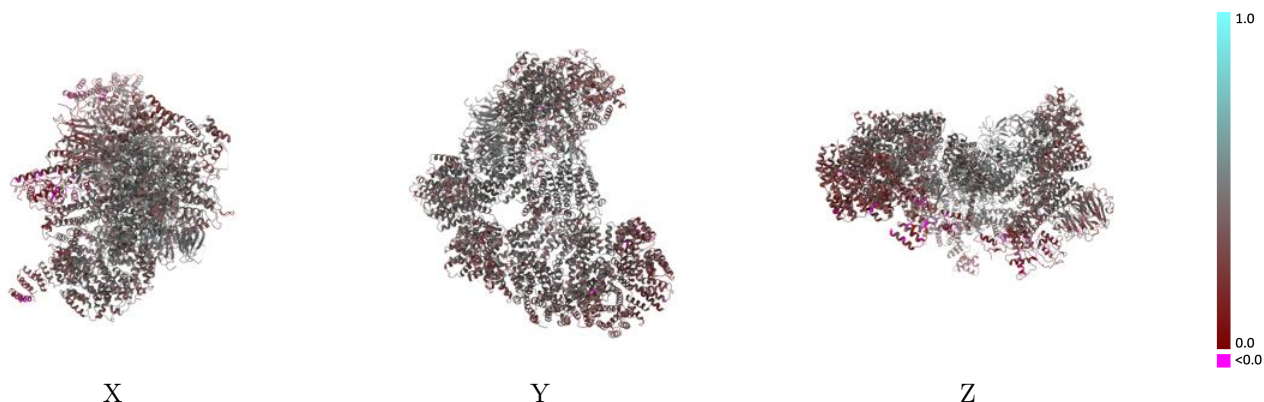
This section contains information regarding the fit between EMDB map EMD-10536 and PDB model 6TNT. Per-residue inclusion information can be found in section 3 on page 7.

9.1 Map-model overlay [i](#)



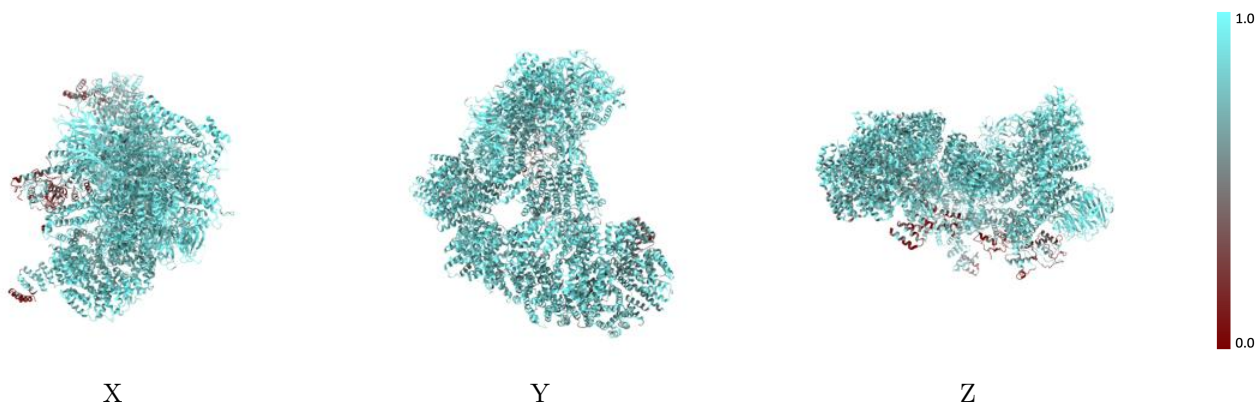
The images above show the 3D surface view of the map at the recommended contour level 0.0117 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



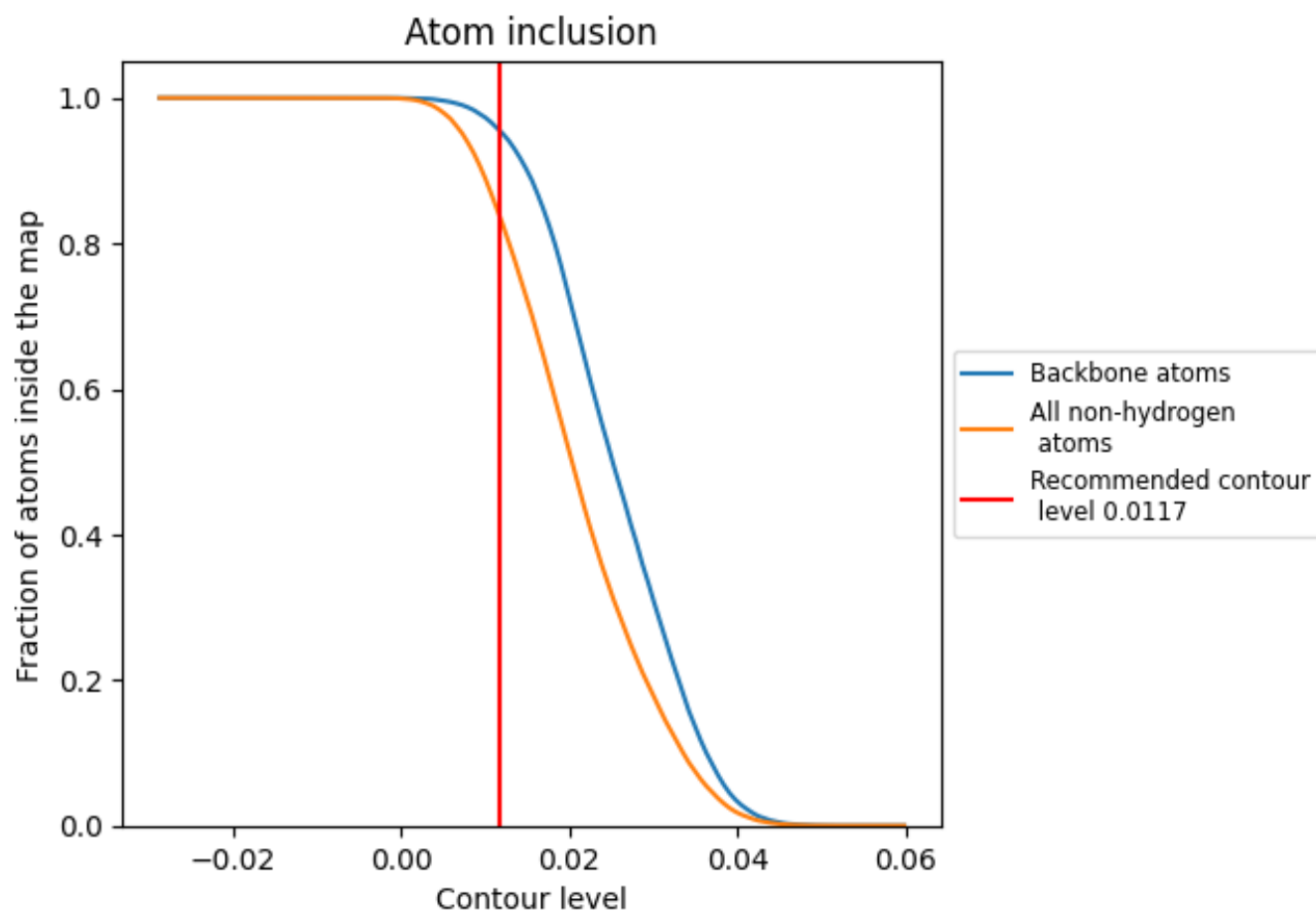
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.0117).











































9.4 Atom inclusion [i](#)



At the recommended contour level, 96% 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 (0.0117) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.8376	 0.3900
A	 0.8929	 0.4460
B	 0.1962	 0.1300
C	 0.8860	 0.4400
D	 0.8426	 0.4380
E	 0.8333	 0.4090
F	 0.8626	 0.3950
G	 0.7972	 0.3690
H	 0.8670	 0.4210
I	 0.8747	 0.3850
J	 0.8753	 0.3910
K	 0.8839	 0.4240
L	 0.8466	 0.4170
M	 0.7643	 0.4260
N	 0.7058	 0.2840
O	 0.8820	 0.4430
P	 0.8399	 0.3860
T	 0.8354	 0.4670
W	 0.7810	 0.3990
X	 0.7172	 0.2860
Y	 0.7691	 0.2920

