



Full wwPDB EM Validation Report ⓘ

Mar 9, 2026 – 10:24 AM UTC

PDB ID : 4V2T / pdb_00004v2t
EMDB ID : EMD-2793
Title : Membrane embedded pleurotolysin pore with 13 fold symmetry
Authors : Lukyanova, N.; Kondos, S.C.; Farabella, I.; Law, R.H.P.; Reboul, C.F.; Caradoc-Davies, T.T.; Spicer, B.A.; Kleifeld, O.; Perugini, M.; Ekkel, S.; Hatfaludi, T.; Oliver, K.; Hotze, E.M.; Tweten, R.K.; Whisstock, J.C.; Topf, M.; Dunstone, M.A.; Saibil, H.R.
Deposited on : 2014-10-15
Resolution : 11.00 Å(reported)
Based on initial model : 4OEB

This is a Full wwPDB EM Validation 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.dev132
MolProbity : 4-5-2 with Phenix2.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

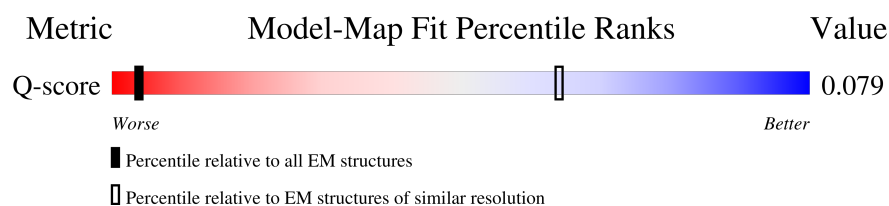
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

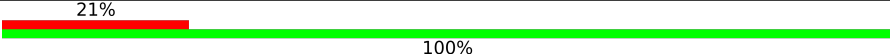
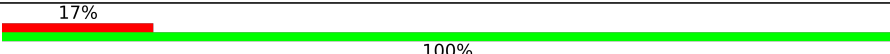
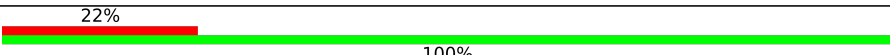
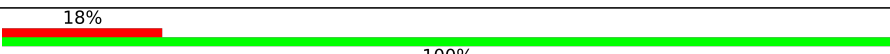
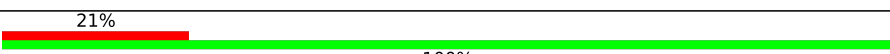
The reported resolution of this entry is 11.00 Å.

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



Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	229148	23984	-
Q-score	-	25397	97 (10.50 - 11.50)

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	0	135	 15% 100%
1	2	135	 21% 100%
1	3	135	 17% 100%
1	5	135	 22% 100%
1	6	135	 18% 100%
1	8	135	 21% 100%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain	
1	9	135	17%	100%
1	B	135	20%	100%
1	C	135	16%	100%
1	E	135	21%	100%
1	F	135	16%	100%
1	H	135	21%	100%
1	I	135	16%	100%
1	K	135	20%	100%
1	L	135	14%	100%
1	N	135	19%	100%
1	O	135	15%	100%
1	Q	135	21%	100%
1	R	135	15%	100%
1	T	135	21%	100%
1	U	135	15%	100%
1	W	135	22%	100%
1	X	135	15%	100%
1	Z	135	23%	100%
1	b	135	20%	100%
1	c	135	17%	100%
2	1	474	5%	100%
2	4	474	5%	100%
2	7	474	5%	100%
2	D	474	6%	100%
2	G	474	5%	100%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
2	J	474	5% 100%
2	M	474	5% 100%
2	P	474	6% 100%
2	S	474	6% 100%
2	V	474	5% 100%
2	Y	474	6% 100%
2	a	474	5% 100%
3	A	475	5% 100%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 9673 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 PLEUROTOLYSIN A.

Mol	Chain	Residues	Atoms	AltConf	Trace
1	0	135	Total C 135 135	0	135
1	2	135	Total C 135 135	0	135
1	3	135	Total C 135 135	0	135
1	5	135	Total C 135 135	0	135
1	6	135	Total C 135 135	0	135
1	8	135	Total C 135 135	0	135
1	9	135	Total C 135 135	0	135
1	B	135	Total C 135 135	0	135
1	C	135	Total C 135 135	0	135
1	E	135	Total C 135 135	0	135
1	F	135	Total C 135 135	0	135
1	H	135	Total C 135 135	0	135
1	I	135	Total C 135 135	0	135
1	K	135	Total C 135 135	0	135
1	L	135	Total C 135 135	0	135
1	N	135	Total C 135 135	0	135
1	O	135	Total C 135 135	0	135

Continued on next page...

Continued from previous page...

Mol	Chain	Residues	Atoms	AltConf	Trace
1	Q	135	Total C 135 135	0	135
1	R	135	Total C 135 135	0	135
1	T	135	Total C 135 135	0	135
1	U	135	Total C 135 135	0	135
1	W	135	Total C 135 135	0	135
1	X	135	Total C 135 135	0	135
1	Z	135	Total C 135 135	0	135
1	b	135	Total C 135 135	0	135
1	c	135	Total C 135 135	0	135

- Molecule 2 is a protein called PLEUROTOLYSIN B.

Mol	Chain	Residues	Atoms	AltConf	Trace
2	1	474	Total C 474 474	0	474
2	4	474	Total C 474 474	0	474
2	7	474	Total C 474 474	0	474
2	D	474	Total C 474 474	0	474
2	G	474	Total C 474 474	0	474
2	J	474	Total C 474 474	0	474
2	M	474	Total C 474 474	0	474
2	P	474	Total C 474 474	0	474
2	S	474	Total C 474 474	0	474
2	V	474	Total C 474 474	0	474

Continued on next page...

Continued from previous page...

Mol	Chain	Residues	Atoms	AltConf	Trace
2	Y	474	Total C 474 474	0	474
2	a	474	Total C 474 474	0	474

- Molecule 3 is a protein called PLEUROTOLYSIN B.

Mol	Chain	Residues	Atoms	AltConf	Trace
3	A	475	Total C 475 475	0	475

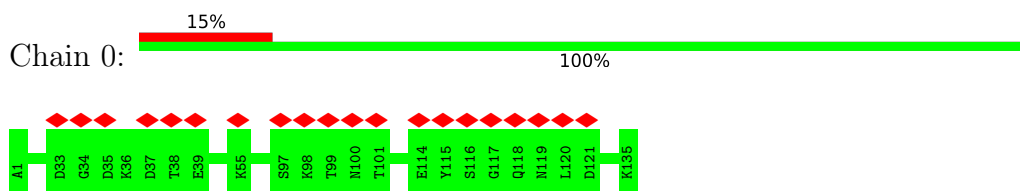
There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	SER	-	expression tag	UNP Q5W9E8

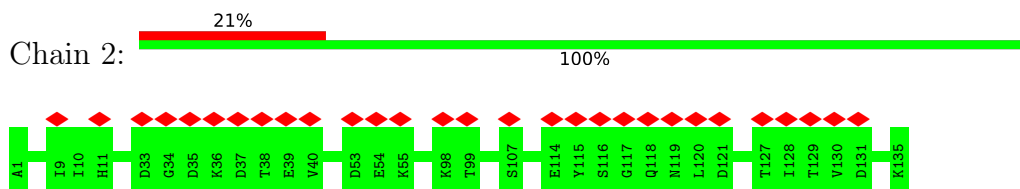
3 Residue-property plots [i](#)

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.

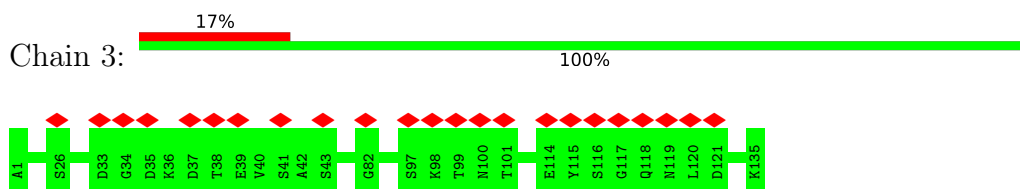
- Molecule 1: PLEUROTOLYSIN A



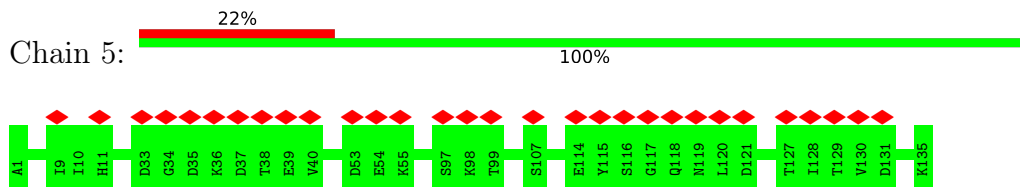
- Molecule 1: PLEUROTOLYSIN A



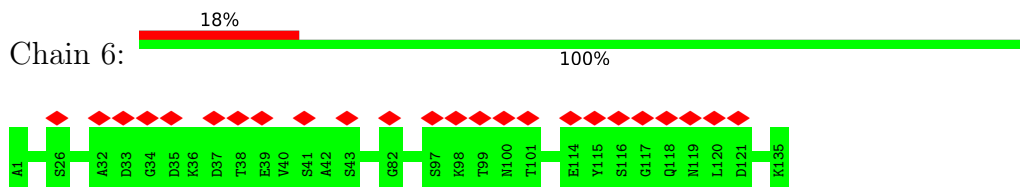
- Molecule 1: PLEUROTOLYSIN A



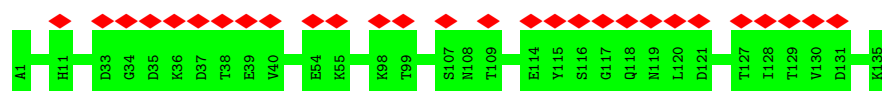
- Molecule 1: PLEUROTOLYSIN A



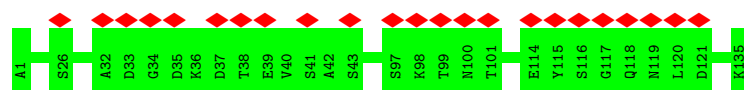
- Molecule 1: PLEUROTOLYSIN A



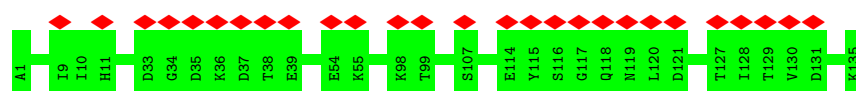
- Molecule 1: PLEUROTOLYSIN A



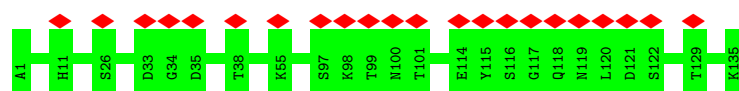
- Molecule 1: PLEUROTOLYSIN A



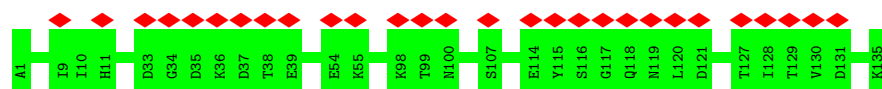
- Molecule 1: PLEUROTOLYSIN A



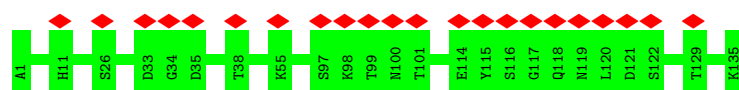
- Molecule 1: PLEUROTOLYSIN A



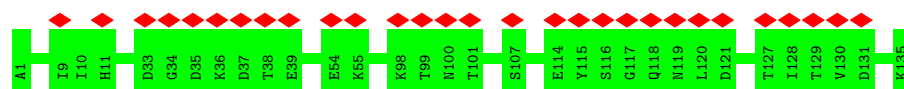
- Molecule 1: PLEUROTOLYSIN A



- Molecule 1: PLEUROTOLYSIN A

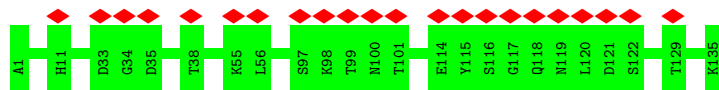


- Molecule 1: PLEUROTOLYSIN A



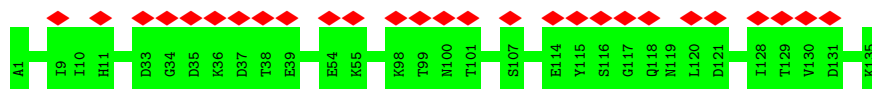
● Molecule 1: PLEUROTOLYSIN A

Chain I:  16% 100%



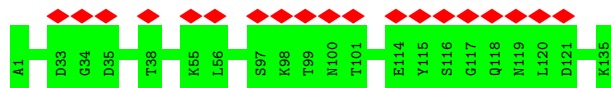
● Molecule 1: PLEUROTOLYSIN A

Chain K:  20% 100%



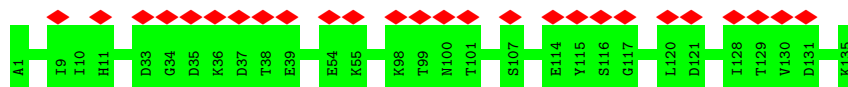
● Molecule 1: PLEUROTOLYSIN A

Chain L:  14% 100%



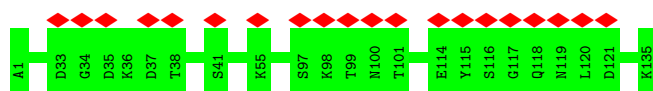
● Molecule 1: PLEUROTOLYSIN A

Chain N:  19% 100%



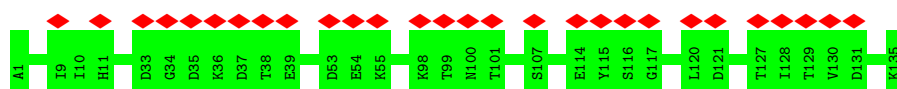
● Molecule 1: PLEUROTOLYSIN A

Chain O:  15% 100%



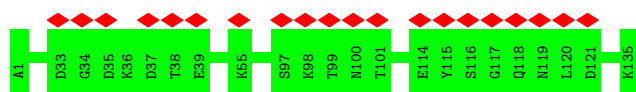
● Molecule 1: PLEUROTOLYSIN A

Chain Q:  21% 100%

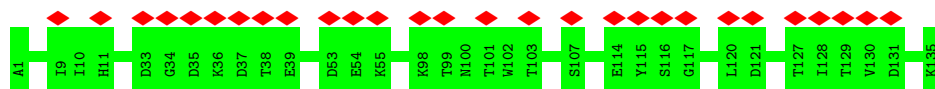


● Molecule 1: PLEUROTOLYSIN A

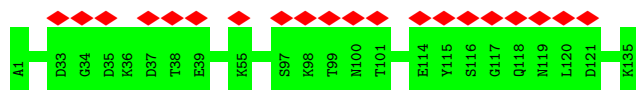
Chain R:  15% 100%



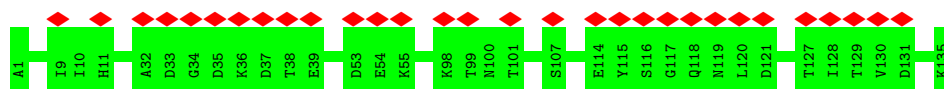
• Molecule 1: PLEUROTOLYSIN A



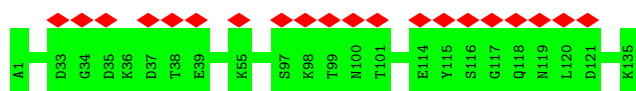
• Molecule 1: PLEUROTOLYSIN A



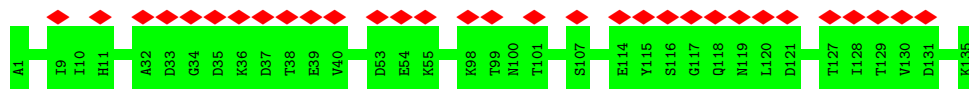
• Molecule 1: PLEUROTOLYSIN A



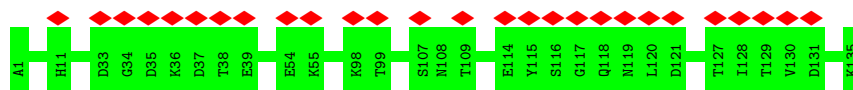
• Molecule 1: PLEUROTOLYSIN A



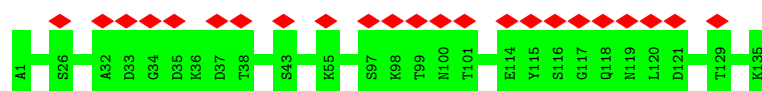
• Molecule 1: PLEUROTOLYSIN A



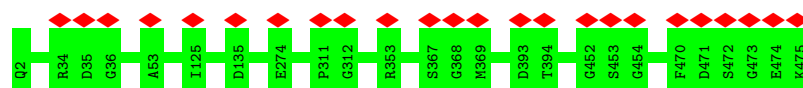
• Molecule 1: PLEUROTOLYSIN A



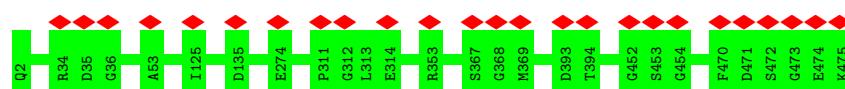
• Molecule 1: PLEUROTOLYSIN A



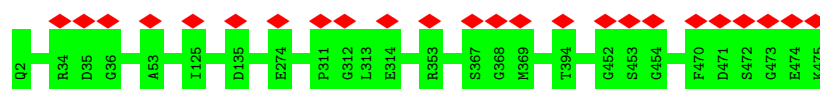
• Molecule 2: PLEUROTOLYSIN B



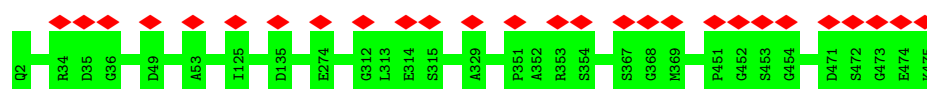
• Molecule 2: PLEUROTOLYSIN B



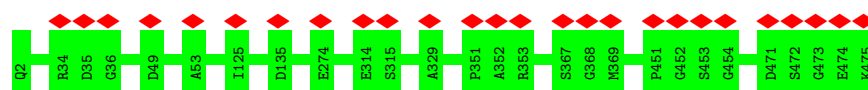
• Molecule 2: PLEUROTOLYSIN B



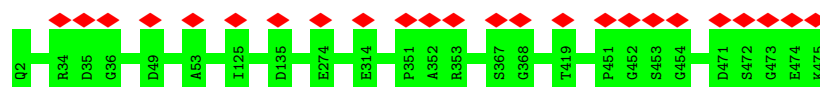
• Molecule 2: PLEUROTOLYSIN B



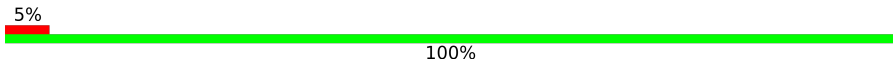
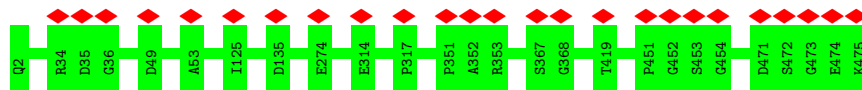
• Molecule 2: PLEUROTOLYSIN B



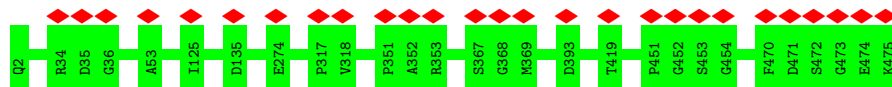
• Molecule 2: PLEUROTOLYSIN B



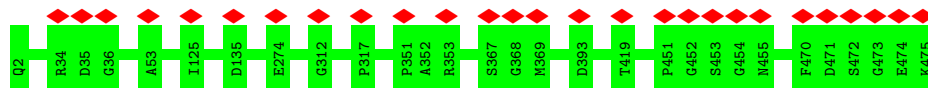
● Molecule 2: PLEUROTOLYSIN B

Chain M:  5% 100%

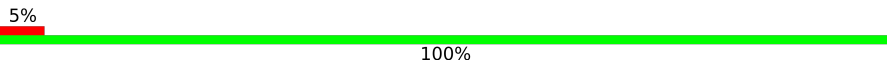
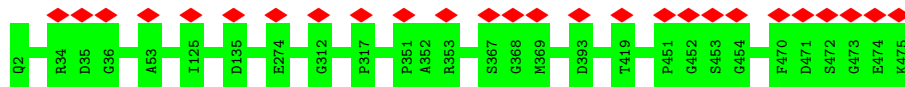
● Molecule 2: PLEUROTOLYSIN B

Chain P:  6% 100%

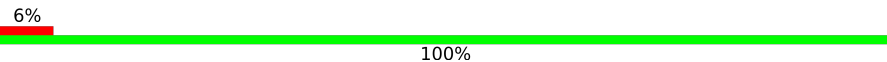
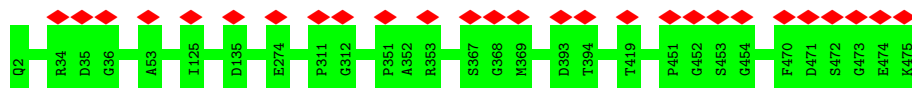
● Molecule 2: PLEUROTOLYSIN B

Chain S:  6% 100%

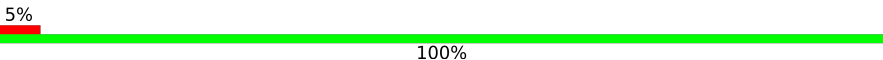
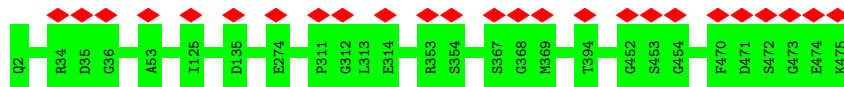
● Molecule 2: PLEUROTOLYSIN B

Chain V:  5% 100%

● Molecule 2: PLEUROTOLYSIN B

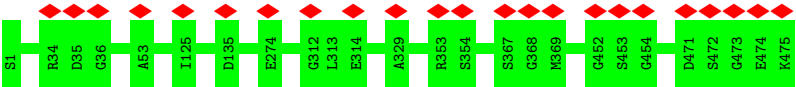
Chain Y:  6% 100%

● Molecule 2: PLEUROTOLYSIN B

Chain a:  5% 100%

● Molecule 3: PLEUROTOLYSIN B

Chain A:  5% 100%



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C13	Depositor
Number of particles used	8700	Depositor
Resolution determination method	Not provided	
CTF correction method	ESTIMATED WITH CTFFIND3, THEN PHASES FLIPPED FOR EACH PARTICLE	Depositor
Microscope	FEI POLARA 300	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	25	Depositor
Minimum defocus (nm)	800	Depositor
Maximum defocus (nm)	3200	Depositor
Magnification	76148	Depositor
Image detector	GATAN ULTRASCAN 4000 (4k x 4k)	Depositor
Maximum map value	4.100	Depositor
Minimum map value	-3.042	Depositor
Average map value	0.007	Depositor
Map value standard deviation	0.316	Depositor
Recommended contour level	0.25	Depositor
Map size ($\text{\AA}$)	400.0, 400.0, 400.0	wwPDB
Map dimensions	200, 200, 200	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing ($\text{\AA}$)	2.0, 2.0, 2.0	Depositor

5 Model quality [i](#)

5.1 Standard geometry [i](#)

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

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

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	0	135	0	0	0	0
1	2	135	0	0	0	0
1	3	135	0	0	0	0
1	5	135	0	0	0	0
1	6	135	0	0	0	0
1	8	135	0	0	0	0
1	9	135	0	0	0	0
1	B	135	0	0	0	0
1	C	135	0	0	0	0
1	E	135	0	0	0	0
1	F	135	0	0	0	0
1	H	135	0	0	0	0
1	I	135	0	0	0	0
1	K	135	0	0	0	0
1	L	135	0	0	0	0
1	N	135	0	0	0	0
1	O	135	0	0	0	0
1	Q	135	0	0	0	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	R	135	0	0	0	0
1	T	135	0	0	0	0
1	U	135	0	0	0	0
1	W	135	0	0	0	0
1	X	135	0	0	0	0
1	Z	135	0	0	0	0
1	b	135	0	0	0	0
1	c	135	0	0	0	0
2	1	474	0	0	0	0
2	4	474	0	0	0	0
2	7	474	0	0	0	0
2	D	474	0	0	0	0
2	G	474	0	0	0	0
2	J	474	0	0	0	0
2	M	474	0	0	0	0
2	P	474	0	0	0	0
2	S	474	0	0	0	0
2	V	474	0	0	0	0
2	Y	474	0	0	0	0
2	a	474	0	0	0	0
3	A	475	0	0	0	0
All	All	9673	0	0	0	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 0.

There are no clashes within the asymmetric unit.

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

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

5.3.2 Protein sidechains [i](#)

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

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-2793. 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: 100



Y Index: 100



Z Index: 100

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: 79



Y Index: 120



Z Index: 83

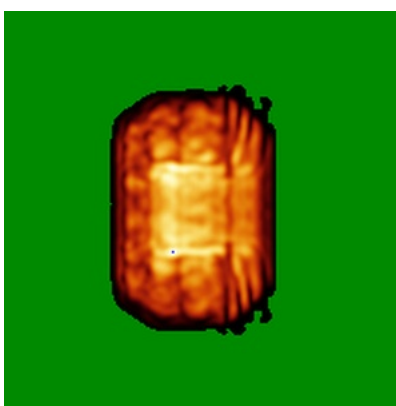
The images above show the largest variance slices of the map in three orthogonal directions.

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

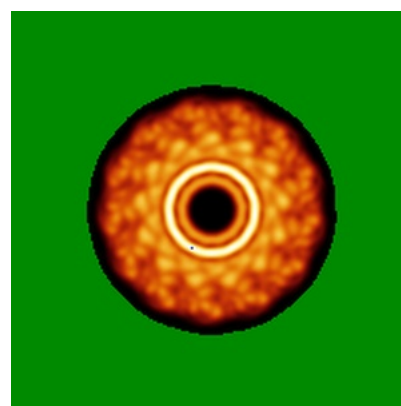
6.4.1 Primary map



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

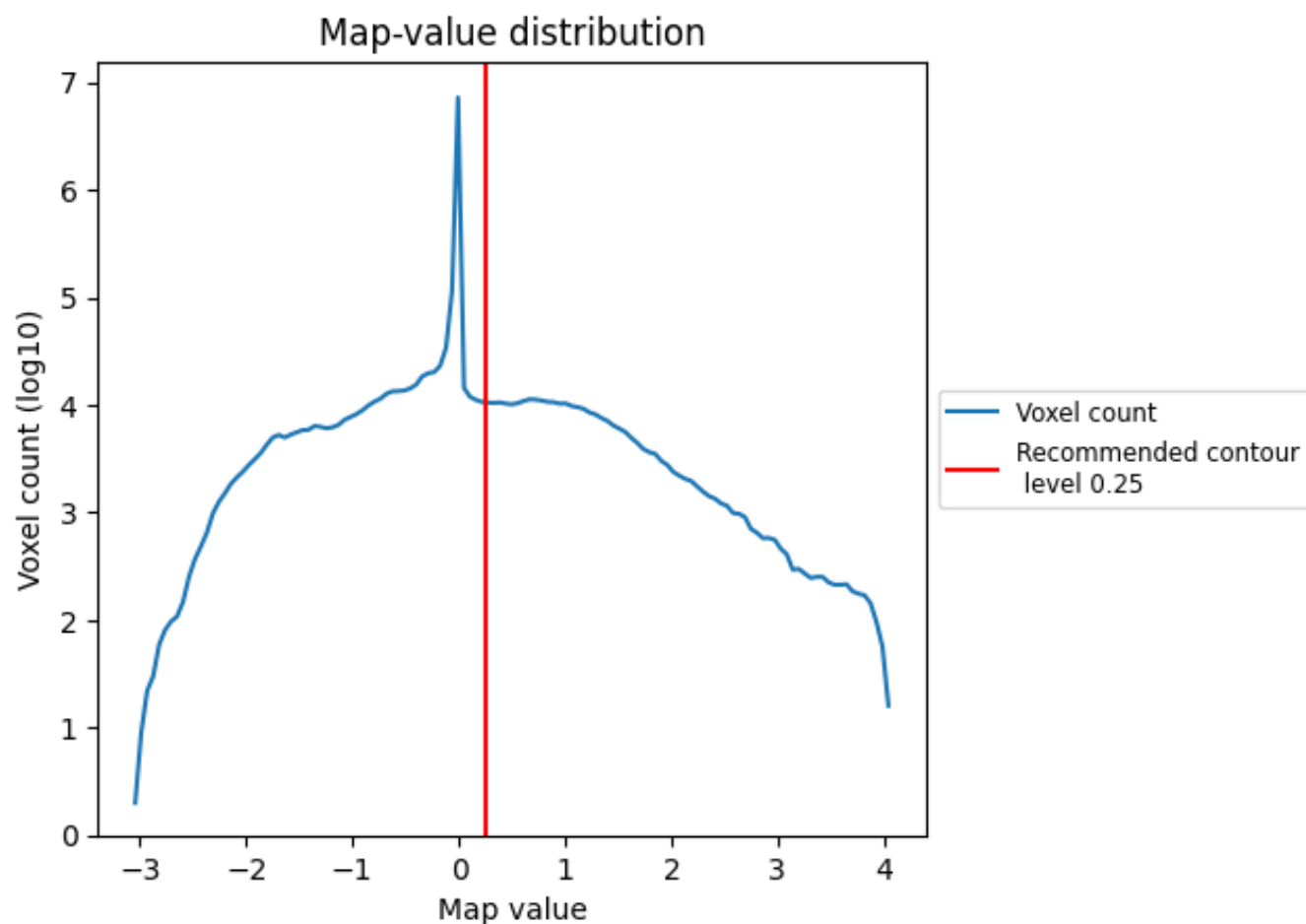
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

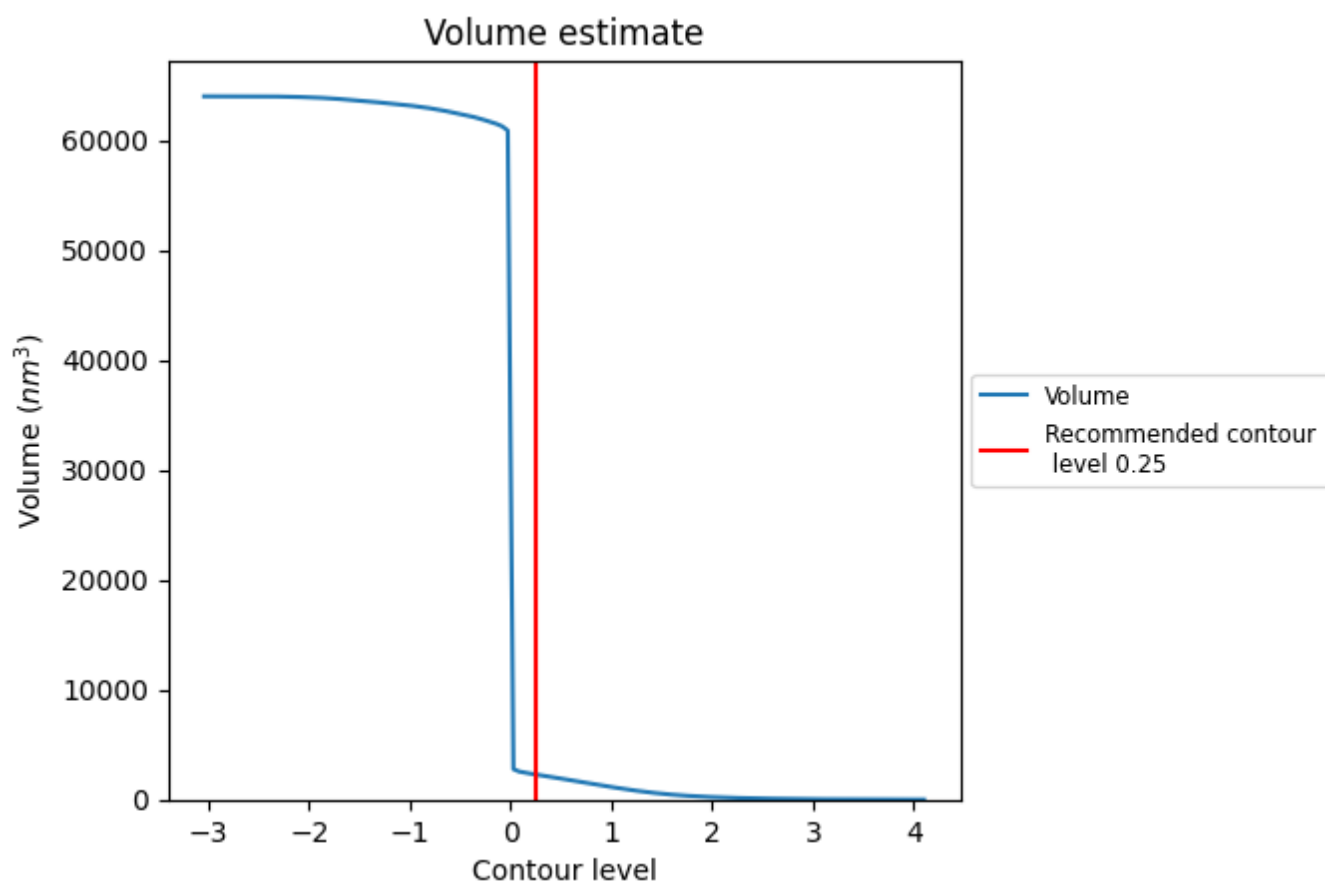
This section contains the results of statistical analysis of the map.

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.

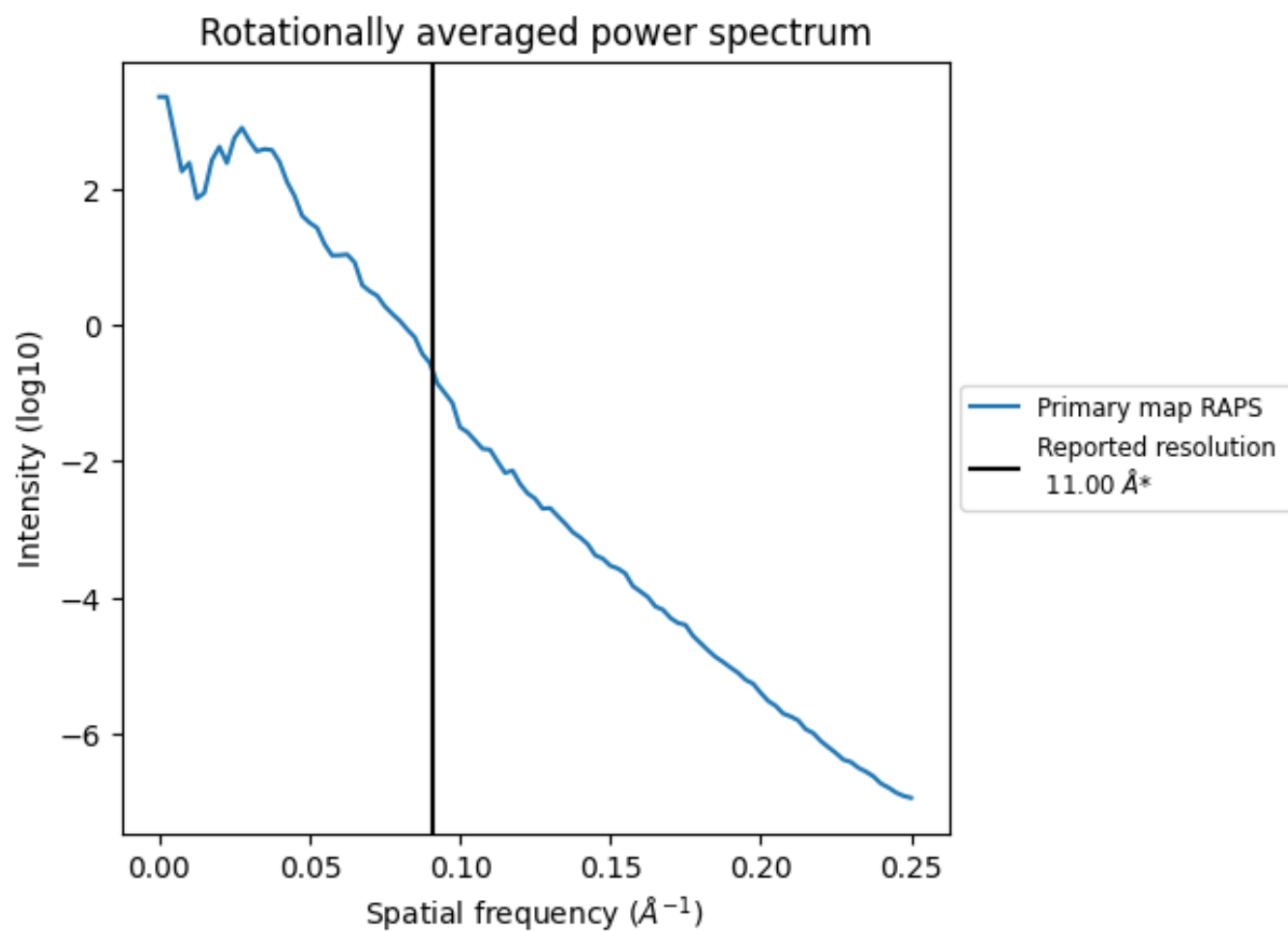
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 2276 nm³; this corresponds to an approximate mass of 2056 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 0.091 Å⁻¹

8 Fourier-Shell correlation ⓘ

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

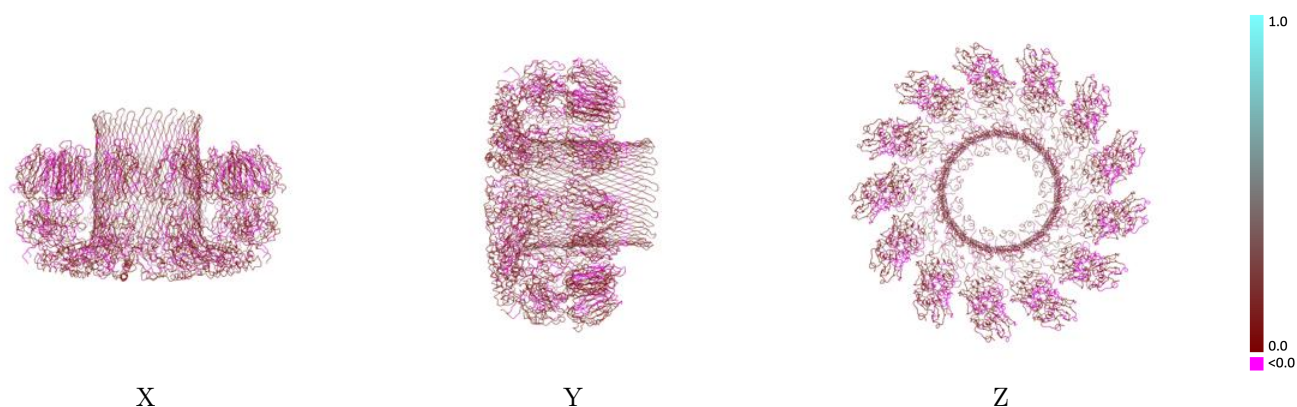
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-2793 and PDB model 4V2T. Per-residue inclusion information can be found in section 3 on page 8.

9.1 Map-model overlay [i](#)

This section was not generated.

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

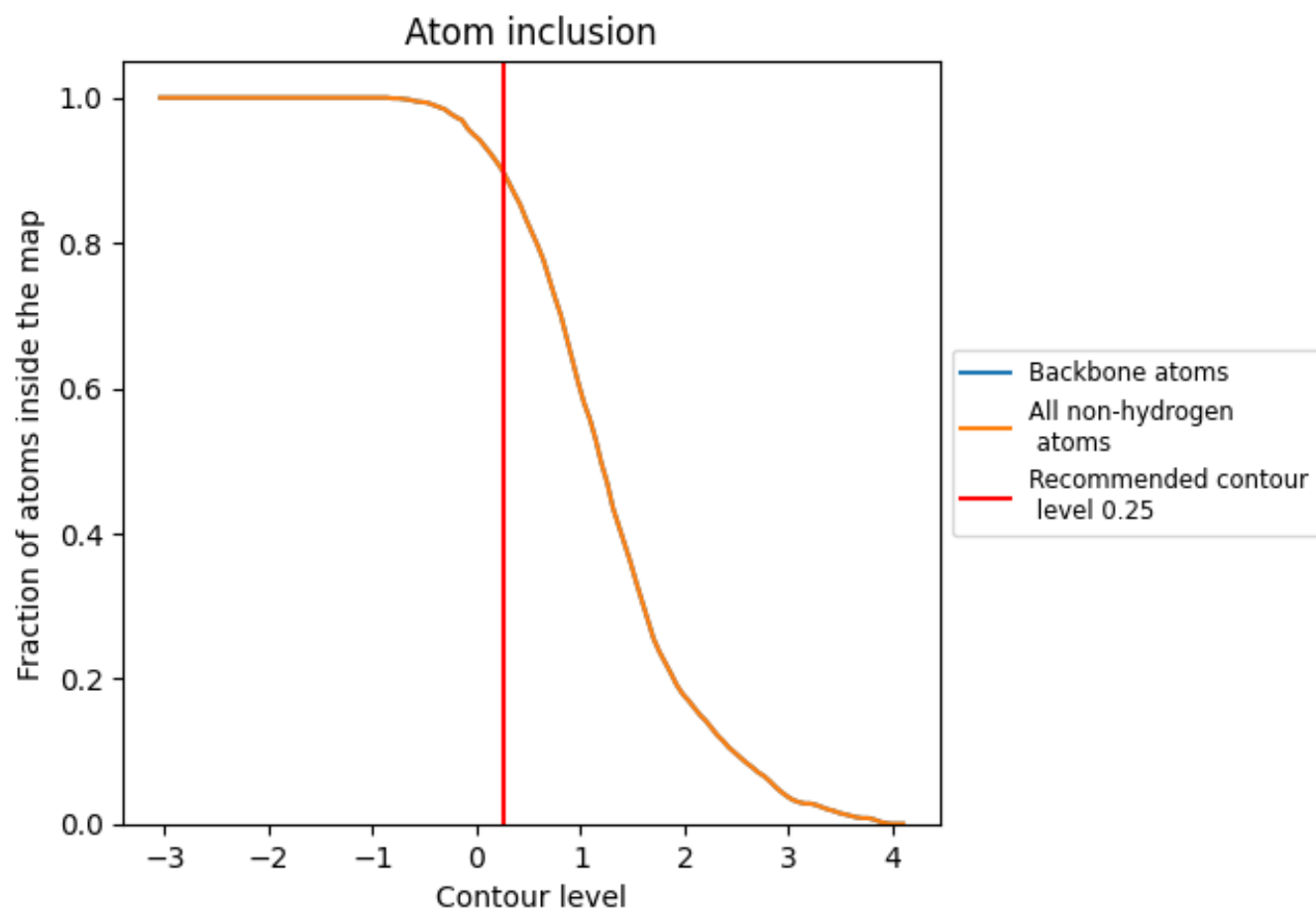


The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions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

This section was not generated.

9.4 Atom inclusion [i](#)



At the recommended contour level, 90% of all backbone atoms, 90% 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 (0.25) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.8990	 0.0790
0	 0.8520	 0.0580
1	 0.9490	 0.0920
2	 0.7850	 0.0300
3	 0.8300	 0.0610
4	 0.9470	 0.0950
5	 0.7780	 0.0290
6	 0.8220	 0.0580
7	 0.9490	 0.0920
8	 0.7930	 0.0390
9	 0.8300	 0.0550
A	 0.9520	 0.0970
B	 0.8000	 0.0480
C	 0.8370	 0.0530
D	 0.9430	 0.0960
E	 0.7930	 0.0540
F	 0.8370	 0.0520
G	 0.9450	 0.1000
H	 0.7850	 0.0600
I	 0.8370	 0.0470
J	 0.9490	 0.1000
K	 0.8000	 0.0600
L	 0.8590	 0.0440
M	 0.9470	 0.0990
N	 0.8070	 0.0550
O	 0.8520	 0.0470
P	 0.9430	 0.1010
Q	 0.7930	 0.0520
R	 0.8520	 0.0470
S	 0.9430	 0.0930
T	 0.7930	 0.0490
U	 0.8520	 0.0520
V	 0.9450	 0.0930
W	 0.7780	 0.0400
X	 0.8520	 0.0550



Continued on next page...

Continued from previous page...

Chain	Atom inclusion	Q-score
Y	 0.9430	 0.0920
Z	 0.7700	 0.0320
a	 0.9470	 0.0950
b	 0.8000	 0.0440
c	 0.8300	 0.0540