



wwPDB EM Validation Summary Report ⓘ

Oct 6, 2024 – 12:27 AM EDT

PDB ID : 6NYM
EMDB ID : EMD-0546
Title : Helicobacter pylori Vacuolating Cytotoxin A Oligomeric Assembly 2d (OA-2d)
Authors : Zhang, K.; Zhang, H.; Li, S.; Au, S.; Chiu, W.
Deposited on : 2019-02-11
Resolution : 3.60 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.dev113
MolProbity : 4.02b-467
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) : 2.39

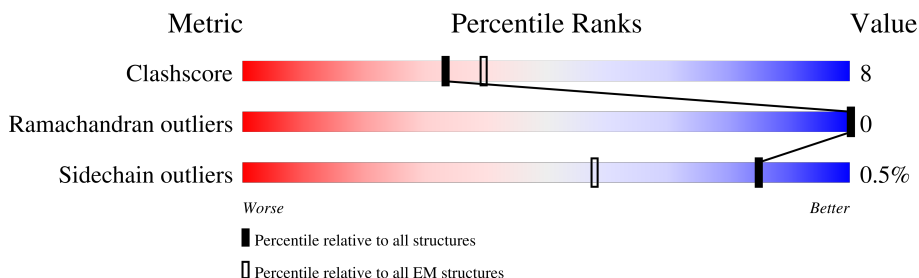
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.60 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

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	821	
1	B	821	
1	C	821	
1	D	821	
1	E	821	
1	F	821	
1	G	821	
1	H	821	

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Mol	Chain	Length	Quality of chain
1	I	821	 72% 19% 9%
1	J	821	 72% 20% 9%
1	K	821	 72% 19% 9%
1	L	821	 72% 19% 9%

2 Entry composition [i](#)

There is only 1 type of molecule in this entry. The entry contains 68664 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.

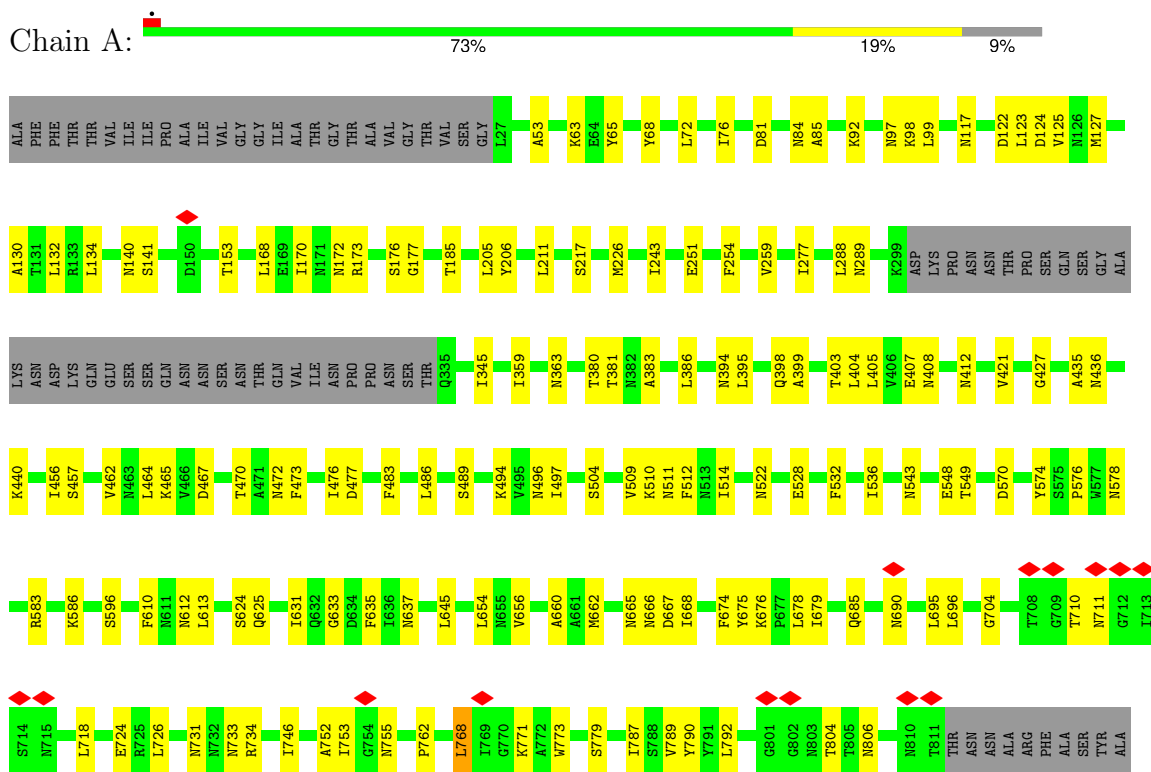
- Molecule 1 is a protein called Vacuolating cytotoxin autotransporter.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	750	5722	3579	1005	1126	12	0	0
1	B	750	5722	3579	1005	1126	12	0	0
1	C	750	5722	3579	1005	1126	12	0	0
1	D	750	5722	3579	1005	1126	12	0	0
1	E	750	5722	3579	1005	1126	12	0	0
1	F	750	5722	3579	1005	1126	12	0	0
1	G	750	5722	3579	1005	1126	12	0	0
1	H	750	5722	3579	1005	1126	12	0	0
1	I	750	5722	3579	1005	1126	12	0	0
1	J	750	5722	3579	1005	1126	12	0	0
1	K	750	5722	3579	1005	1126	12	0	0
1	L	750	5722	3579	1005	1126	12	0	0

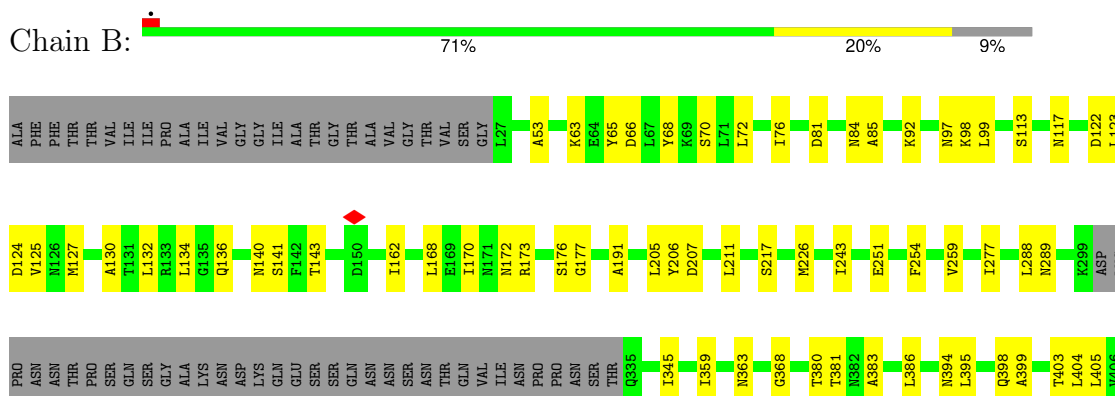
3 Residue-property plots

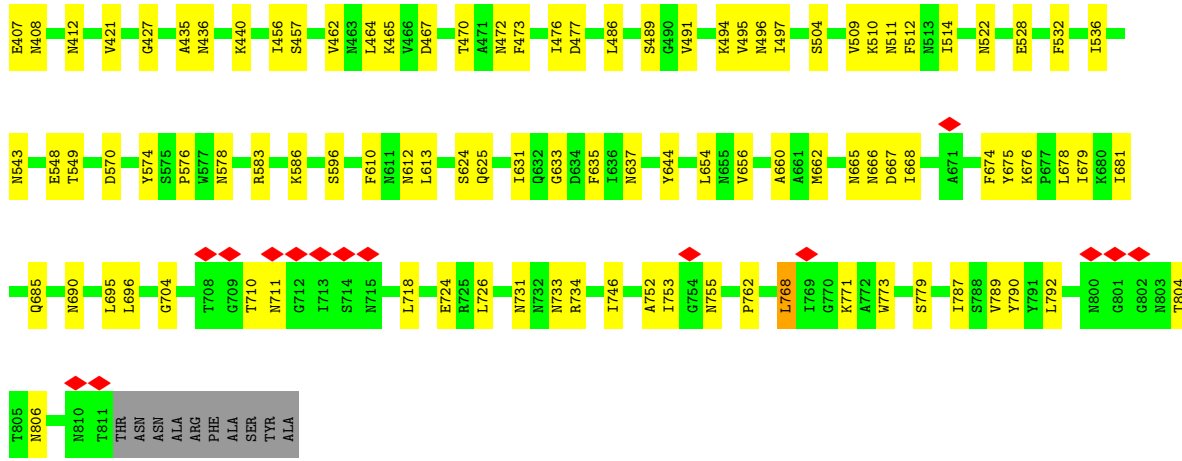
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion 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: Vacuolating cytotoxin autotransporter

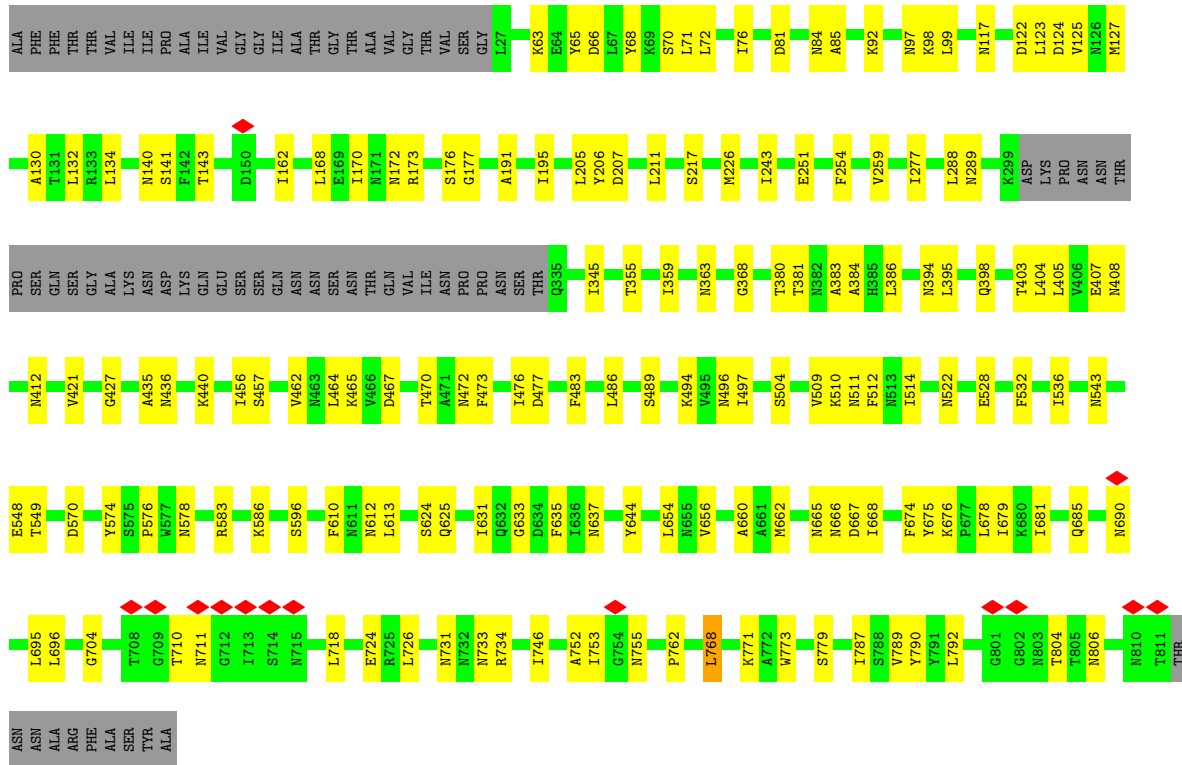


• Molecule 1: Vacuolating cytotoxin autotransporter



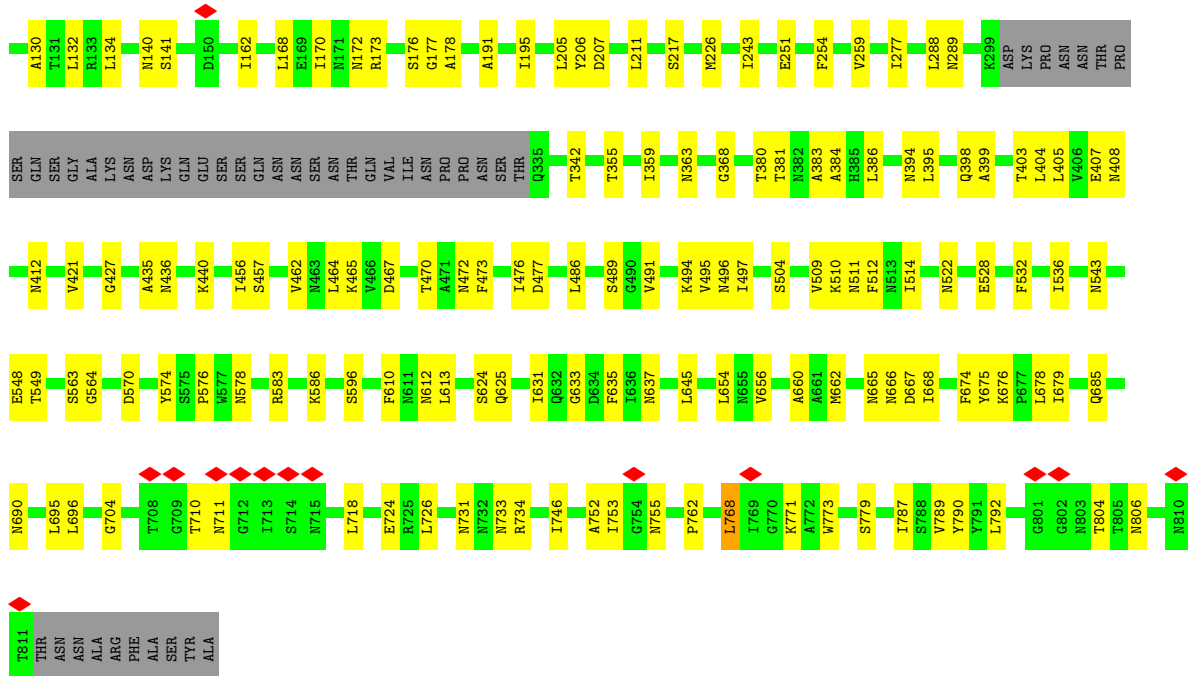


• Molecule 1: Vacuolating cytotoxin autotransporter

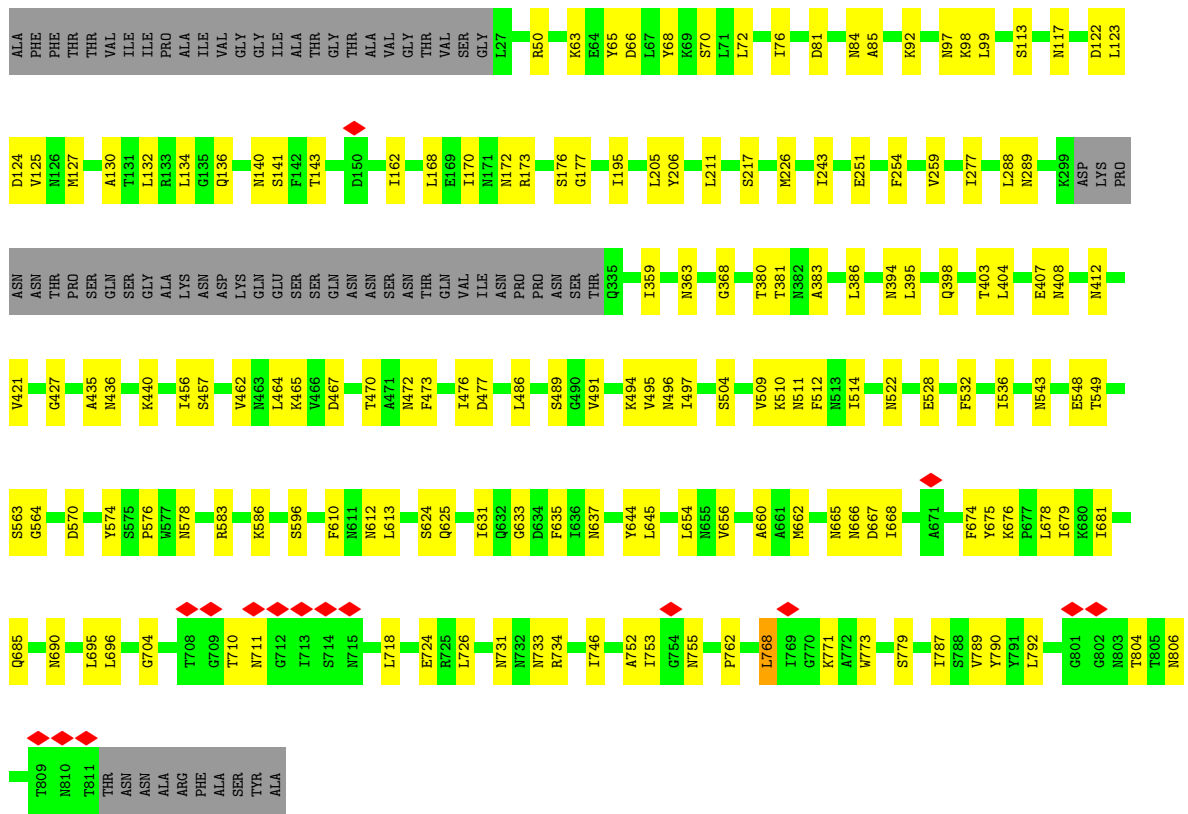


• Molecule 1: Vacuolating cytotoxin autotransporter



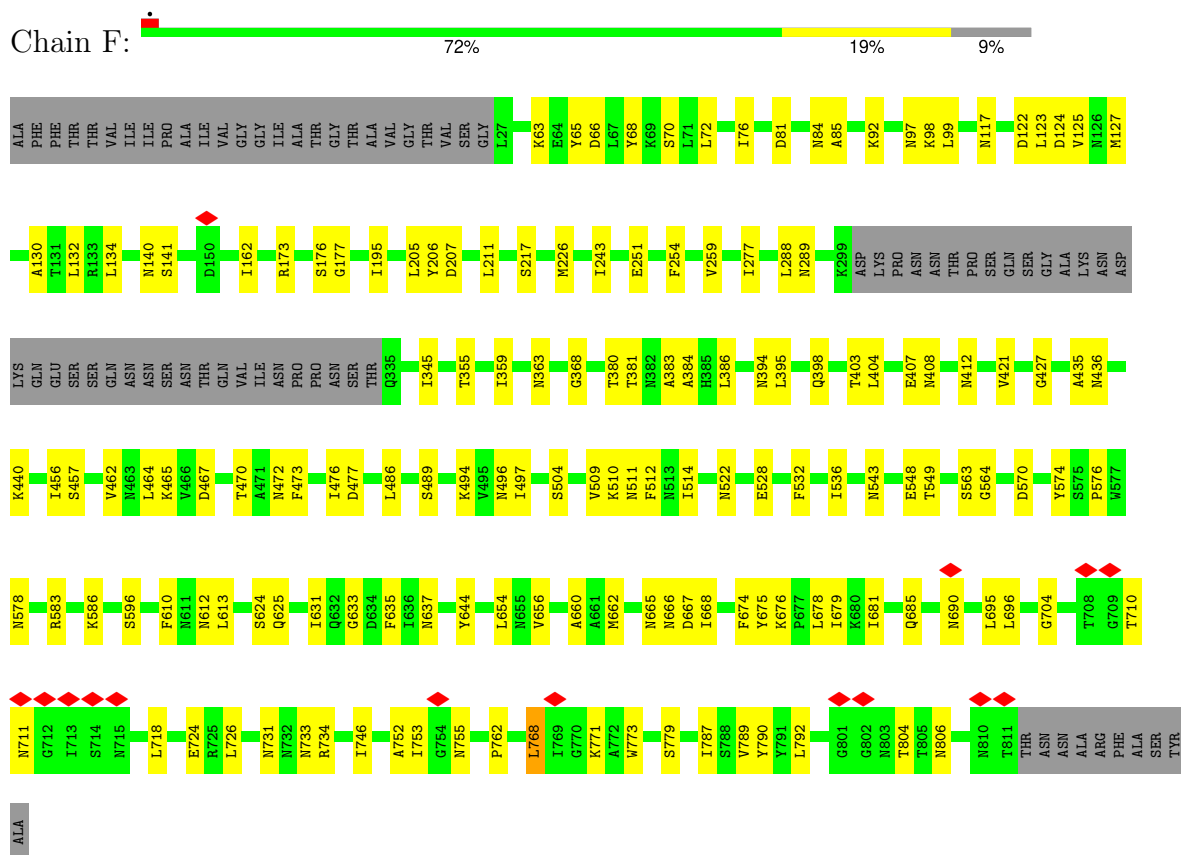


• Molecule 1: Vacuolating cytotoxin autotransporter



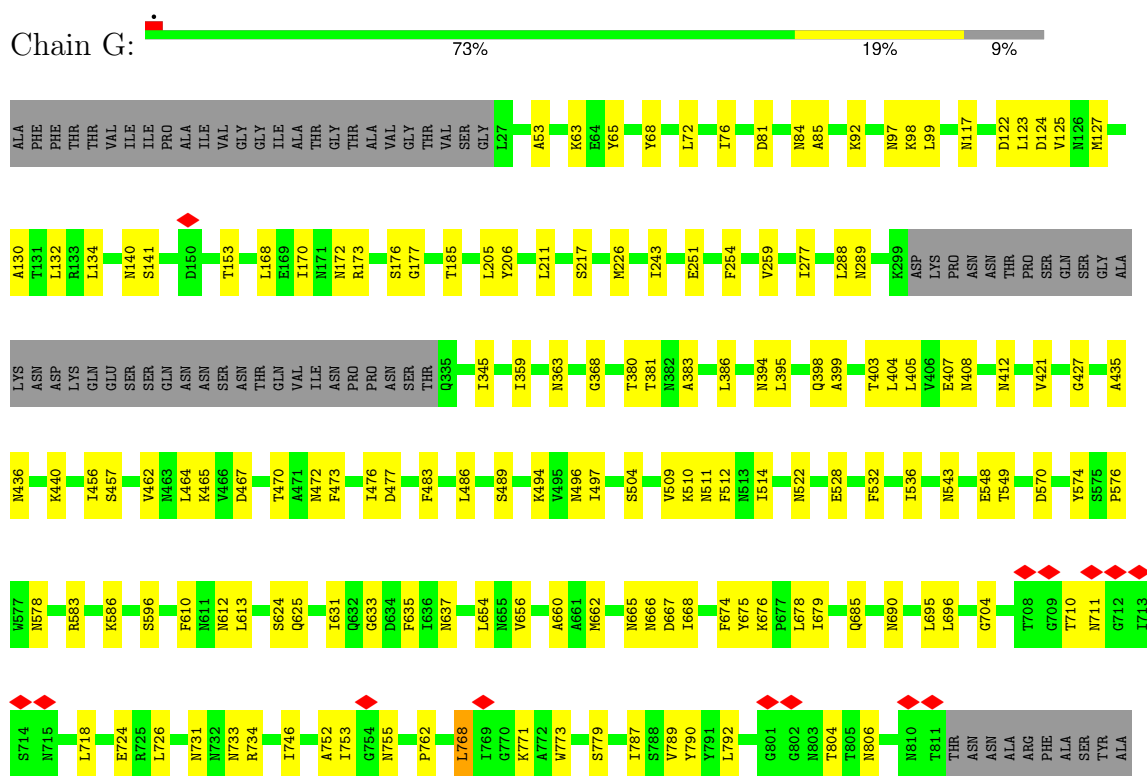
• Molecule 1: Vacuolating cytotoxin autotransporter

Chain F:



- Molecule 1: Vacuolating cytotoxin autotransporter

Chain G:



- Molecule 1: Vacuolating cytotoxin autotransporter



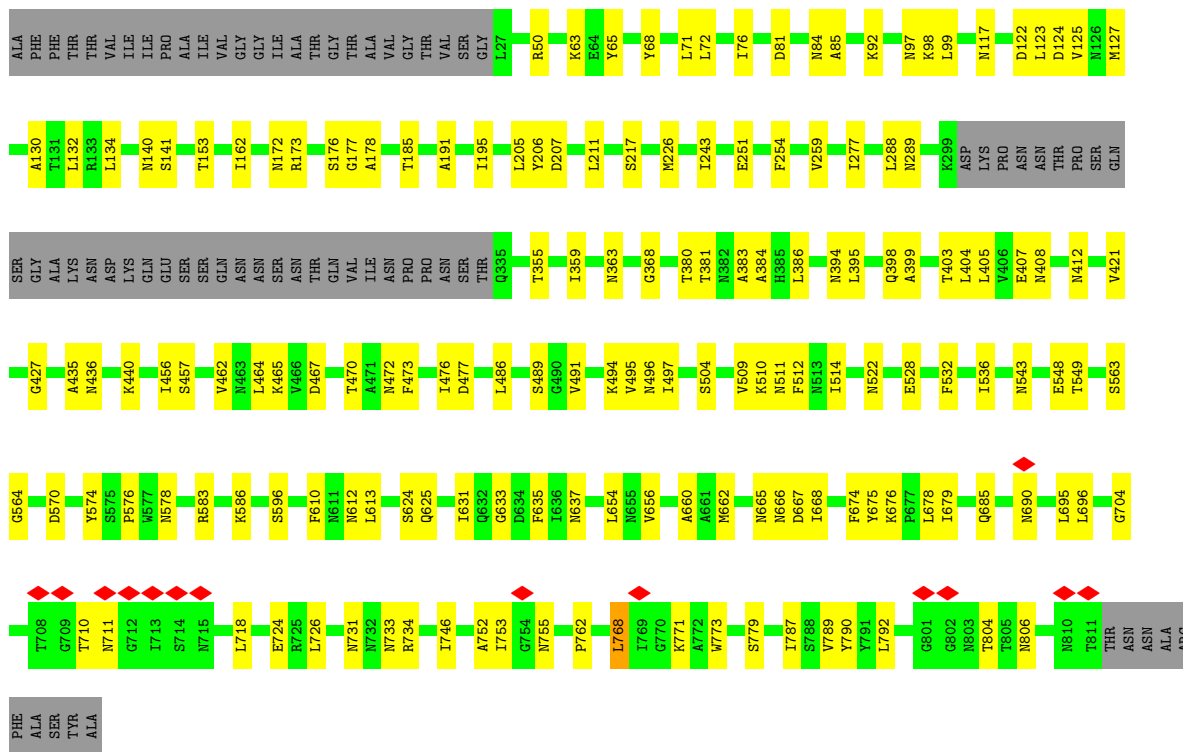
ALA	PHE	PHE	THR	THR	VAL	VAL	ILE	ILE	PRO	ALA	ASN	VAL	GLY	GLY	ILE	THR	GLY	THR	ALA	THR	VAL	GLY	THR	GLY	THR	VAL	GLY	L27																					
K63	E64	Y65	D66	L67	Y68	K69	S70	L71	L72	I76	D81	N84	A85	K92	N97	K98	L99	S113	N117	D122	L123	D124	V125	H126	M127																								
A130	T131	L132	R133	L134	G135	Q136	N140	S141	F142	T143	D150	I162	L168	E169	N170	H171	M172	R173	S176	G177	A191	L205	Y206	D207	L211	S217	F254	V259	I277	L288	M289	K299	LYS	PRO	ASN														
ASN	THR	PRO	GLN	SER	GLY	ALA	LYS	ASP	LYS	GLU	SER	ASN	SER	ASN	THR	Q395	T359	N363	G368	T380	T381	N382	A383	L386	N394	L395	Q398	T403	L404	L405	V406	E407	M408	N412															
V421	G427	A435	N436	K440	I456	S457	V462	H463	L464	K465	V466	D467	T470	A471	N472	F473	I476	D477	L486	S489	G490	V491	K494	V495	N496	L497	S504	V509	K510	N511	F512	H513	I514	N522	E528	F532	I536	N543	E548	T549									
D570	Y574	S575	P576	H577	H578	R583	K586	S596	F610	N611	N612	L613	S624	Q625	I631	G632	G633	D634	F635	I636	N637	L654	H655	V656	A660	K661	M662	M665	M666	D667	I668	F674	Y675	K676	P677	L678	I679	Q685	N690	L695	L696	G704	T708						
G709	T710	M711	G712	I713	S714	N715	L718	E724	R725	L726	N731	N732	N733	R734	I746	A752	I753	G754	N755	P762	L768	I769	G770	K771	A772	W773	S779	I787	S788	V789	Y790	Y791	L792	G801	G802	N803	T804	T805	N806	N810	T811	THR	ASN	ALA	ARG	PHE	ALA		
SER	TTR	ALA																																															

● Molecule 1: Vacuolating cytotoxin autotransporter

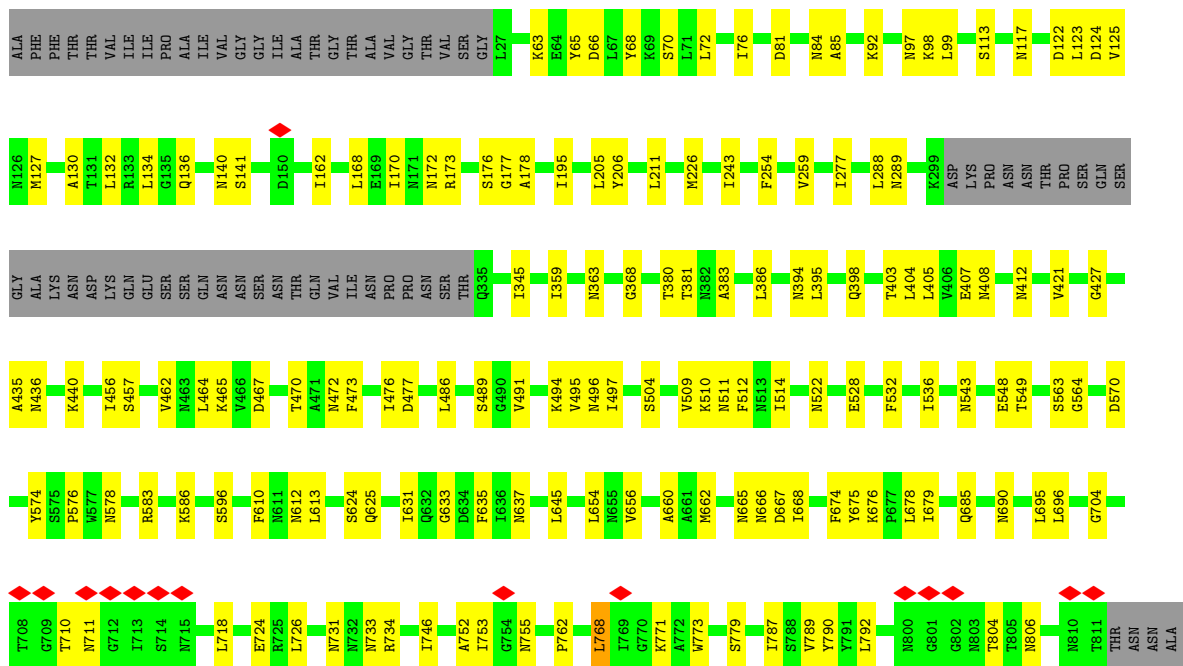


ALA	PHE	PHE	THR	THR	VAL	VAL	ILE	ILE	PRO	ALA	ASN	VAL	GLY	GLY	ILE	THR	GLY	THR	ALA	THR	VAL	GLY	THR	VAL	GLY	L27																																							
K63	E64	Y65	D66	L67	Y68	K69	S70	L71	L72	I76	D81	N84	A85	K92	N97	K98	L99	S117	D123	L124	V126	M127	A130	T131	L132	R133	L134	N140	S141	F142	T143	I162	L168	E169	N170	H171	M172	R173	S176	G177	A191	L205	Y206	D207	L211	S217	F254	V259	I277	L288	M289	K299	ASP	LYS	PRO	ASN	ASN	THR	PRO	GLN	ASP	THR	GLN	GLY	L27
A130	T131	L132	R133	L134	N140	S141	F142	T143	I162	L168	E169	N170	H171	M172	R173	S176	G177	A191	L205	Y206	D207	L211	S217	F254	V259	I277	L288	M289	K299	ASP	LYS	PRO	ASN	ASN	THR	PRO	GLN	ASP	THR	GLN	GLY	L27																							
GLY	ALA	LYS	ASN	ASP	LYS	GLU	SER	ASN	SER	ASN	THR	THR	PRO	PRO	ASN	SER	THR	Q395	T342	I345	T355	I359	N363	G368	T380	T381	A383	A384	R385	L386	N394	L395	Q398	T403	L404	L405	V406	E407	M408	N412																									
V421	G427	A435	N436	K440	I456	S457	V462	H463	L464	K465	V466	D467	T470	A471	N472	F473	I476	D477	L486	S489	G490	V491	K494	V495	N496	L497	S504	V509	K510	N511	F512	H513	I514	N522	E528	F532	I536	N543	E548	T549																									
D570	Y574	S575	P576	H577	H578	R583	K586	S596	F610	N611	N612	L613	S624	Q625	I631	G632	G633	D634	F635	I636	N637	Y644	L654	H655	V656	A660	K661	M662	M665	M666	D667	I668	F674	Y675	K676	P677	L678	I679	Q685	N690	L695																								
L696	G704	T708	G709	T710	M711	G712	I713	S714	N715	L718	E724	R725	L726	N731	N732	N733	R734	I746	A752	I753	G754	N755	P762	L768	K771	A772	W773	S779	I787	S788	V789	Y790	Y791	L792	G801	G802	N803	T804	T805	N806	N810	T811	THR	ASN	ASN																				
ALA	ARG	PHE	ALA	ALA	TTR	SER	TYR	VAL	ALA																																																								

• Molecule 1: Vacuolating cytotoxin autotransporter



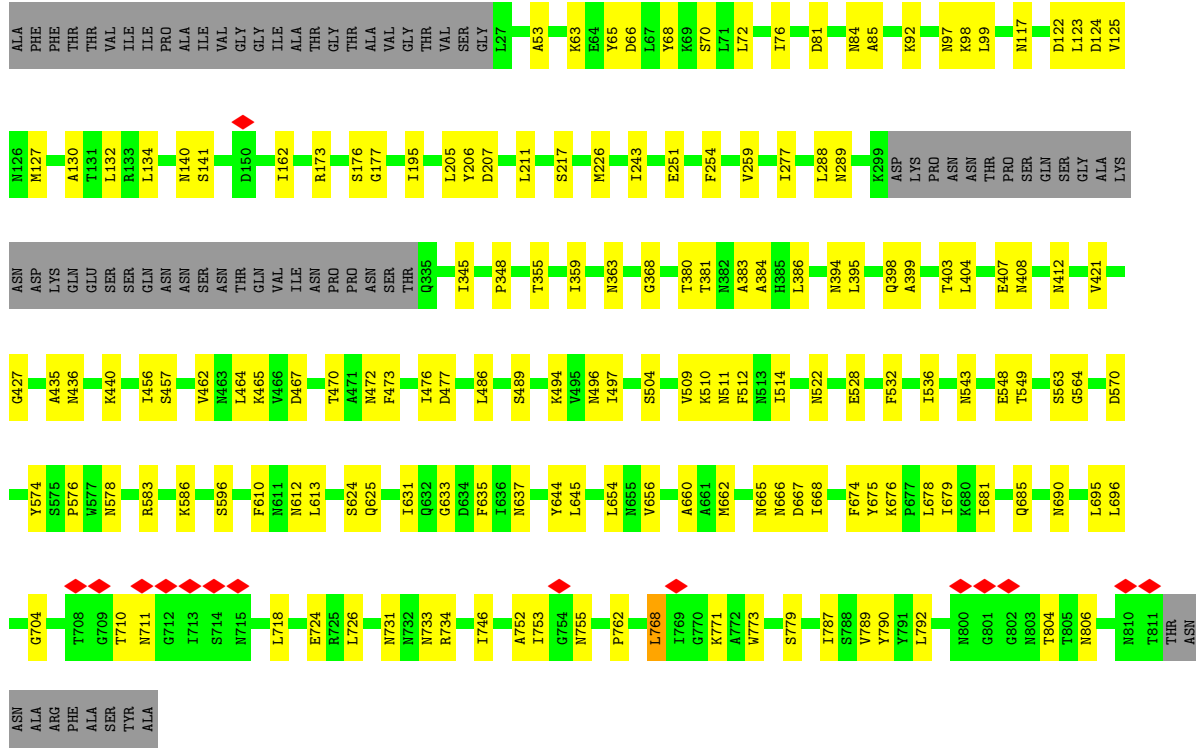
• Molecule 1: Vacuolating cytotoxin autotransporter



PHE
ALA
SER
TYR
ALA

• Molecule 1: Vacuolating cytotoxin autotransporter

Chain L: 72% 19% 9%



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, D6	Depositor
Number of particles used	31625	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 ($e^-/\text{\AA}^2$)	7	Depositor
Minimum defocus (nm)	1300	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	130000	Depositor
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	2.167	Depositor
Minimum map value	-0.896	Depositor
Average map value	0.008	Depositor
Map value standard deviation	0.074	Depositor
Recommended contour level	0.3	Depositor
Map size (Å)	407.03998, 407.03998, 407.03998	wwPDB
Map dimensions	384, 384, 384	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.06, 1.06, 1.06	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	0.31	0/5820	0.59	1/7882 (0.0%)
1	B	0.31	0/5820	0.59	1/7882 (0.0%)
1	C	0.31	0/5820	0.59	1/7882 (0.0%)
1	D	0.31	0/5820	0.59	1/7882 (0.0%)
1	E	0.31	0/5820	0.59	1/7882 (0.0%)
1	F	0.31	0/5820	0.59	1/7882 (0.0%)
1	G	0.31	0/5820	0.59	1/7882 (0.0%)
1	H	0.31	0/5820	0.59	1/7882 (0.0%)
1	I	0.31	0/5820	0.59	1/7882 (0.0%)
1	J	0.31	0/5820	0.59	1/7882 (0.0%)
1	K	0.31	0/5820	0.59	1/7882 (0.0%)
1	L	0.31	0/5820	0.59	1/7882 (0.0%)
All	All	0.31	0/69840	0.59	12/94584 (0.0%)

There are no bond length outliers.

The worst 5 of 12 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	G	132	LEU	CA-CB-CG	5.30	127.49	115.30
1	E	132	LEU	CA-CB-CG	5.29	127.48	115.30
1	A	132	LEU	CA-CB-CG	5.29	127.46	115.30
1	H	132	LEU	CA-CB-CG	5.28	127.45	115.30
1	J	132	LEU	CA-CB-CG	5.28	127.45	115.30

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	5722	0	5634	90	0
1	B	5722	0	5634	95	0
1	C	5722	0	5634	95	0
1	D	5722	0	5634	97	0
1	E	5722	0	5634	92	0
1	F	5722	0	5634	88	0
1	G	5722	0	5634	91	0
1	H	5722	0	5634	92	0
1	I	5722	0	5634	94	0
1	J	5722	0	5634	95	0
1	K	5722	0	5634	91	0
1	L	5722	0	5634	92	0
All	All	68664	0	67608	1101	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 8.

The worst 5 of 1101 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:B:654:LEU:H	1:B:696:LEU:HA	1.59	0.67
1:F:654:LEU:H	1:F:696:LEU:HA	1.59	0.67
1:H:654:LEU:H	1:H:696:LEU:HA	1.59	0.67
1:D:654:LEU:H	1:D:696:LEU:HA	1.60	0.67
1:J:654:LEU:H	1:J:696:LEU:HA	1.59	0.67

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	746/821 (91%)	652 (87%)	94 (13%)	0	100	100
1	B	746/821 (91%)	652 (87%)	94 (13%)	0	100	100
1	C	746/821 (91%)	652 (87%)	94 (13%)	0	100	100
1	D	746/821 (91%)	652 (87%)	94 (13%)	0	100	100
1	E	746/821 (91%)	652 (87%)	94 (13%)	0	100	100
1	F	746/821 (91%)	652 (87%)	94 (13%)	0	100	100
1	G	746/821 (91%)	653 (88%)	93 (12%)	0	100	100
1	H	746/821 (91%)	653 (88%)	93 (12%)	0	100	100
1	I	746/821 (91%)	652 (87%)	94 (13%)	0	100	100
1	J	746/821 (91%)	652 (87%)	94 (13%)	0	100	100
1	K	746/821 (91%)	652 (87%)	94 (13%)	0	100	100
1	L	746/821 (91%)	652 (87%)	94 (13%)	0	100	100
All	All	8952/9852 (91%)	7826 (87%)	1126 (13%)	0	100	100

There are no Ramachandran outliers to report.

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	617/674 (92%)	614 (100%)	3 (0%)	86	93
1	B	617/674 (92%)	614 (100%)	3 (0%)	86	93
1	C	617/674 (92%)	614 (100%)	3 (0%)	86	93
1	D	617/674 (92%)	614 (100%)	3 (0%)	86	93
1	E	617/674 (92%)	614 (100%)	3 (0%)	86	93
1	F	617/674 (92%)	614 (100%)	3 (0%)	86	93
1	G	617/674 (92%)	614 (100%)	3 (0%)	86	93
1	H	617/674 (92%)	614 (100%)	3 (0%)	86	93
1	I	617/674 (92%)	614 (100%)	3 (0%)	86	93

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	J	617/674 (92%)	614 (100%)	3 (0%)	86	93
1	K	617/674 (92%)	614 (100%)	3 (0%)	86	93
1	L	617/674 (92%)	614 (100%)	3 (0%)	86	93
All	All	7404/8088 (92%)	7368 (100%)	36 (0%)	85	93

5 of 36 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	J	665	ASN
1	L	768	LEU
1	J	768	LEU
1	K	768	LEU
1	E	613	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 96 such sidechains are listed below:

Mol	Chain	Res	Type
1	H	387	ASN
1	I	810	ASN
1	H	665	ASN
1	I	387	ASN
1	J	665	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 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.

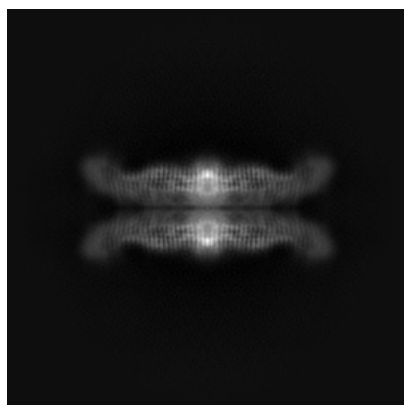
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-0546. These allow visual inspection of the internal detail of the map and identification of artifacts.

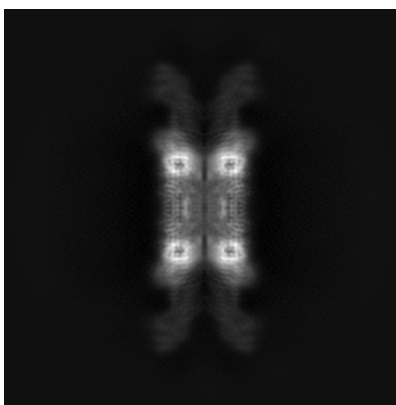
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections [i](#)

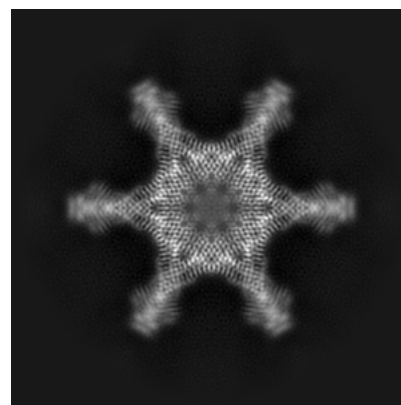
6.1.1 Primary map



X



Y

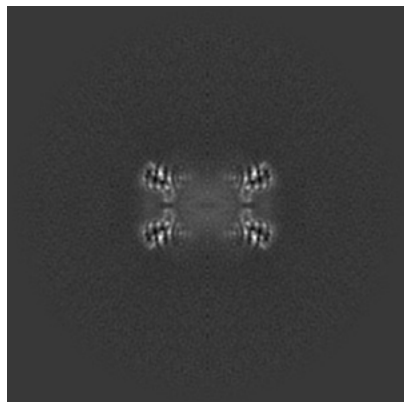


Z

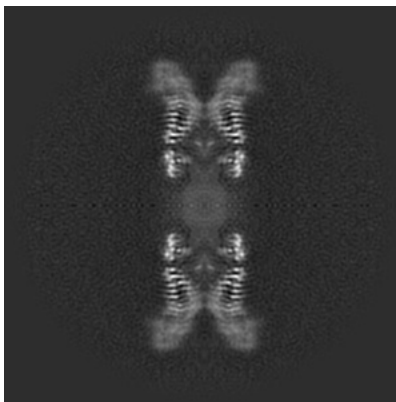
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

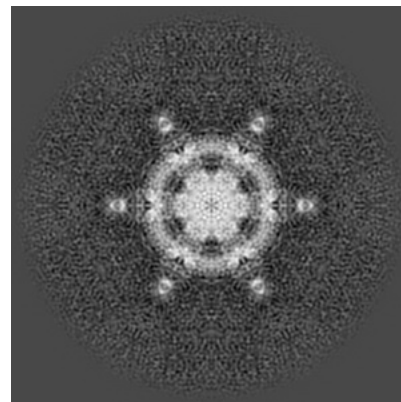
6.2.1 Primary map



X Index: 192



Y Index: 192

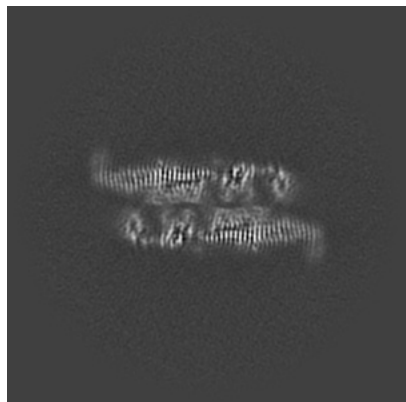


Z Index: 192

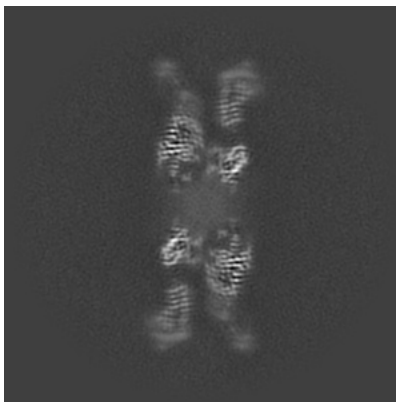
The images above show central slices of the map in three orthogonal directions.

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

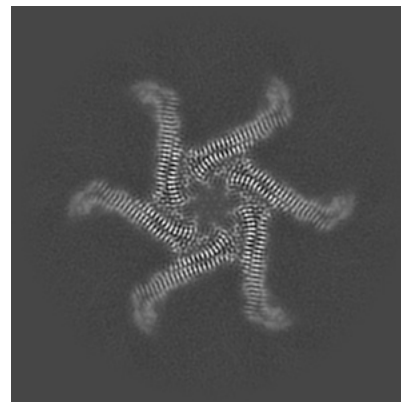
6.3.1 Primary map



X Index: 156



Y Index: 201

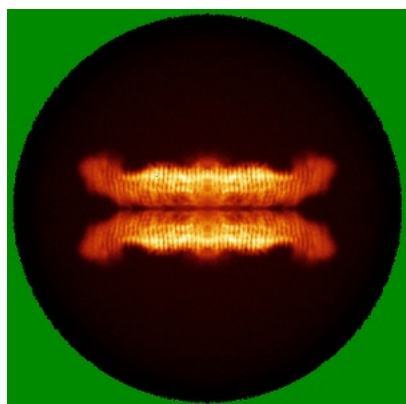


Z Index: 162

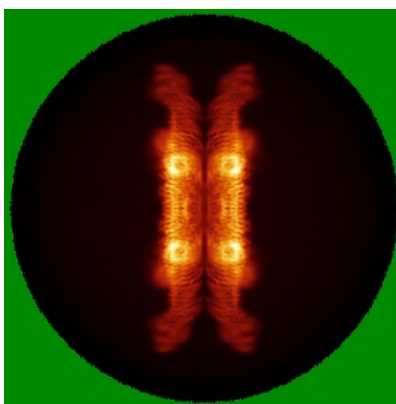
The images above show the largest variance slices of the map in three orthogonal directions.

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

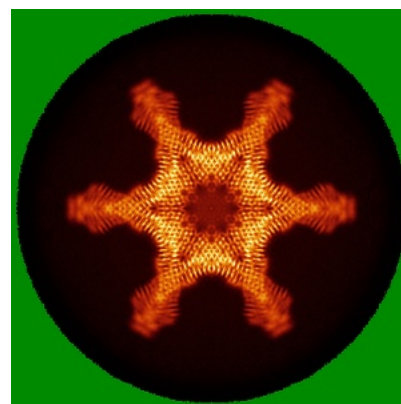
6.4.1 Primary map



X



Y

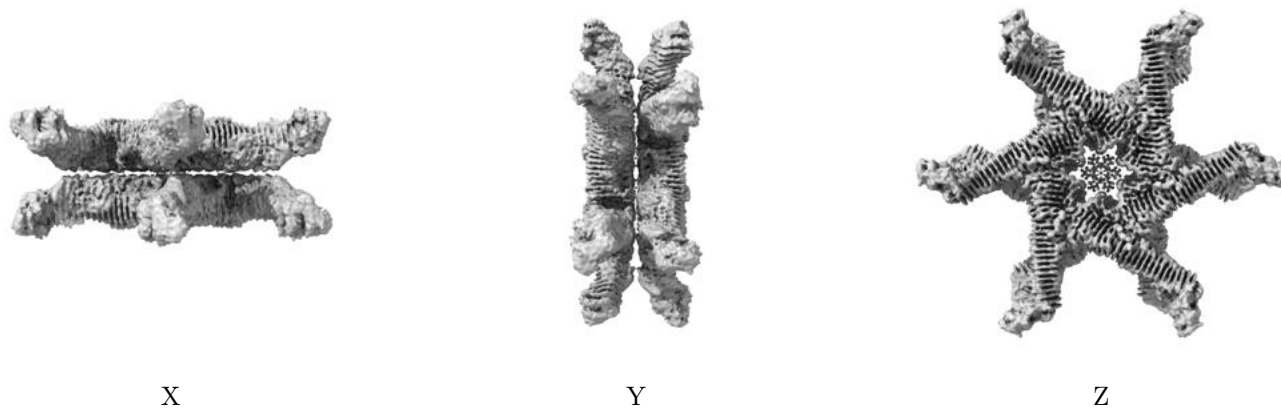


Z

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

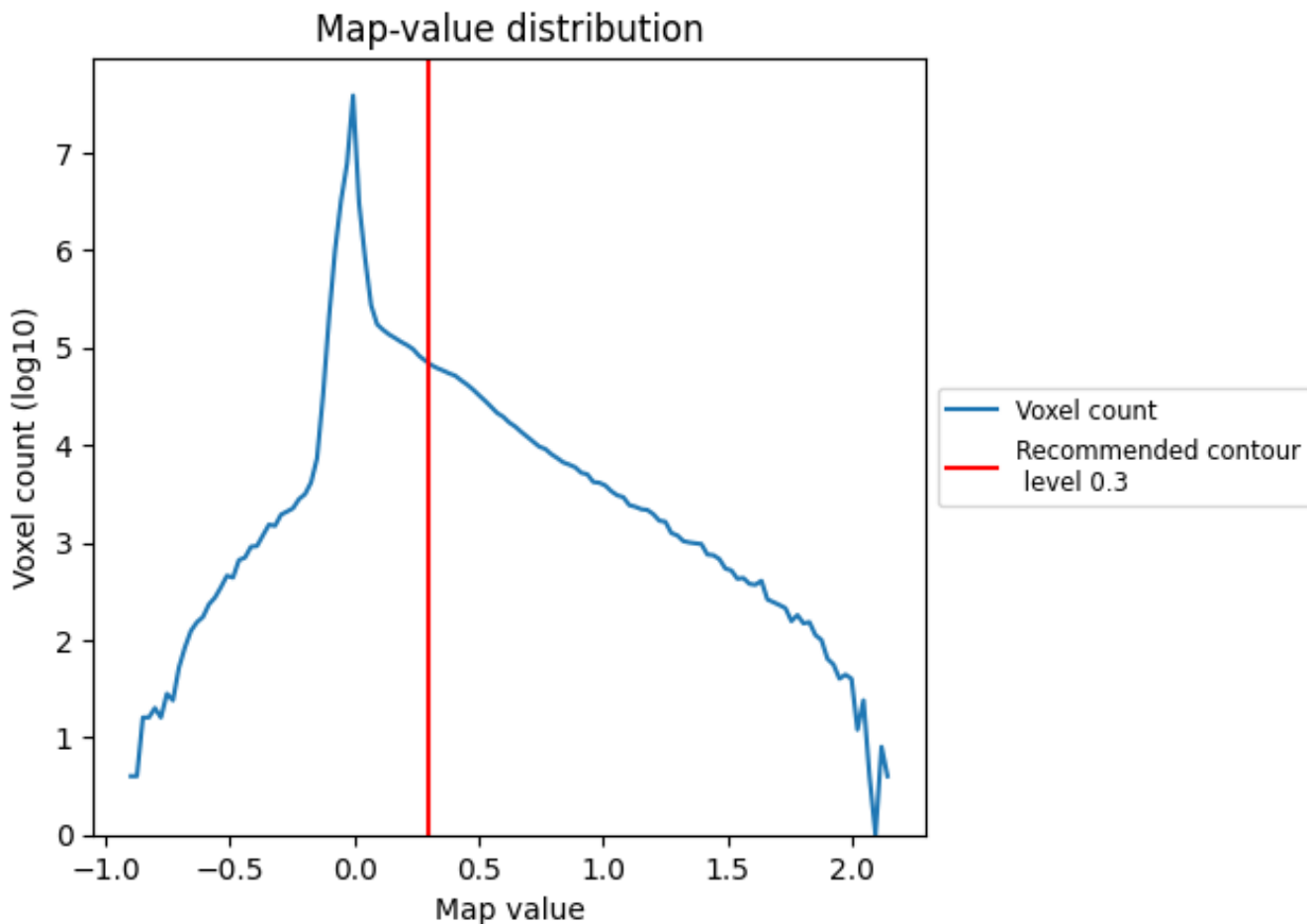
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

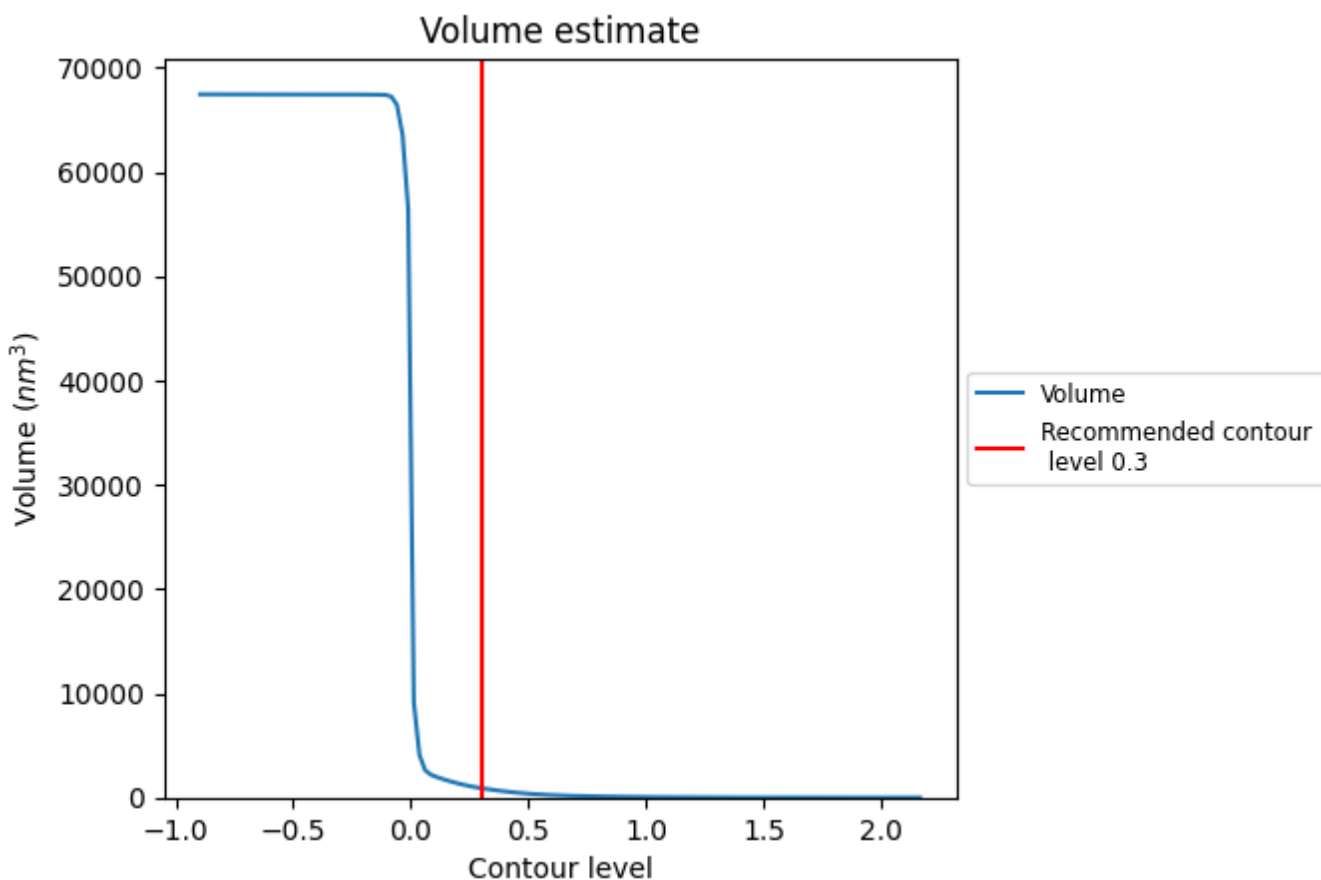
This section contains the results of statistical analysis of the map.

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.

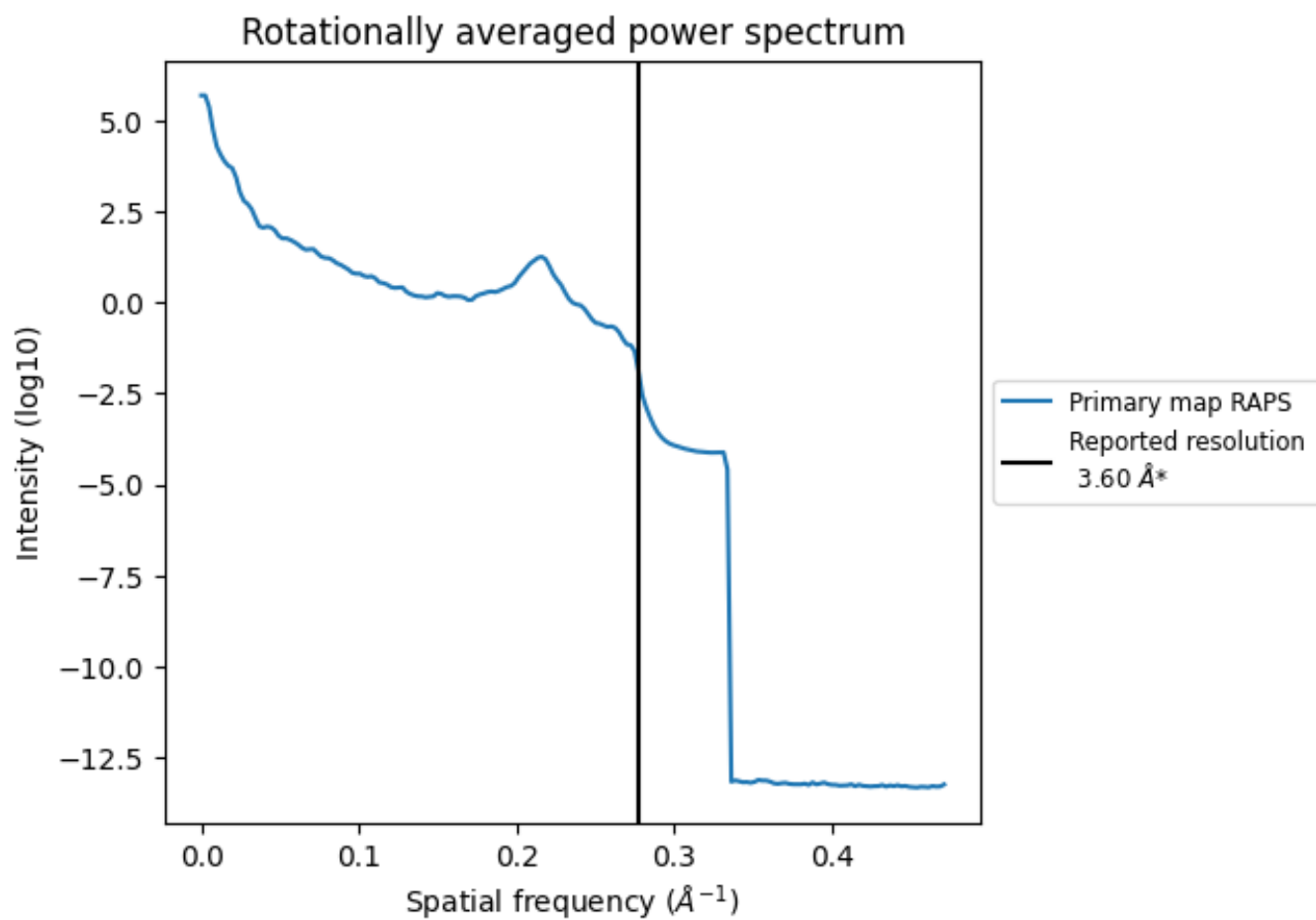
7.2 Volume estimate [\(i\)](#)



The volume at the recommended contour level is 895 nm³; this corresponds to an approximate mass of 809 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 0.278 Å⁻¹

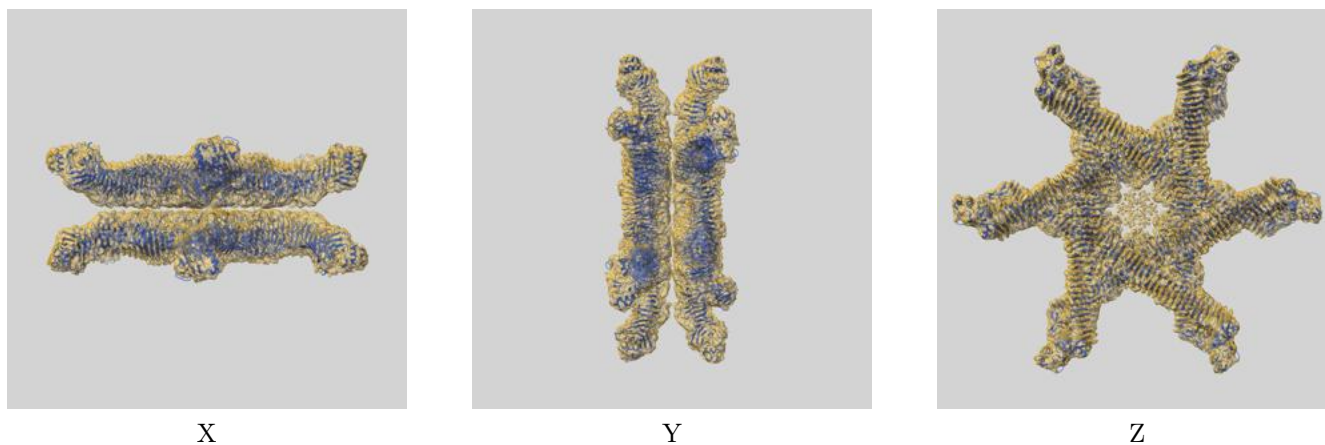
8 Fourier-Shell correlation

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

9 Map-model fit [i](#)

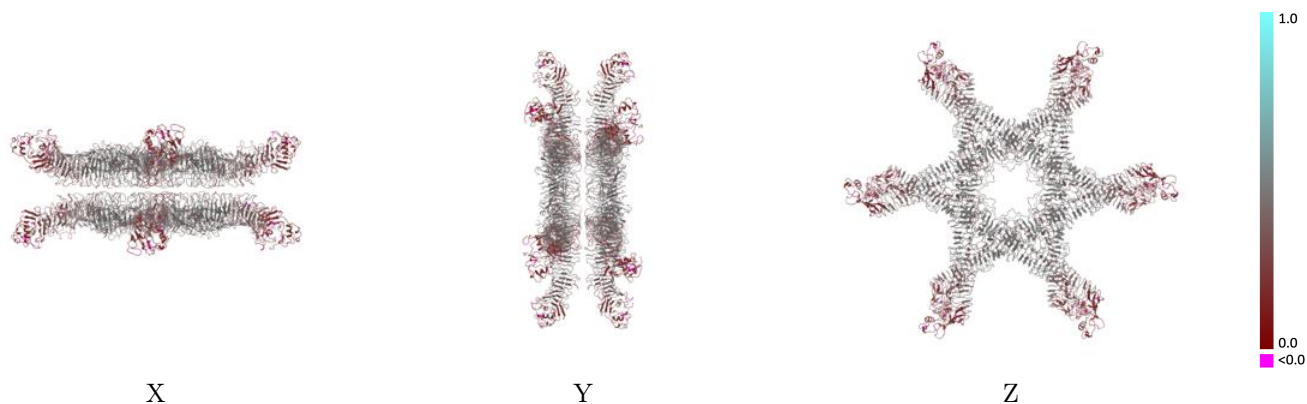
This section contains information regarding the fit between EMDB map EMD-0546 and PDB model 6NYM. Per-residue inclusion information can be found in section [3](#) on page [5](#).

9.1 Map-model overlay [i](#)



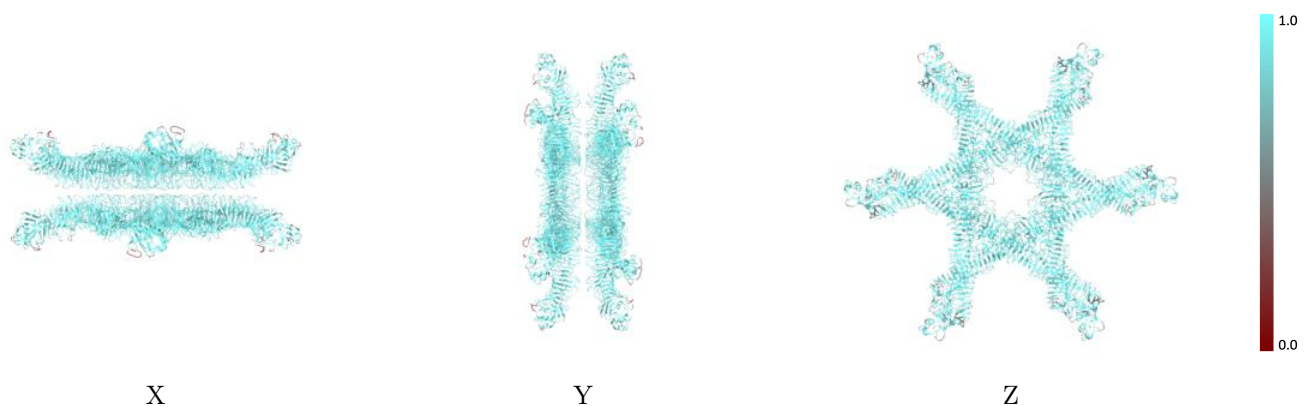
The images above show the 3D surface view of the map at the recommended contour level 0.3 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



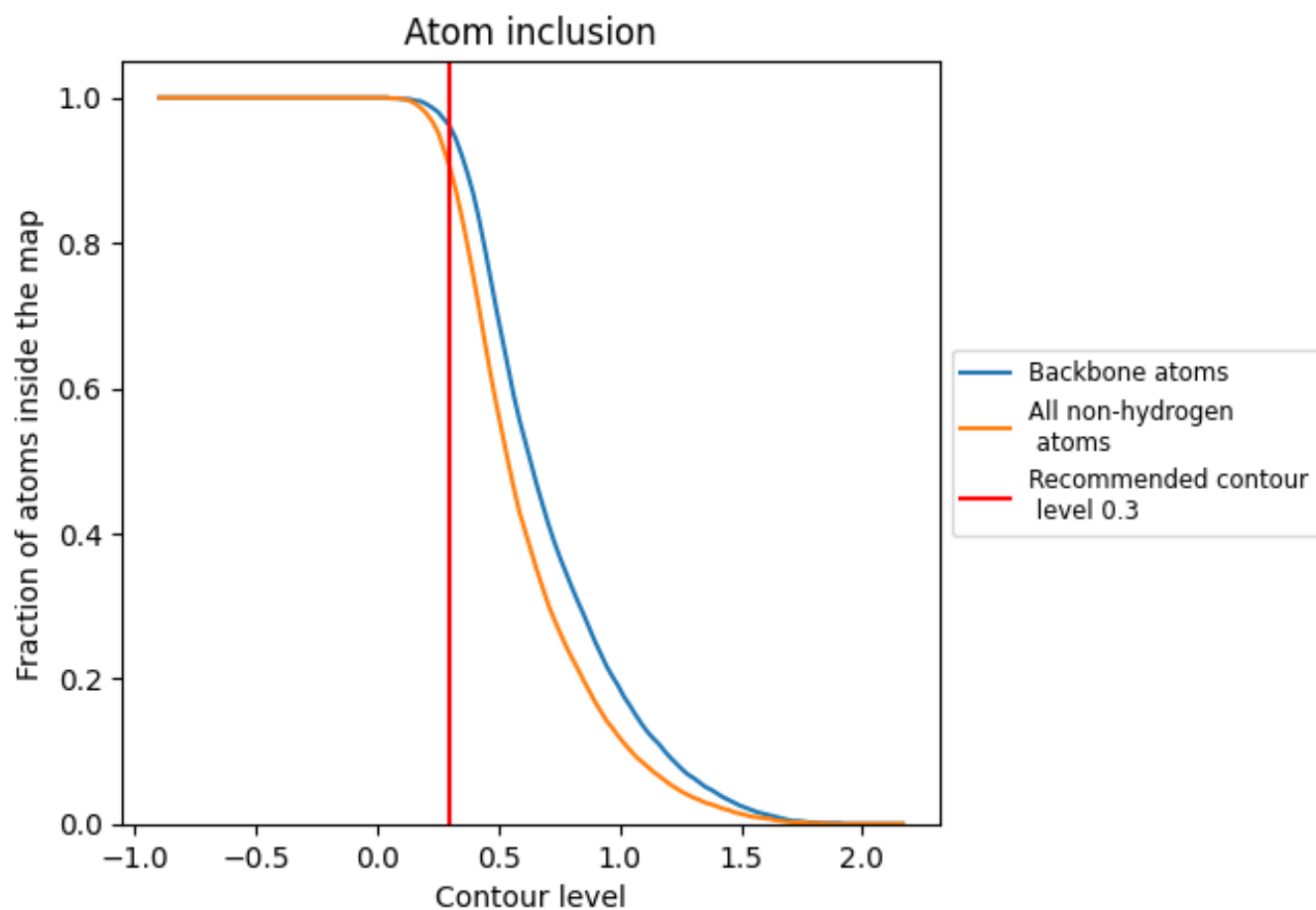
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.3).



























9.4 Atom inclusion [i](#)



At the recommended contour level, 96% of all backbone atoms, 90% 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 (0.3) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.9050	 0.3620
A	 0.9040	 0.3650
B	 0.9010	 0.3620
C	 0.9060	 0.3600
D	 0.9060	 0.3630
E	 0.9040	 0.3610
F	 0.9060	 0.3640
G	 0.9030	 0.3630
H	 0.9030	 0.3600
I	 0.9070	 0.3620
J	 0.9070	 0.3630
K	 0.9030	 0.3610
L	 0.9060	 0.3630

