



wwPDB EM Validation Summary Report ⓘ

Mar 21, 2023 – 10:12 PM JST

PDB ID : 7XEC
EMDB ID : EMD-33155
Title : Cryo-EM structure of human ABCD1 E630Q in the presence of ATP in inward-facing state 2
Authors : Chao, X.; Li-Na, J.; Lin, T.
Deposited on : 2022-03-30
Resolution : 3.34 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
Mogul : 1.8.5 (274361), CSD as541be (2020)
MolProbity : 4.02b-467
buster-report : 1.1.7 (2018)
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) : 2.32.1

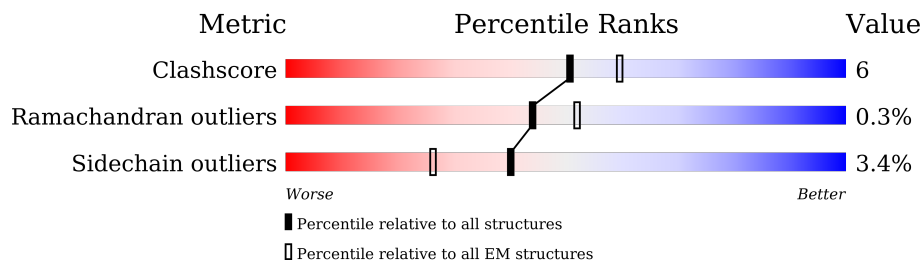
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.34 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	745	
1	B	745	

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
2	ATP	A	801	-	-	X	-

2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 9485 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.

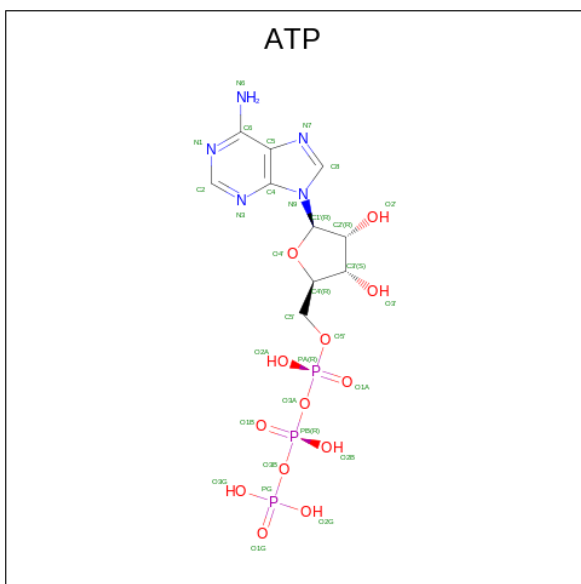
- Molecule 1 is a protein called ATP-binding cassette sub-family D member 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	597	Total	C	N	O	S	0	0
			4759	3052	838	847	22		
1	B	589	Total	C	N	O	S	0	0
			4695	3012	827	835	21		

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	630	GLN	GLU	engineered mutation	UNP P33897
B	630	GLN	GLU	engineered mutation	UNP P33897

- Molecule 2 is ADENOSINE-5'-TRIPHOSPHATE (three-letter code: ATP) (formula: $C_{10}H_{16}N_5O_{13}P_3$) (labeled as "Ligand of Interest" by depositor).

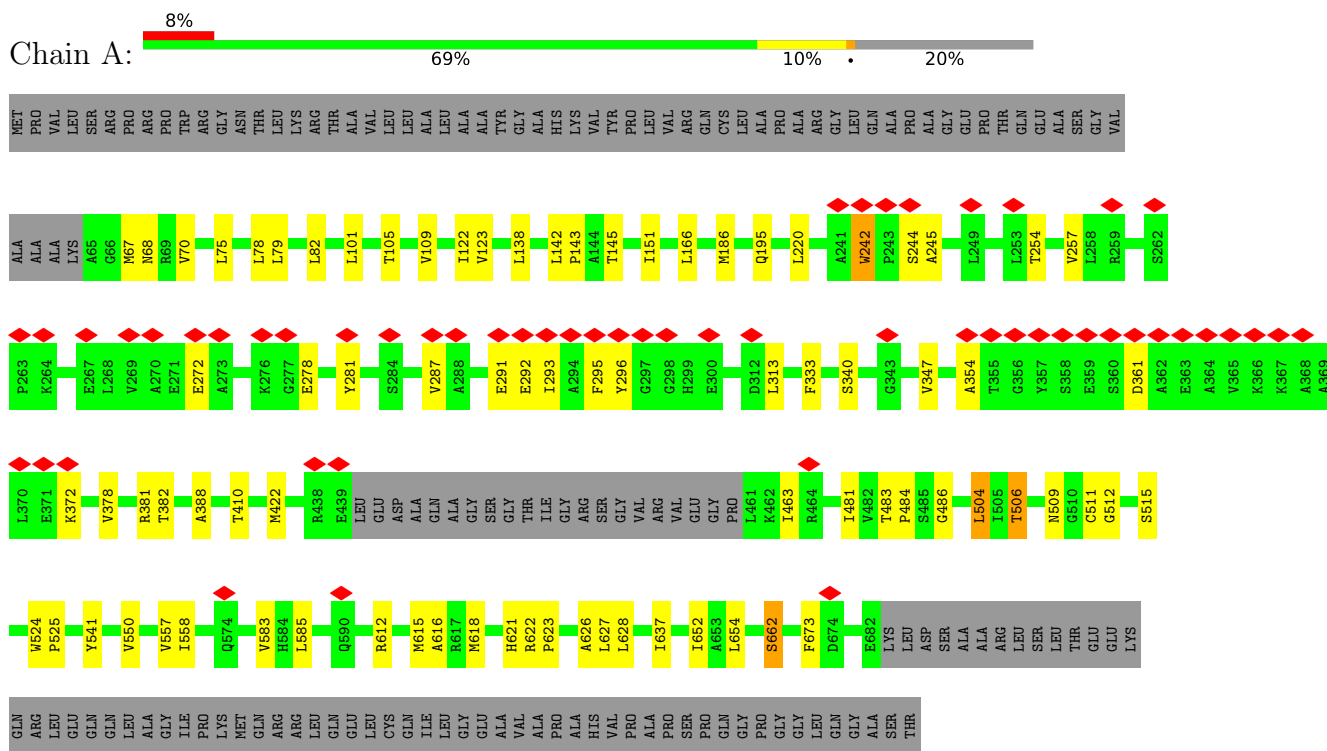


Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
2	A	1	Total	C	N	O	P	0
			31	10	5	13	3	

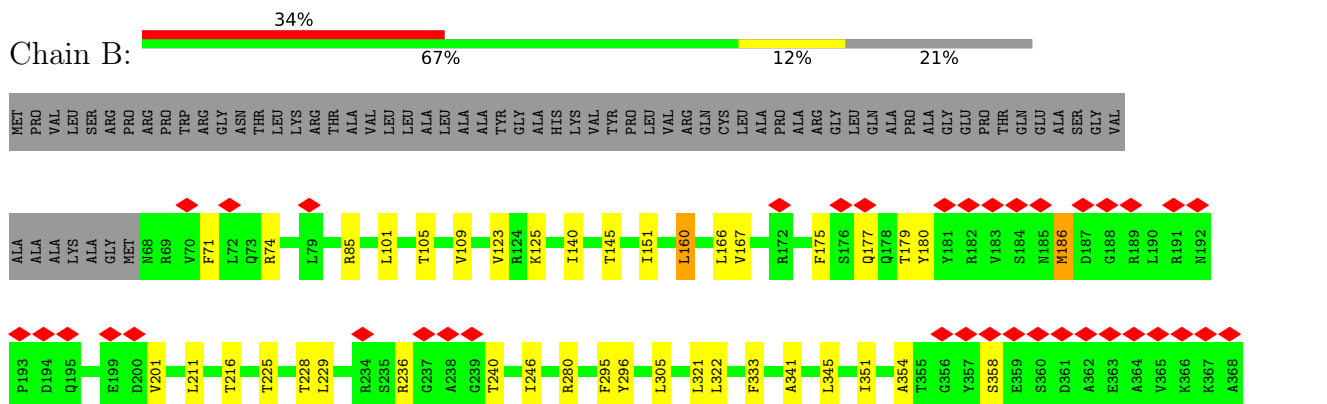
3 Residue-property plots

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: ATP-binding cassette sub-family D member 1



- Molecule 1: ATP-binding cassette sub-family D member 1



LYS	A369	Q466	TS26	IS88	K648	ALA
MET	L370	V467	Y527	L589	D649	GLU
GLN	E371	V468	G528	Q590	A650	LYS
ARG	K372	D469	G529	R591	A651	LEU
LEU	K373	V470	V530	E592	I652	GLN
GLN	E374	E471	L531	G593	A653	GLU
GLU	E375	Q472	Y532	G594	L654	LEU
LEU	V378	G473	K533	M595	L655	CYS
GLN	T382	I474	P534	E596	S656	ILE
ILE	V409	I475	P535	A597	I657	LEU
LEU	T410	C476	P536	M598	T658	GLY
ALA	T411	E477	Q537	C599	H659	GLU
ALA	A417	M478	R538	D600	R660	ALA
VAL	H420	I479	M539	W601	P661	VAL
ALA	E421	F480	F540	K602	S662	ALA
PRO	Q424	I481	Y541	D603	L663	PRO
ALA	D428	V482	I542	V604	W664	ALA
ALA	V429	T483	P543	L605	K665	VAL
ALA	V430	P484	Q544	S606	Y666	PRO
PRO	R431	S485	R545	G607	H667	PRO
SER	C432	G486	P546	G608	T668	SER
PRO	H433	E487	Y547	E609	H669	PRO
GLN	F434	V488	M548	K610	L670	GLN
GLY	K435	V489	S549	Q611	L671	GLY
SER	R436	V490	L553	R612	Q672	PRO
THR	PRO	A491	R554	I613	F673	GLY
THR	ARG	S492	D555	G614	D674	LEU
THR	ARG	L493	Q556	M615	G675	GLN
THR	LEU	M494	V557	A616	E676	ALA
THR	LEU	I495	I558	R617	G677	SER
THR	LEU	R496	Y559	M618	G678	THR
THR	ASP	V497	P560	F619	M679	THR
THR	ALA	E498	D561	Y620	K680	THR
THR	ALA	E499	S562	H621	PHE	THR
THR	GLN	G500	V563	R622	GLU	THR
THR	GLY	M501	E564	P623	GLU	THR
THR	SER	H502	D565	K624	LYS	THR
THR	THR	L503	M566	Y625	ASP	THR
THR	ILE	L504	Q567	A626	SER	THR
THR	GLY	I505	R568	L627	ALA	THR
THR	ARG	T506	D629	L628	ALA	THR
THR	GLY	G507	K569	D629	ARG	THR
THR	VAL	F508	G570	Q630	LEU	THR
THR	VAL	P508	Y571	C631	SER	THR
THR	GLU	M509	S572	T632	LEU	THR
THR	GLY	G510	E573	S633	GLU	THR
THR	PRO	C511	Q574	A634	LYS	THR
THR	PRO	G512	D575	V635	GLN	THR
THR	PRO	K513	L576	S636	ARG	THR
THR	PRO	S514	E577	I637	LEU	THR
THR	PRO	S515	A578	D638	GLU	THR
THR	PRO	S515	I579	V639	GLN	THR
THR	PRO	L516	L580	E640	LEU	THR
THR	PRO	F517	D581	G641	ALA	THR
THR	PRO	R518	V582	K642	ILE	THR
THR	PRO	I519	H584	I643	PRO	THR
THR	PRO	L520	L585	F644	PRO	THR
THR	PRO	G521	H586	Q645	PRO	THR
THR	PRO	L523	H587	A646	PRO	THR
THR	PRO	L523	H587	A647	PRO	THR
THR	PRO	M524	H587	A647	PRO	THR
THR	PRO	P525	H587	A647	PRO	THR

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	3010722	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 ($e^-/\text{\AA}^2$)	66.5	Depositor
Minimum defocus (nm)	1500	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	Not provided	
Image detector	FEI EAGLE (4k x 4k)	Depositor
Maximum map value	2.030	Depositor
Minimum map value	-1.347	Depositor
Average map value	-0.001	Depositor
Map value standard deviation	0.025	Depositor
Recommended contour level	0.13	Depositor
Map size (\AA)	315.4, 315.4, 315.4	wwPDB
Map dimensions	380, 380, 380	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (\AA)	0.83, 0.83, 0.83	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: ATP

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	0/4863	0.65	0/6585
1	B	0.32	0/4797	0.63	0/6497
All	All	0.33	0/9660	0.64	0/13082

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
1	B	0	1
All	All	0	2

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	361	ASP	Peptide
1	B	186	MET	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	4759	0	4810	58	0
1	B	4695	0	4752	67	0
2	A	31	0	12	13	0
All	All	9485	0	9574	112	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 112 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:484:PRO:HD3	2:A:801:ATP:H2	1.26	1.00
1:A:484:PRO:HD3	2:A:801:ATP:C2	2.09	0.88
1:A:484:PRO:CD	2:A:801:ATP:C2	2.65	0.80
1:A:123:VAL:HG21	1:A:382:THR:HG21	1.64	0.77
1:B:166:LEU:HD23	1:B:201:VAL:HG13	1.67	0.74

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	593/745 (80%)	536 (90%)	55 (9%)	2 (0%)	41 72
1	B	585/745 (78%)	526 (90%)	58 (10%)	1 (0%)	47 78
All	All	1178/1490 (79%)	1062 (90%)	113 (10%)	3 (0%)	44 72

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	242	TRP
1	A	486	GLY

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Mol	Chain	Res	Type
1	B	151	ILE

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	501/610 (82%)	486 (97%)	15 (3%)	41	70
1	B	495/610 (81%)	476 (96%)	19 (4%)	33	64
All	All	996/1220 (82%)	962 (97%)	34 (3%)	40	67

5 of 34 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	502	HIS
1	B	561	ASP
1	B	669	HIS
1	A	558	ILE
1	A	506	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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](#)

1 ligand is 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
2	ATP	A	801	-	26,33,33	3.71	6 (23%)	31,52,52	1.52	5 (16%)

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
2	ATP	A	801	-	-	4/18/38/38	0/3/3/3

The worst 5 of 6 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	801	ATP	C2'-C1'	-11.11	1.36	1.53
2	A	801	ATP	O4'-C1'	9.33	1.54	1.41
2	A	801	ATP	C3'-C4'	-7.92	1.32	1.53
2	A	801	ATP	O4'-C4'	6.76	1.60	1.45
2	A	801	ATP	C2'-C3'	3.54	1.63	1.53

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	801	ATP	PA-O3A-PB	-4.37	117.82	132.83
2	A	801	ATP	N3-C2-N1	-4.00	122.43	128.68
2	A	801	ATP	C3'-C2'-C1'	3.41	106.11	100.98
2	A	801	ATP	PB-O3B-PG	-2.68	123.62	132.83
2	A	801	ATP	C4-C5-N7	-2.02	107.29	109.40

There are no chirality outliers.

All (4) torsion outliers are listed below:

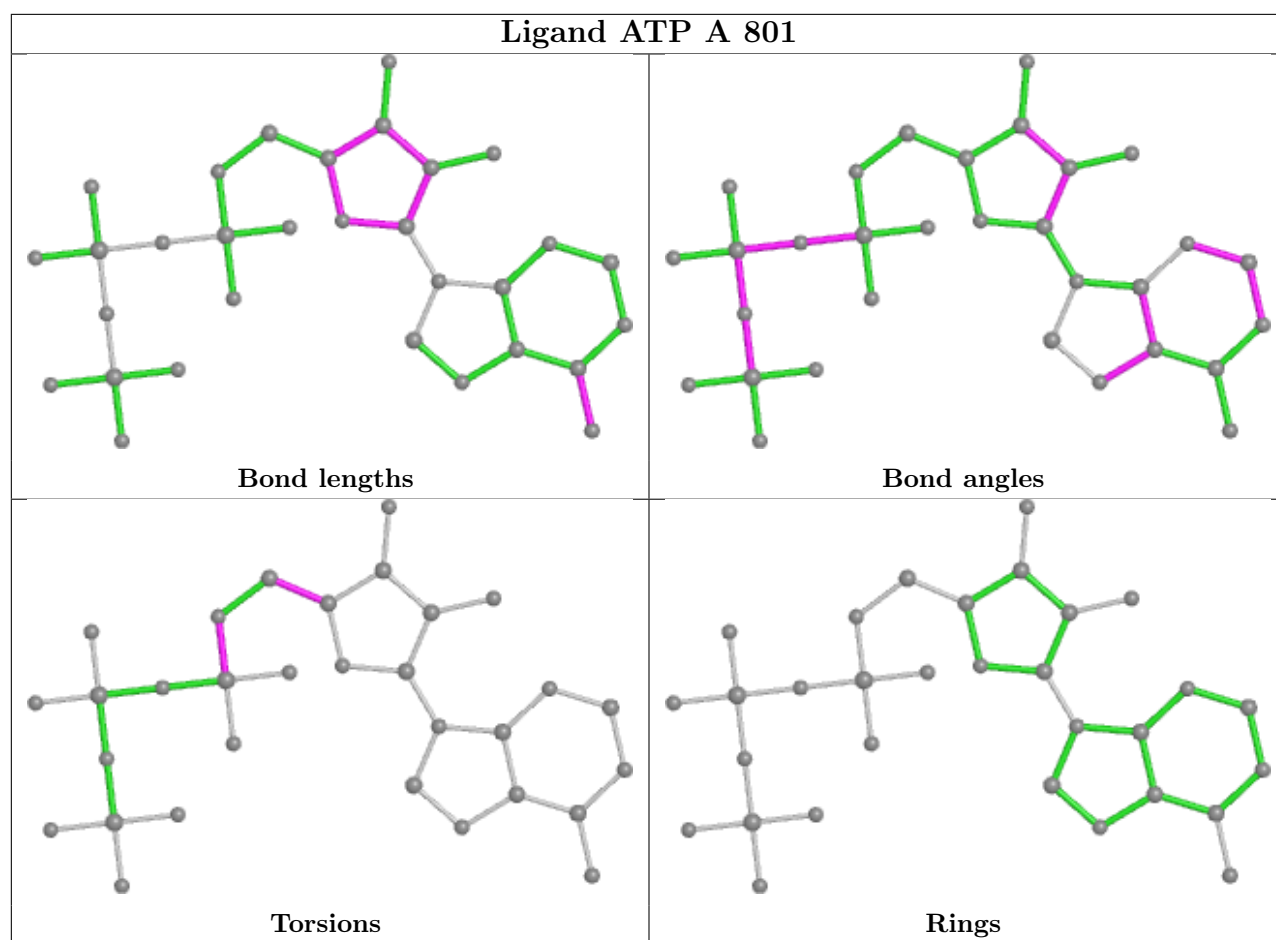
Mol	Chain	Res	Type	Atoms
2	A	801	ATP	C5'-O5'-PA-O3A
2	A	801	ATP	O4'-C4'-C5'-O5'
2	A	801	ATP	C3'-C4'-C5'-O5'
2	A	801	ATP	C5'-O5'-PA-O2A

There are no ring outliers.

1 monomer is involved in 13 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	801	ATP	13	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



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.

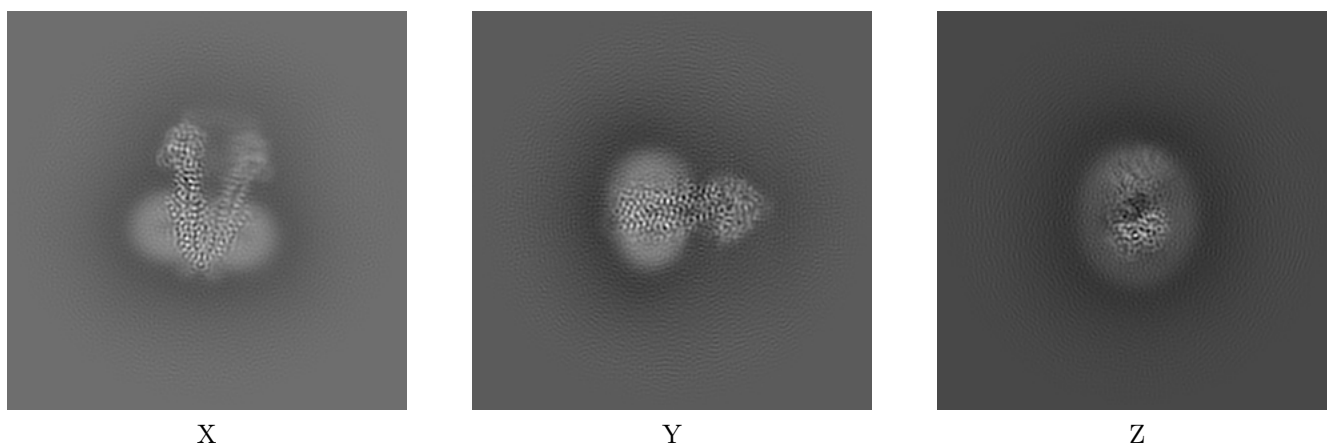
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-33155. 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](#)

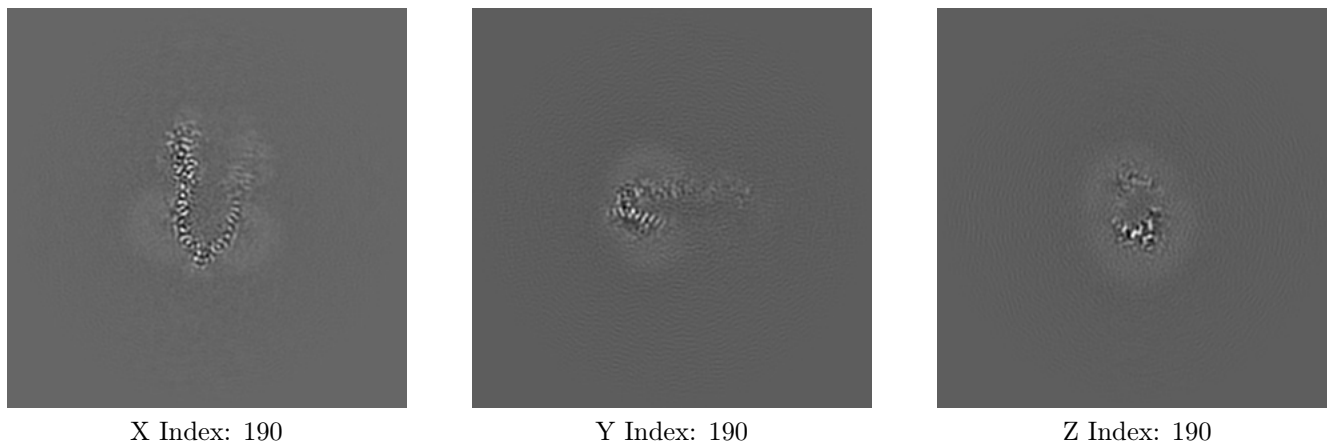
6.1.1 Primary map



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

6.2 Central slices [i](#)

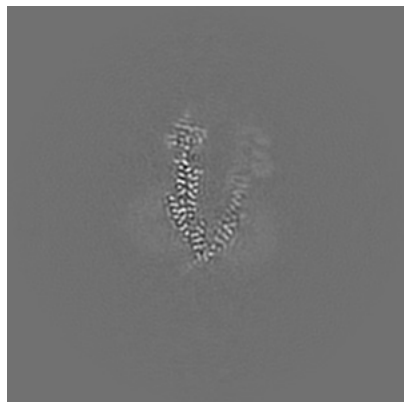
6.2.1 Primary map



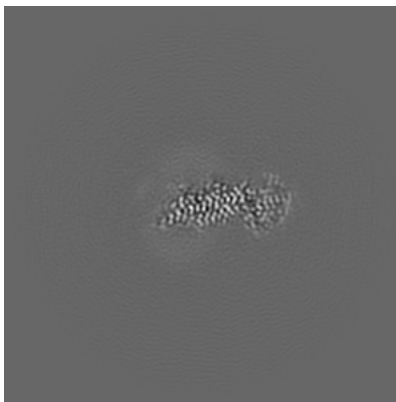
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

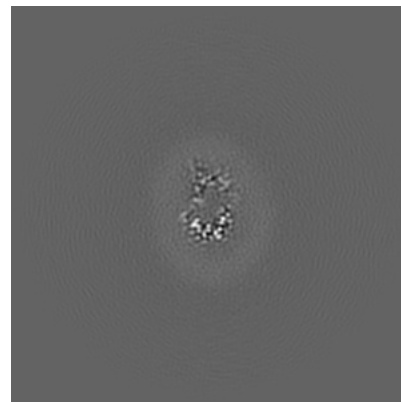
6.3.1 Primary map



X Index: 197



Y Index: 166



Z Index: 179

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 0.13. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

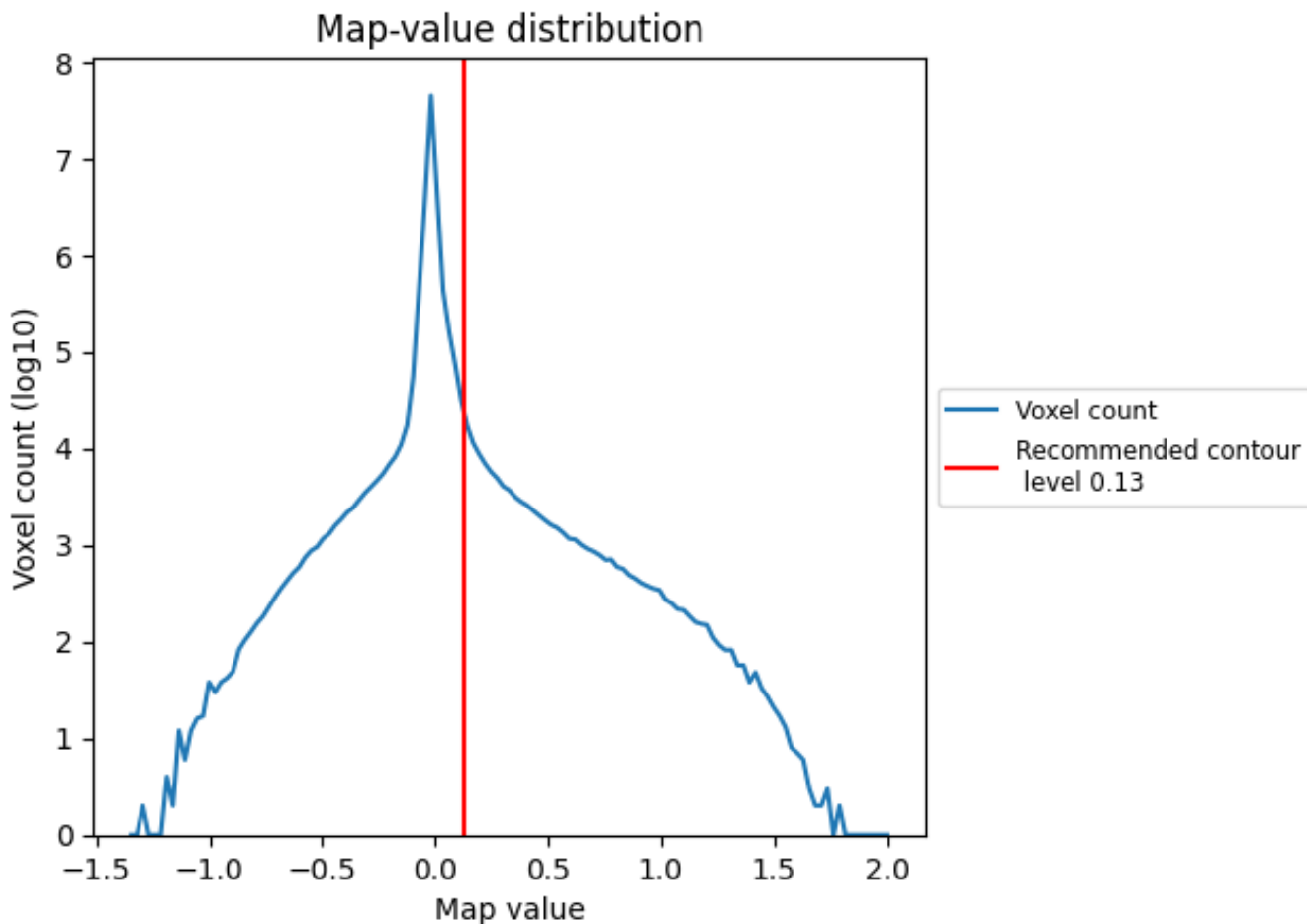
6.5 Mask visualisation

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

7 Map analysis [i](#)

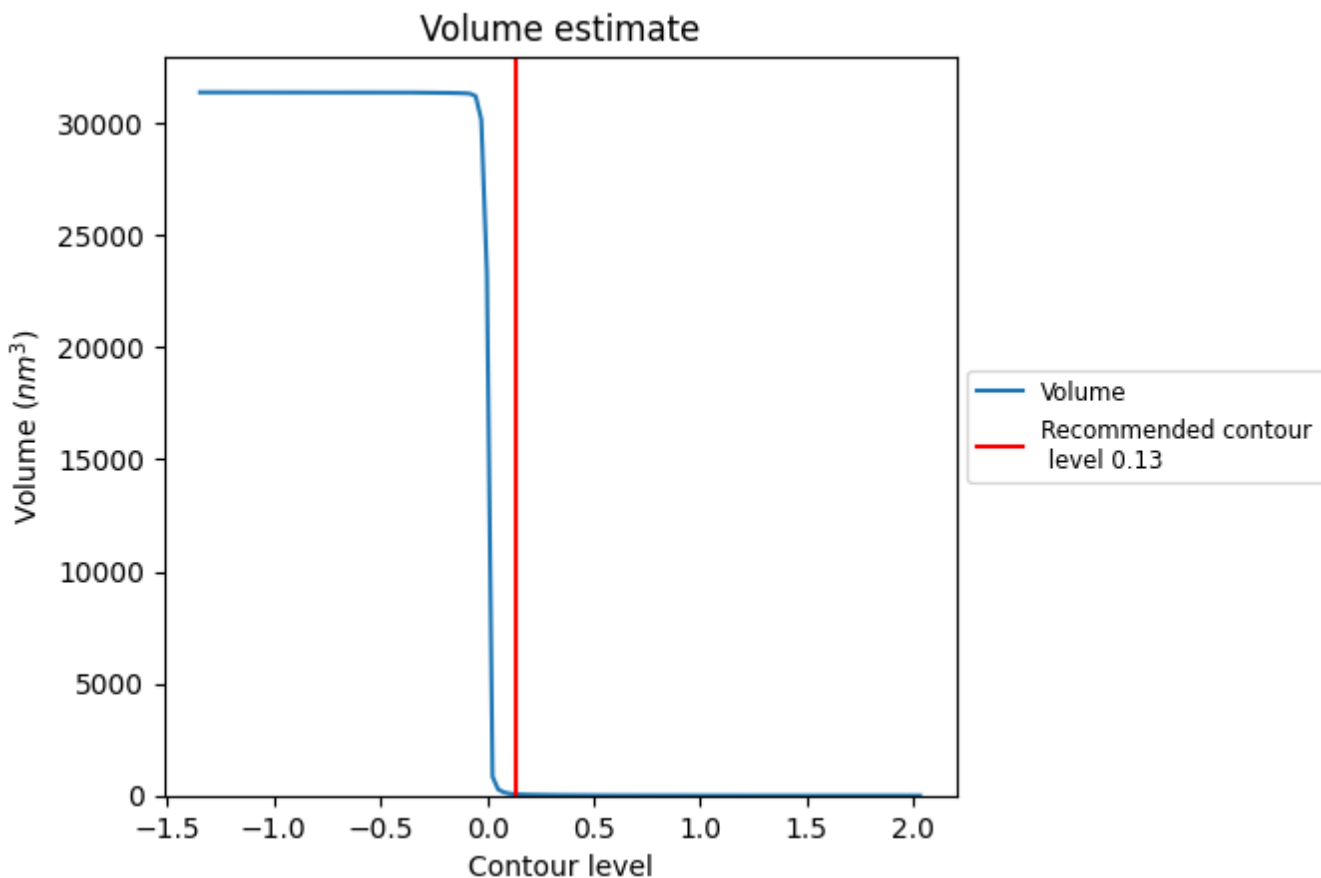
This section contains the results of statistical analysis of the map.

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.

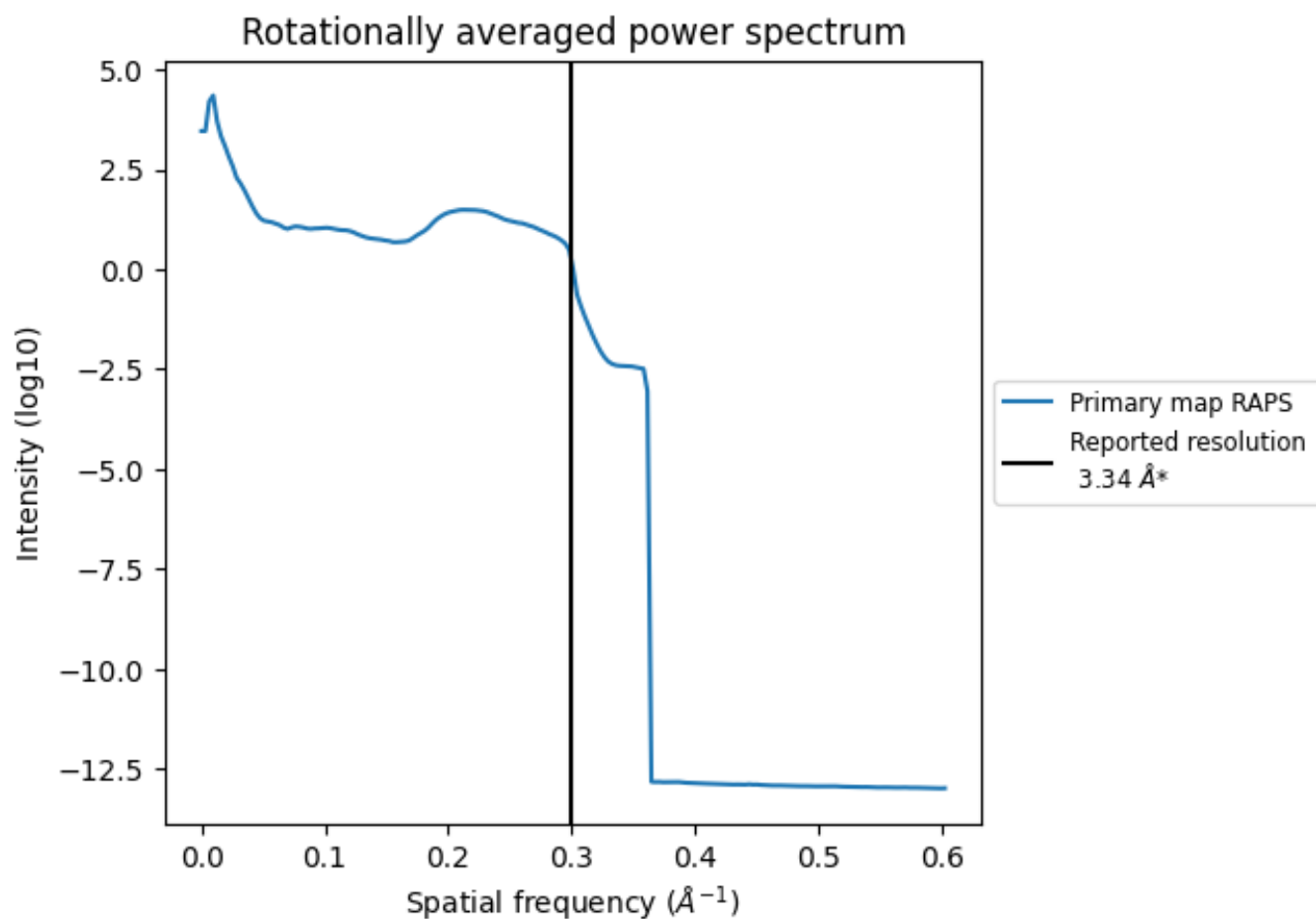
7.2 Volume estimate [\(i\)](#)



The volume at the recommended contour level is 61 nm^3 ; this corresponds to an approximate mass of 55 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 0.299\AA^{-1}

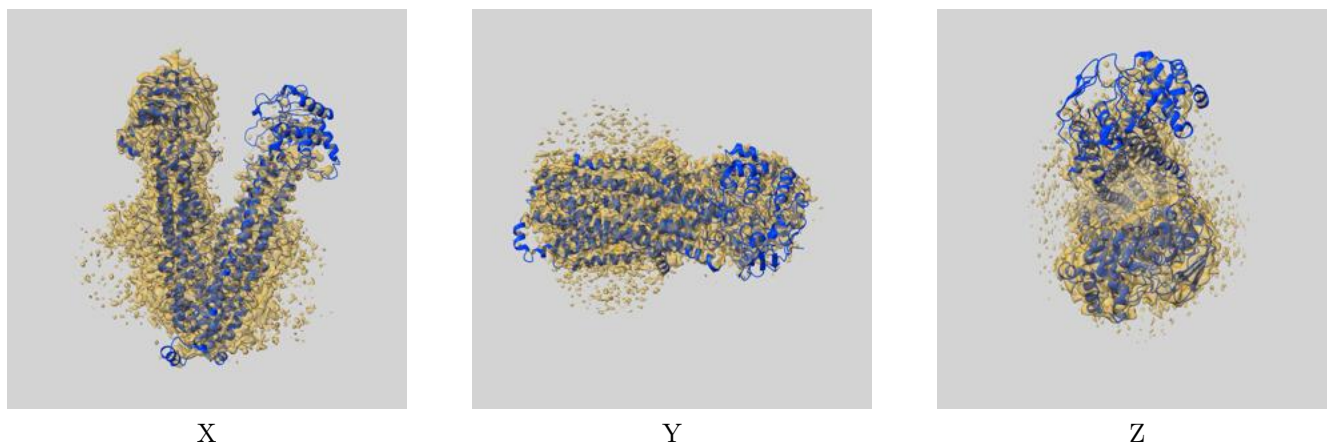
8 Fourier-Shell correlation

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

9 Map-model fit [i](#)

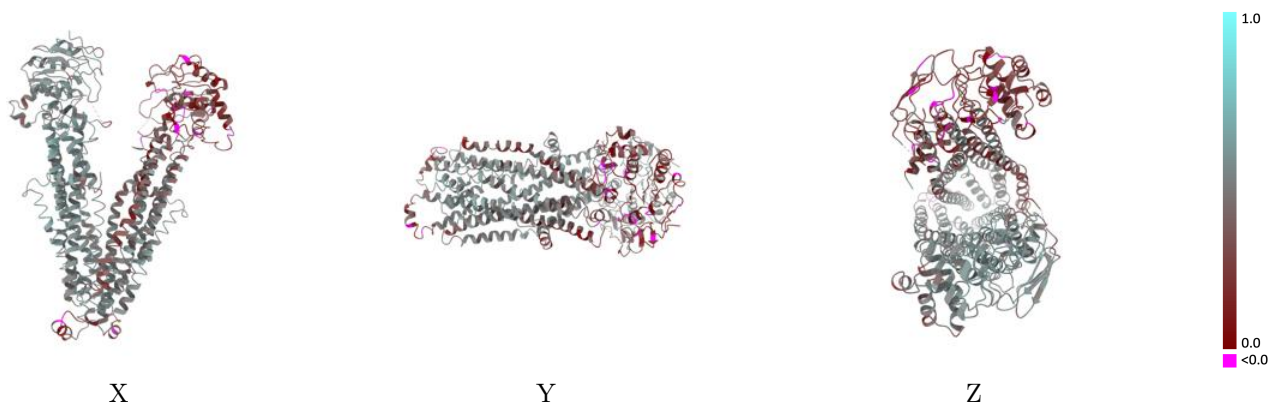
This section contains information regarding the fit between EMDB map EMD-33155 and PDB model 7XEC. Per-residue inclusion information can be found in section 3 on page 4.

9.1 Map-model overlay [i](#)



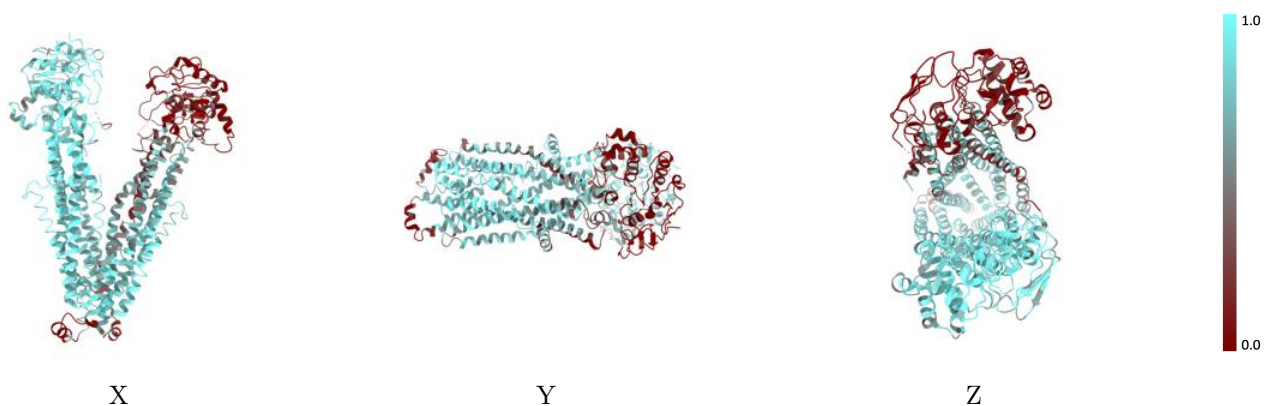
The images above show the 3D surface view of the map at the recommended contour level 0.13 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



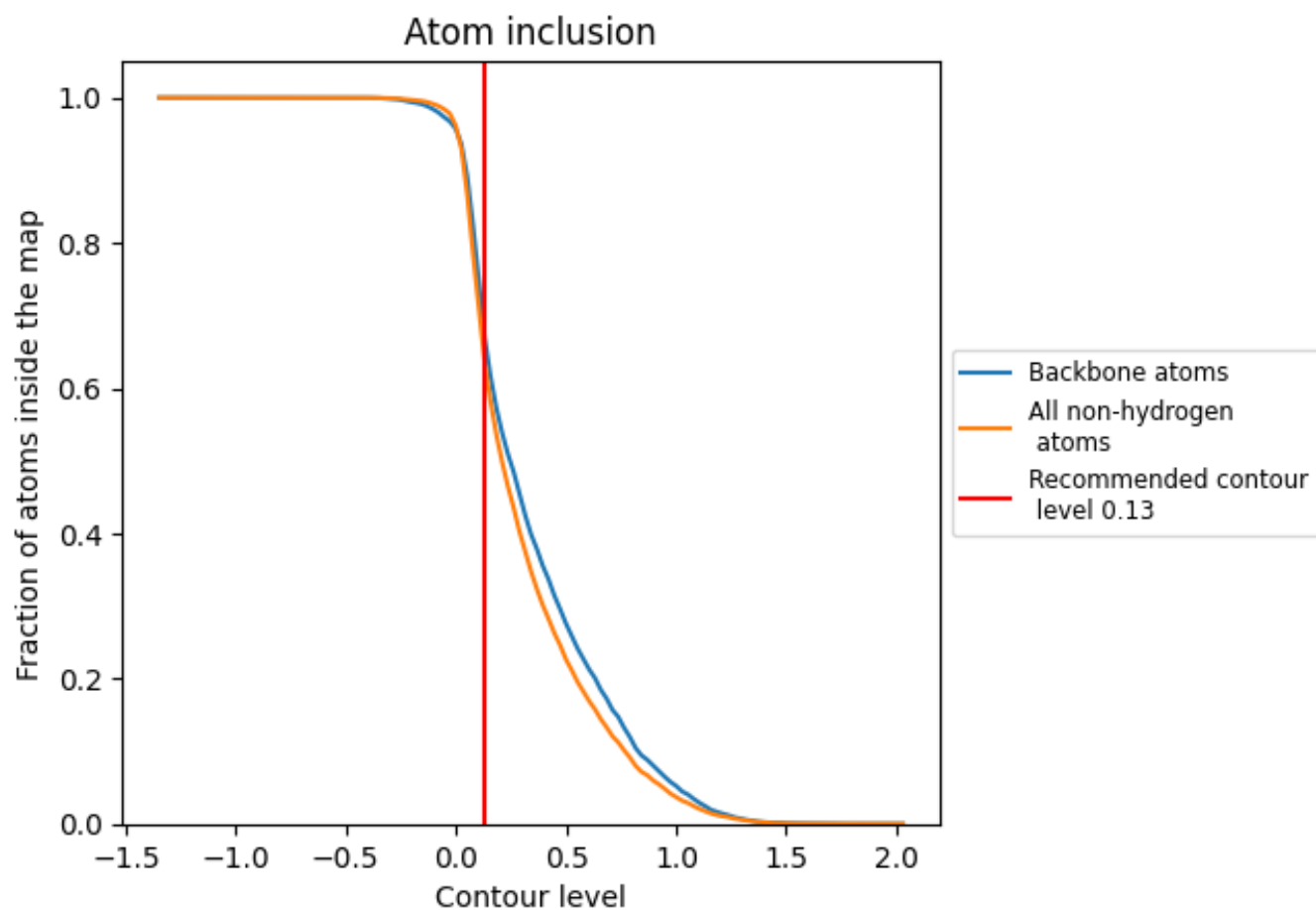
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.13).







9.4 Atom inclusion [i](#)



At the recommended contour level, 67% of all backbone atoms, 64% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary [i](#)

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	 0.6367	 0.4260
A	 0.7775	 0.4800
B	 0.4931	 0.3710

