



wwPDB EM Validation Summary Report ⓘ

Oct 5, 2025 – 09:59 am BST

PDB ID : 9R86 / pdb_00009r86
EMDB ID : EMD-53805
Title : Major Vault Protein from Human Brain
Authors : Lovestam, S.L.; Scheres, S.H.W.
Deposited on : 2025-05-15
Resolution : 3.10 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.dev129
MolProbity : 4-5-2 with Phenix2.0
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
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) : 2.46

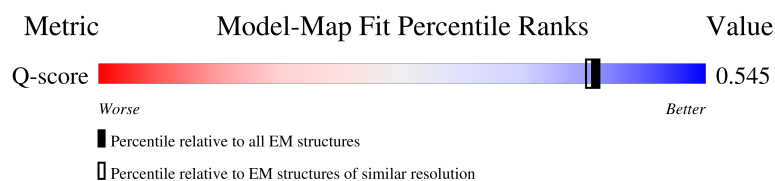
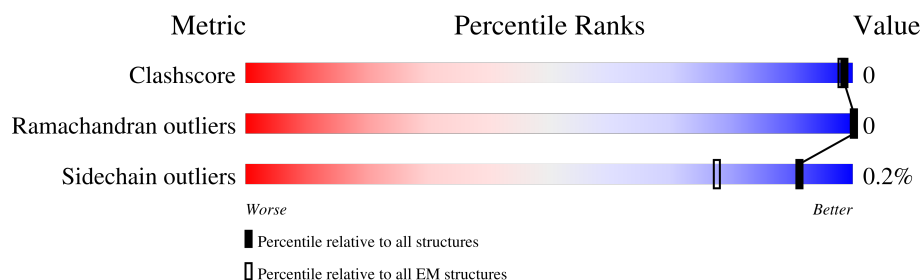
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.10 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.



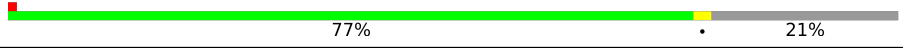
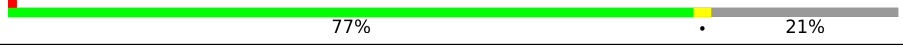
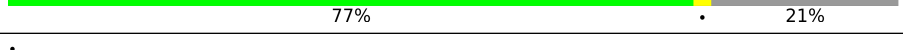
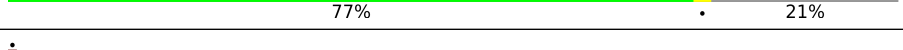
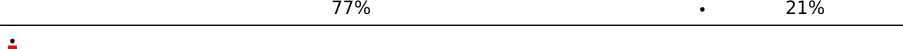
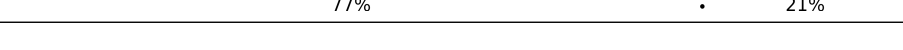
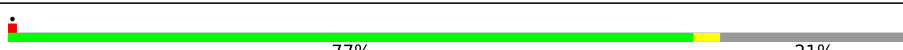
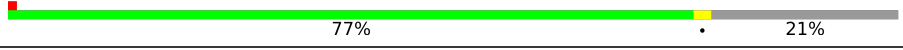
Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	210492	15764	-
Ramachandran outliers	207382	16835	-
Sidechain outliers	206894	16415	-
Q-score	-	25397	14724 (2.60 - 3.60)

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	A0	893	 78% 21%
1	A1	893	 77% 21%
1	A2	893	 77% 21%
1	A3	893	 77% 21%

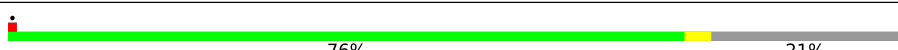
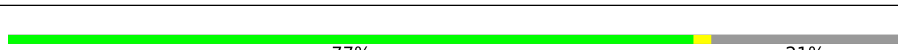
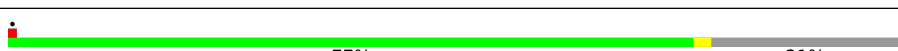
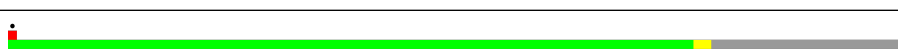
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Mol	Chain	Length	Quality of chain
1	A4	893	
1	A5	893	
1	A6	893	
1	A7	893	
1	A8	893	
1	A9	893	
1	Ac	893	
1	Ad	893	
1	Ae	893	
1	Af	893	
1	Ag	893	
1	Ah	893	
1	Ai	893	
1	Aj	893	
1	Ak	893	
1	Al	893	
1	Am	893	
1	An	893	
1	Ap	893	
1	Aq	893	
1	Ar	893	
1	As	893	
1	At	893	
1	Au	893	
1	Av	893	

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Mol	Chain	Length	Quality of chain
1	Aw	893	 77%21%
1	Ax	893	 77%21%
1	Ay	893	 77%21%
1	Az	893	 78%21%
1	BA	893	 77%21%
1	BB	893	 76%21%
1	BC	893	 77%21%
1	BD	893	 77%21%
1	BE	893	 77%21%
1	BF	893	 77%21%

2 Entry composition [i](#)

There is only 1 type of molecule in this entry. The entry contains 440774 atoms, of which 220502 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 Major vault protein.

Mol	Chain	Residues	Atoms						AltConf	Trace
1	A0	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	A1	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	A2	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	A3	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	A4	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	A5	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	A6	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	A7	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	A8	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	A9	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	Ac	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	Ad	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	Ae	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	Af	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	Ag	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	Ah	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	Ai	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0

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Mol	Chain	Residues	Atoms						AltConf	Trace
1	Aj	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	Ak	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	Al	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	Am	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	An	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	Ap	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	Aq	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	Ar	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	As	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	At	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	Au	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	Av	709	Total 11298	C 3548	H 5650	N 1015	O 1076	S 9	0	0
1	Aw	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	Ax	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	Ay	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	Az	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	BA	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	BB	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	BC	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	BD	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0
1	BE	709	Total 11302	C 3548	H 5654	N 1015	O 1076	S 9	0	0

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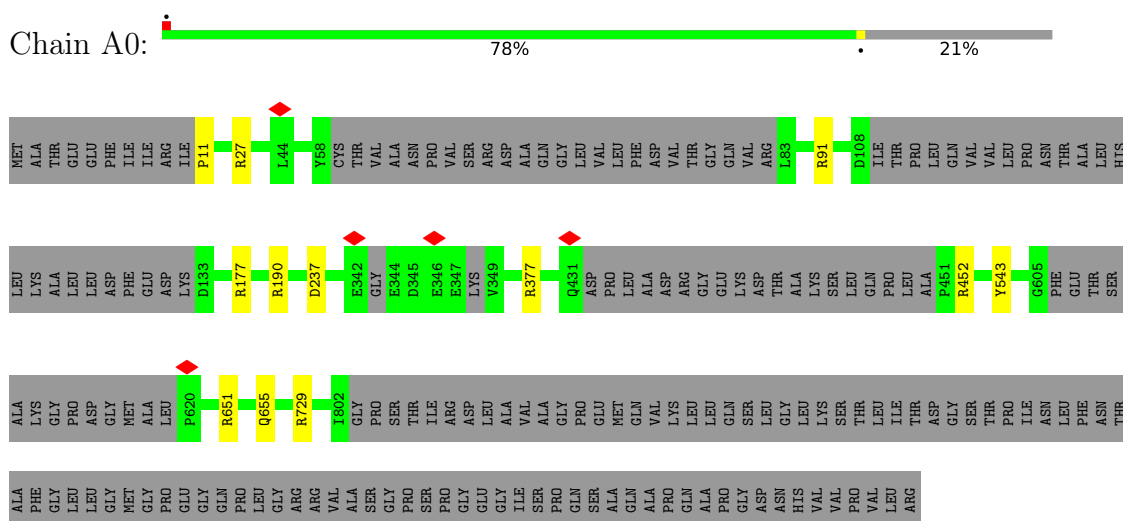
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Mol	Chain	Residues	Atoms						AltConf	Trace
1	BF	709	Total	C	H	N	O	S	0	0
			11302	3548	5654	1015	1076	9		

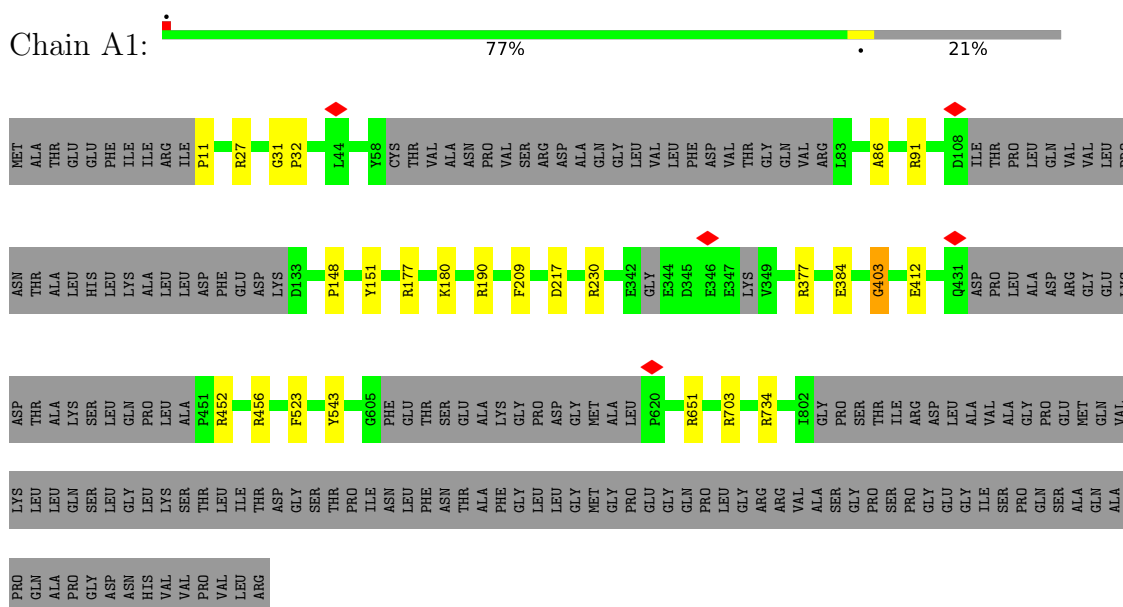
3 Residue-property plots

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.

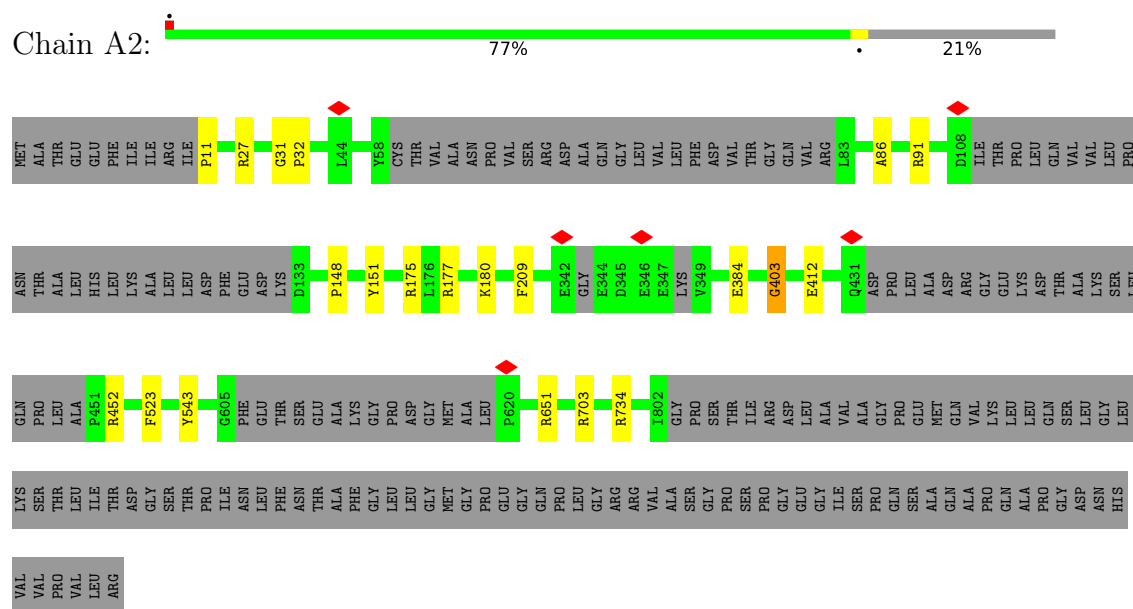
• Molecule 1: Major vault protein



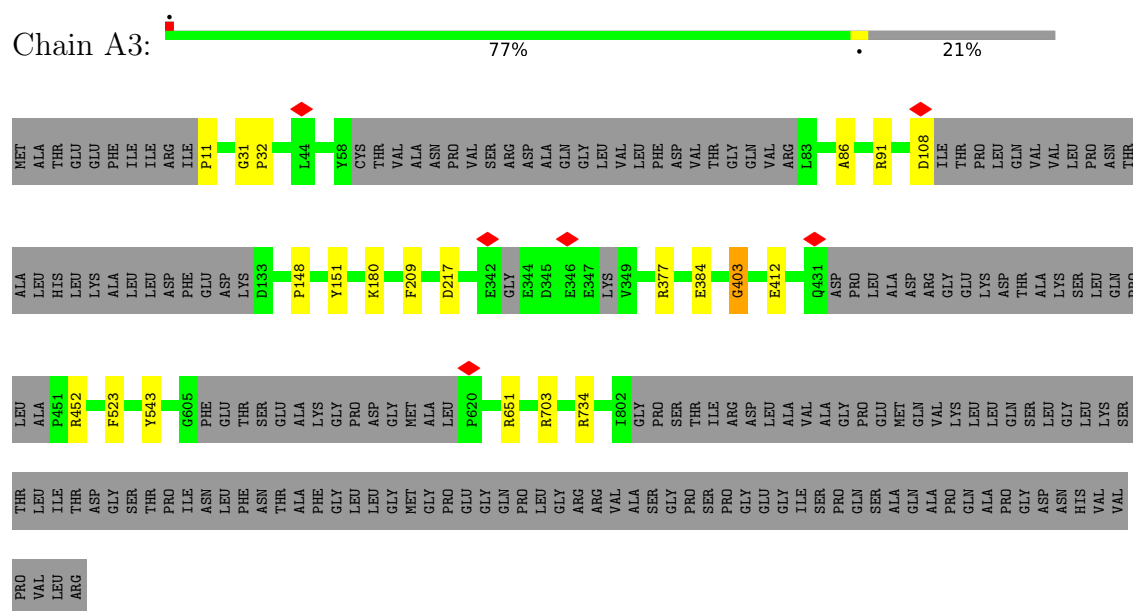
• Molecule 1: Major vault protein



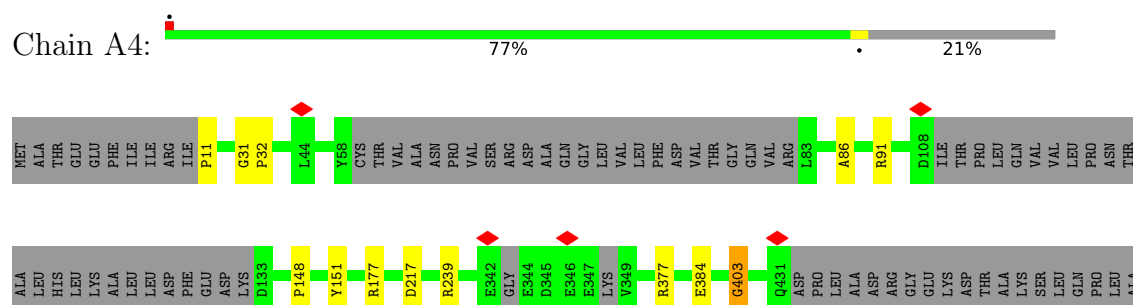
• Molecule 1: Major vault protein

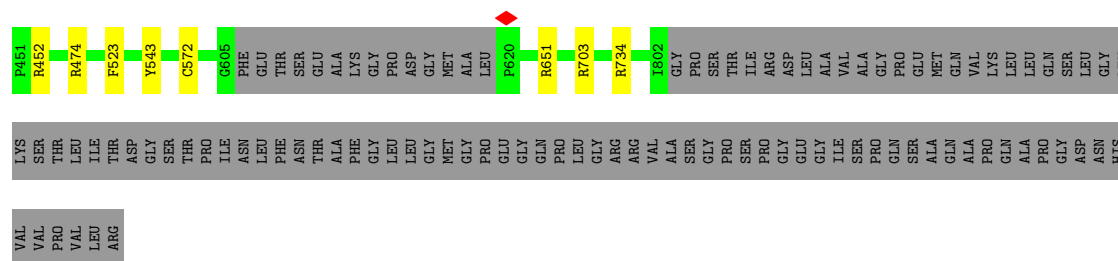


• Molecule 1: Major vault protein



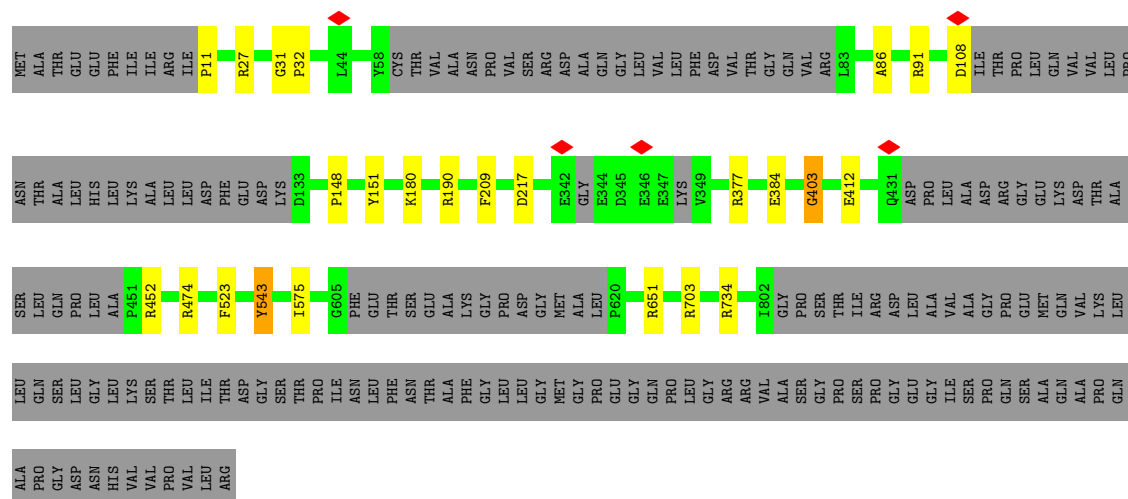
• Molecule 1: Major vault protein





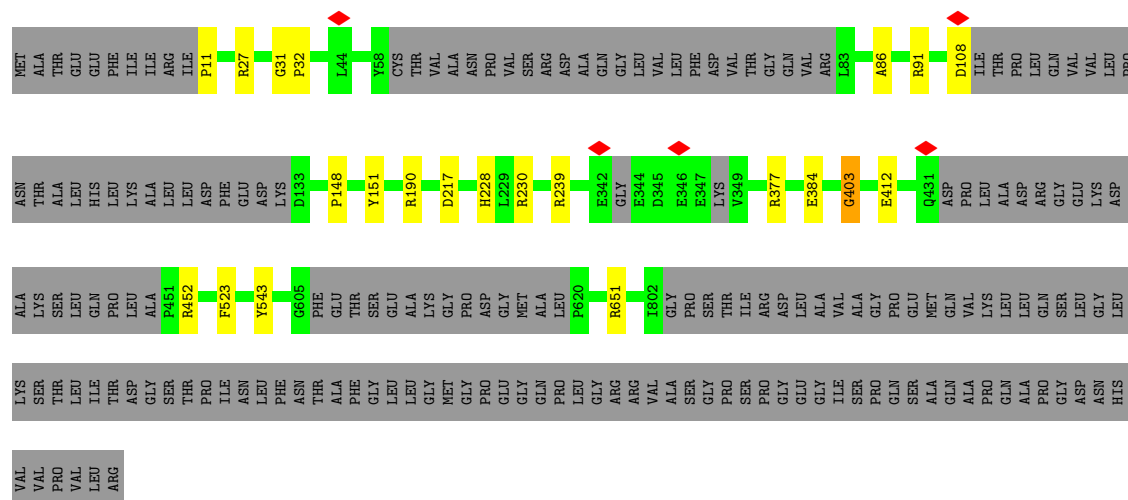
- Molecule 1: Major vault protein

Chain A5: 77% 21%



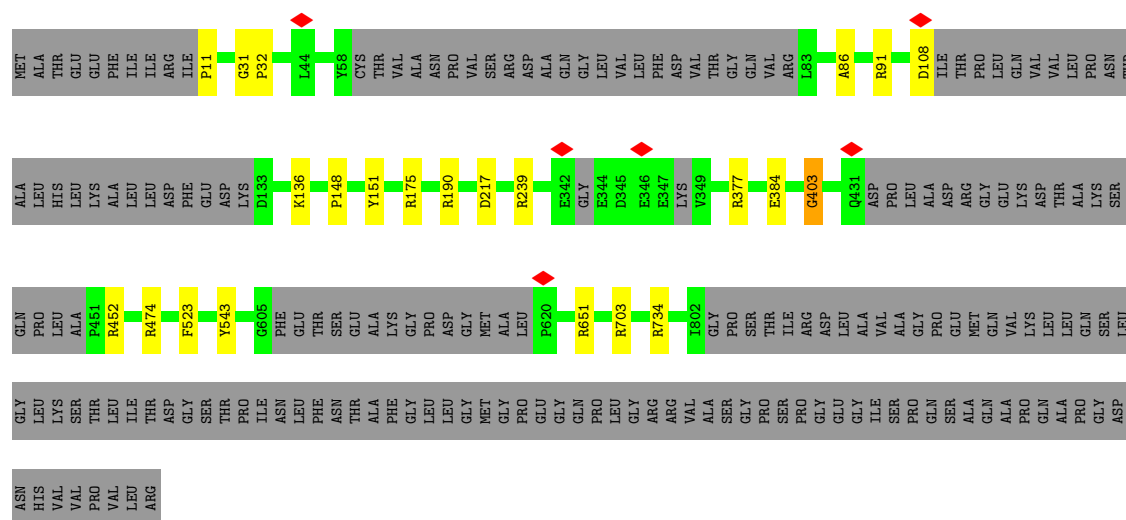
- Molecule 1: Major vault protein

Chain A6: 77% 21%

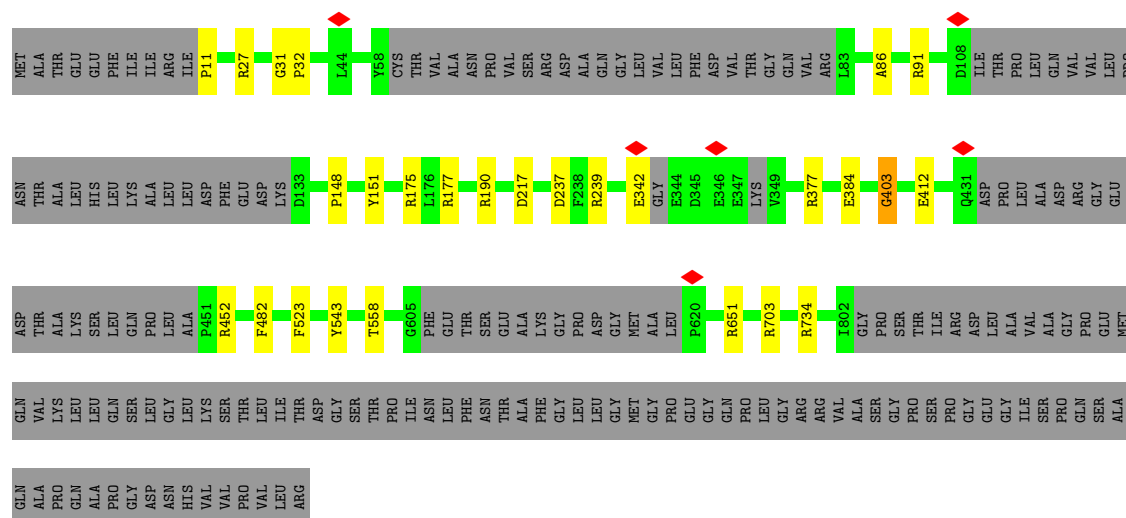
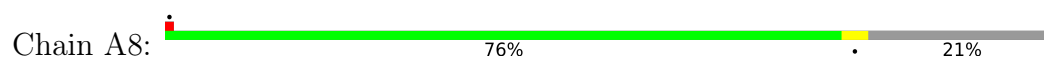


- Molecule 1: Major vault protein

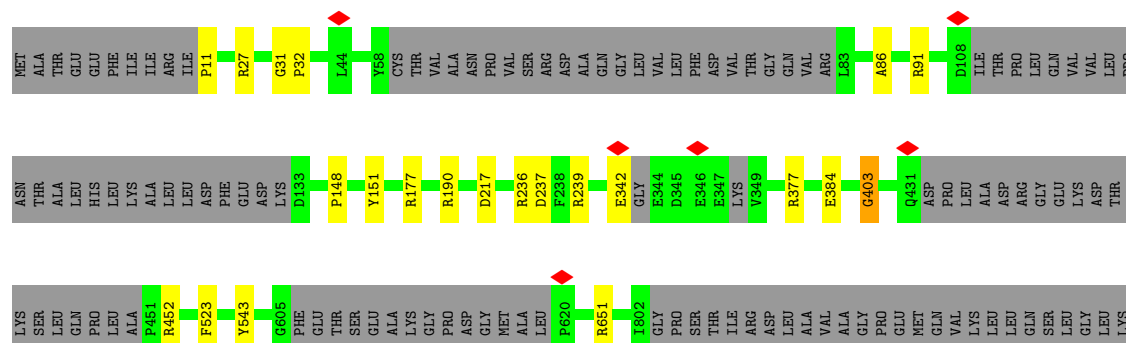
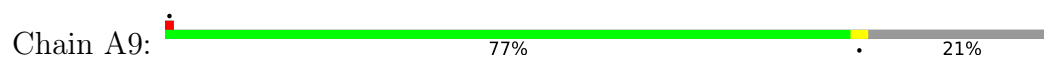
Chain A7: 77% 21%



• Molecule 1: Major vault protein



• Molecule 1: Major vault protein



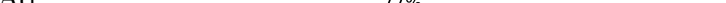
[illegible]

- Molecule 1: Major vault protein

Chain Ac: 77% 21%

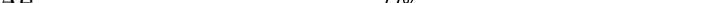
[illegible]

- Molecule 1: Major vault protein

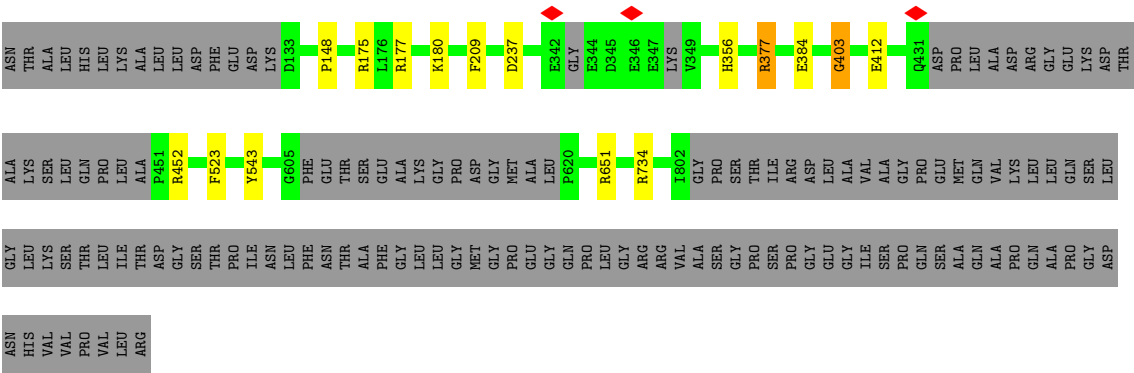
Chain Ad:  77% 21%

[illegible]

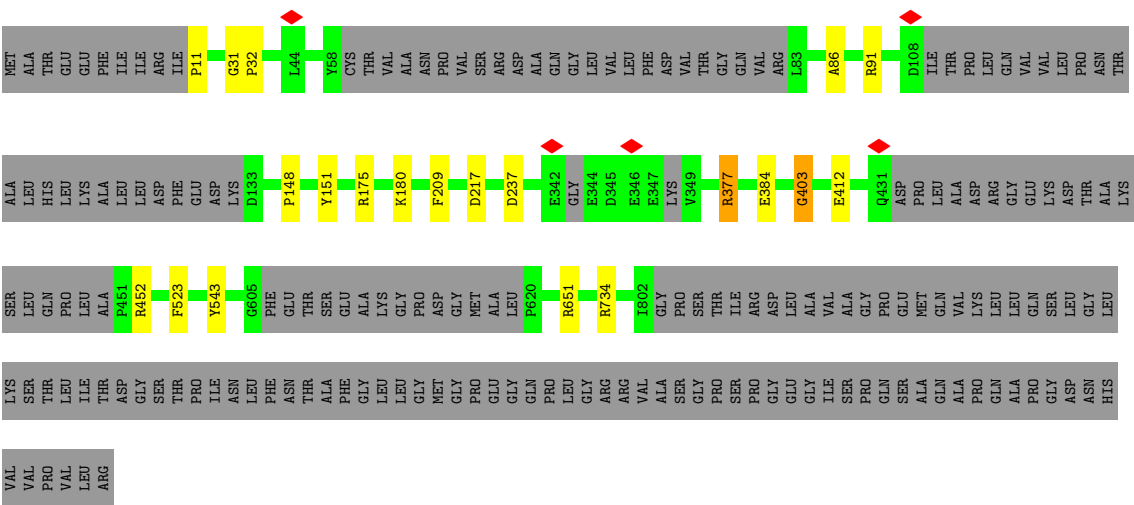
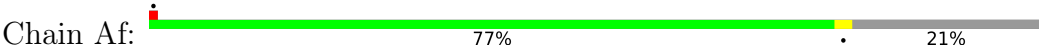
- Molecule 1: Major vault protein

Chain Ae:  77% 21%

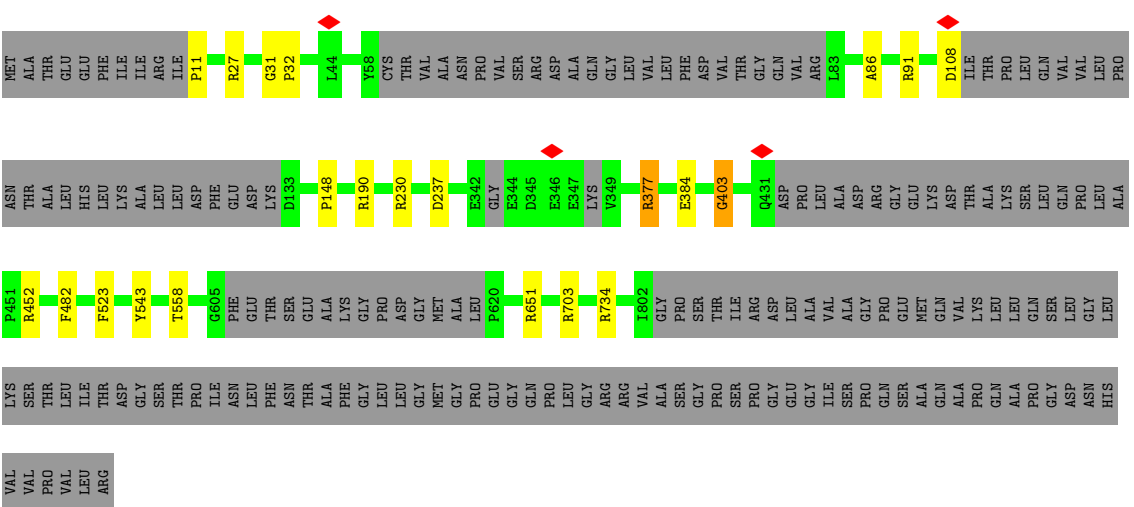
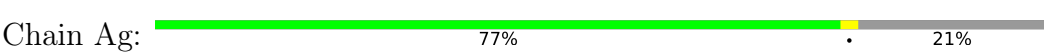
MET ALA THR GLU GLU PHE PHE ILE ILE ARG ARG ILE P11 P27 G31 P32 L44 Y58 CYS THR VAL ALA ASN PRO VAL VAL SER ARG ASP ALA GLN GLY LEU LEU VAL LEU PHE ASP ASP VAL THR THR GLN VAL VAL ARG L83 A86 R91 D108 ILE THR PRO LEU LEU VAL VAL LEU LEU



• Molecule 1: Major vault protein



• Molecule 1: Major vault protein



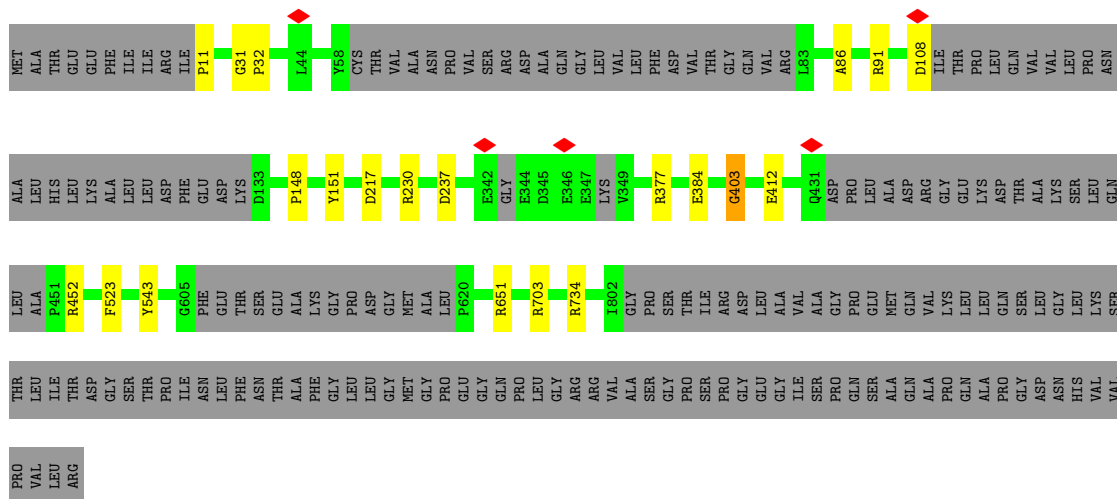
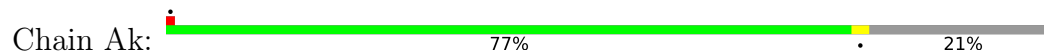
- Chain Ah:
-
- | Amino Acid | Frequency (%) |
|------------|---------------|
| MET | ~0.5 |
| ALA | ~0.5 |
| THR | ~0.5 |
| GLU | ~0.5 |
| PHE | ~0.5 |
| ILE | ~0.5 |
| ARG | ~0.5 |
| ILE | ~0.5 |
| P11 | ~0.5 |
| R27 | ~0.5 |
| G31 | ~0.5 |
| P32 | ~0.5 |
| L44 | ~0.5 |
| Y58 | ~0.5 |
| CYS | ~0.5 |
| THR | ~0.5 |
| VAL | ~0.5 |
| ALA | ~0.5 |
| ASN | ~0.5 |
| PRO | ~0.5 |
| VAL | ~0.5 |
| SER | ~0.5 |
| ARG | ~0.5 |
| ASP | ~0.5 |
| ALA | ~0.5 |
| GLN | ~0.5 |
| GLY | ~0.5 |
| VAL | ~0.5 |
| LEU | ~0.5 |
| VAL | ~0.5 |
| PHE | ~0.5 |
| ASP | ~0.5 |
| VAL | ~0.5 |
| THR | ~0.5 |
| GLY | ~0.5 |
| GLN | ~0.5 |
| VAL | ~0.5 |
| ARG | ~0.5 |
| L83 | ~0.5 |
| A86 | ~0.5 |
| R91 | ~0.5 |
| D108 | ~0.5 |
| PRO | ~0.5 |
| THR | ~0.5 |
| ILE | ~0.5 |
| THR | ~0.5 |
| PRO | ~0.5 |
| LEU | ~0.5 |
| GLN | ~0.5 |
| VAL | ~0.5 |
| VAL | ~0.5 |
| LEU | ~0.5 |
| PRO | ~0.5 |

- Chain Ai:
-
- | Amino Acid | Performance |
|------------|-------------|
| VAL | 77% |
| PRO | 77% |
| PRO | 77% |
| VAL | 77% |
| LEU | 77% |
| ARG | 77% |
| SER | 77% |
| THR | 77% |
| THR | 77% |
| LEU | 77% |
| ALA | 77% |
| THR | 77% |
| GLU | 77% |
| GLY | 77% |
| ASP | 77% |
| GLY | 77% |
| SER | 77% |
| THR | 77% |
| PRO | 77% |
| PRO | 77% |
| ASN | 77% |
| LEU | 77% |
| LEU | 77% |
| PHE | 77% |
| THR | 77% |
| GLU | 77% |
| GLU | 77% |
| ASP | 77% |
| GLY | 77% |
| THR | 77% |
| THR | 77% |
| VAL | 77% |
| VAL | 77% |
| ALA | 77% |
| ASN | 77% |
| PRO | 77% |
| PRO | 77% |
| VAL | 77% |
| SER | 77% |
| SER | 77% |
| ARG | 77% |
| ASP | 77% |
| ALA | 77% |
| ALA | 77% |
| GLN | 77% |
| GLY | 77% |
| LEU | 77% |
| LEU | 77% |
| VAL | 77% |
| LEU | 77% |
| PHE | 77% |
| ASP | 77% |
| VAL | 77% |
| THR | 77% |
| GLY | 77% |
| GLN | 77% |
| VAL | 77% |
| VAL | 77% |
| ARG | 77% |
| ARG | 77% |
| L83 | 77% |
| A86 | 77% |
| R91 | 77% |
| D108 | 77% |
| ILE | 77% |
| THR | 77% |
| PRO | 77% |
| PRO | 77% |
| LEU | 77% |
| GLN | 77% |
| VAL | 77% |
| VAL | 77% |
| GLY | 77% |
| SER | 77% |
| ASN | 77% |
| HIS | 77% |
| VAL | 77% |

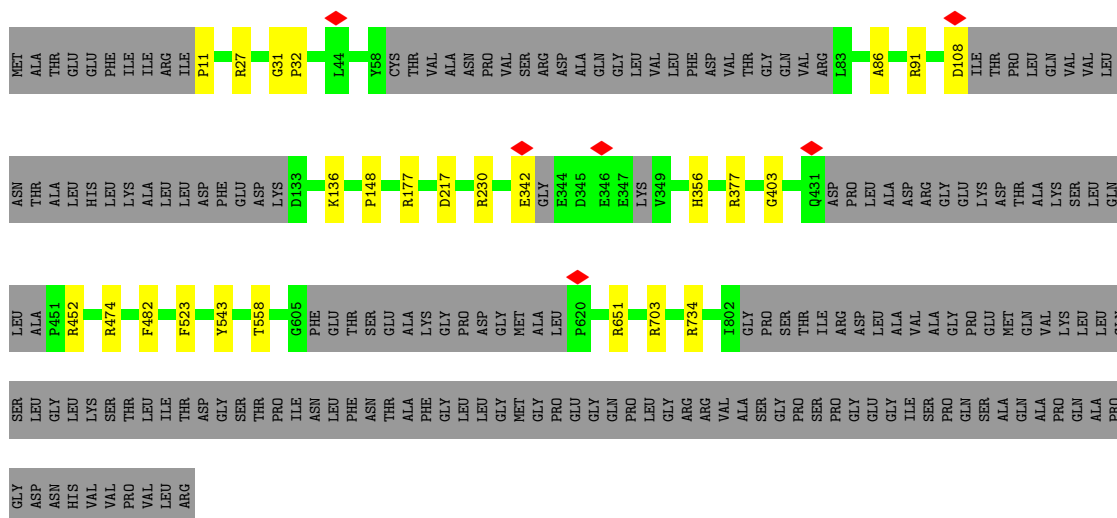
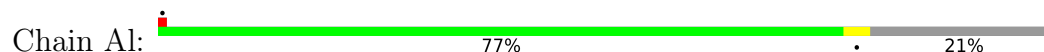
- Chain A_j:
-
- 77% 21%
- | Residue | Category |
|---------|----------|
| MET | Grey |
| ALA | Grey |
| THR | Grey |
| GLU | Grey |
| PHE | Grey |
| ILE | Grey |
| ARG | Grey |
| ILE | Grey |
| P11 | Yellow |
| R27 | Yellow |
| G31 | Yellow |
| P32 | Yellow |
| I44 | Green |
| Y58 | Green |
| CYS | Grey |
| THR | Grey |
| VAL | Grey |
| ALA | Grey |
| ASN | Grey |
| PRO | Grey |
| VAL | Grey |
| SER | Grey |
| ARG | Grey |
| ASP | Grey |
| ALA | Grey |
| GLN | Grey |
| GLY | Grey |
| LEU | Grey |
| VAL | Grey |
| LEU | Grey |
| PHE | Grey |
| ASP | Grey |
| VAL | Grey |
| THR | Grey |
| GLY | Grey |
| GLN | Grey |
| VAL | Grey |
| ARG | Grey |
| I83 | Green |
| A86 | Yellow |
| R91 | Yellow |
| D108 | Green |
| ILE | Grey |
| THR | Grey |
| PRO | Grey |
| LEU | Grey |
| GLN | Grey |
| VAL | Grey |
| ARG | Grey |
| VAL | Grey |
| LEU | Grey |
| PRO | Grey |
- | Residue | Category |
|---------|----------|
| ASN | Grey |
| THR | Grey |
| ALA | Grey |
| HIS | Grey |
| LEU | Grey |
| LYS | Grey |
| LEU | Grey |
| LEU | Grey |
| ASP | Grey |
| PHE | Grey |
| GLU | Grey |
| ASP | Grey |
| LYS | Grey |
| D133 | Green |
| P148 | Yellow |
| R175 | Yellow |
| L176 | Yellow |
| R177 | Yellow |
| R190 | Yellow |
| D217 | Yellow |
| R230 | Yellow |
| D237 | Yellow |
| F238 | Green |
| R239 | Yellow |
| E342 | Green |
| GLY | Grey |
| E344 | Green |
| D345 | Green |
| E346 | Green |
| E347 | Grey |
| LYS | Grey |
| V349 | Green |
| R377 | Yellow |
| E384 | Yellow |
| G403 | Orange |
| E412 | Yellow |
| Q431 | Green |
| ASP | Grey |
| PRO | Grey |
| LEU | Grey |
| ALA | Grey |
| ASP | Grey |
| ARG | Grey |
| GLY | Grey |
| LEU | Grey |
| LYS | Grey |



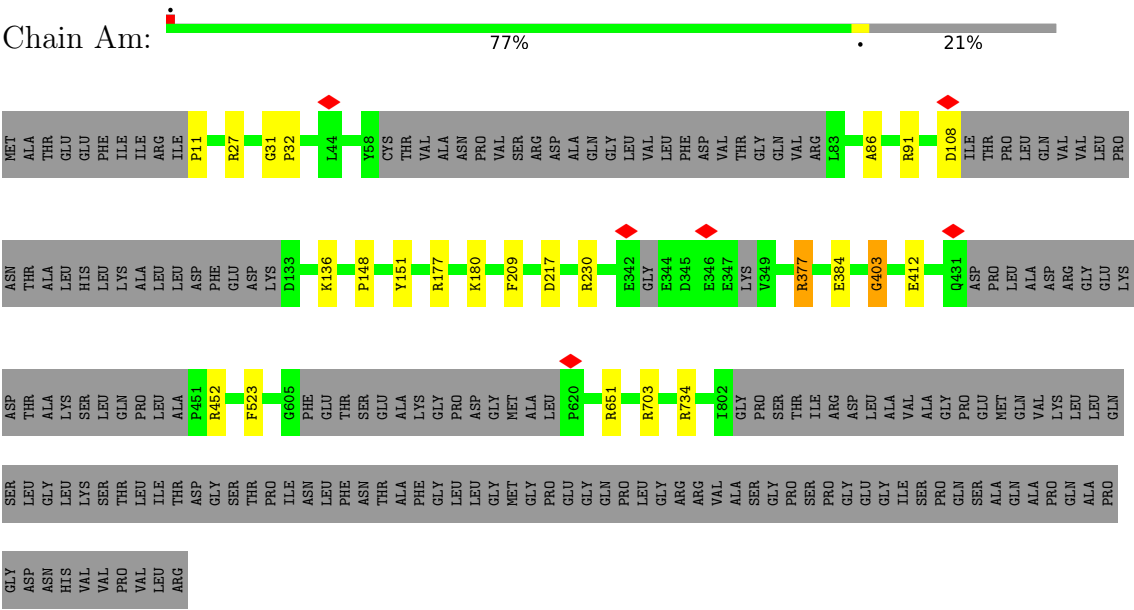
- Molecule 1: Major vault protein



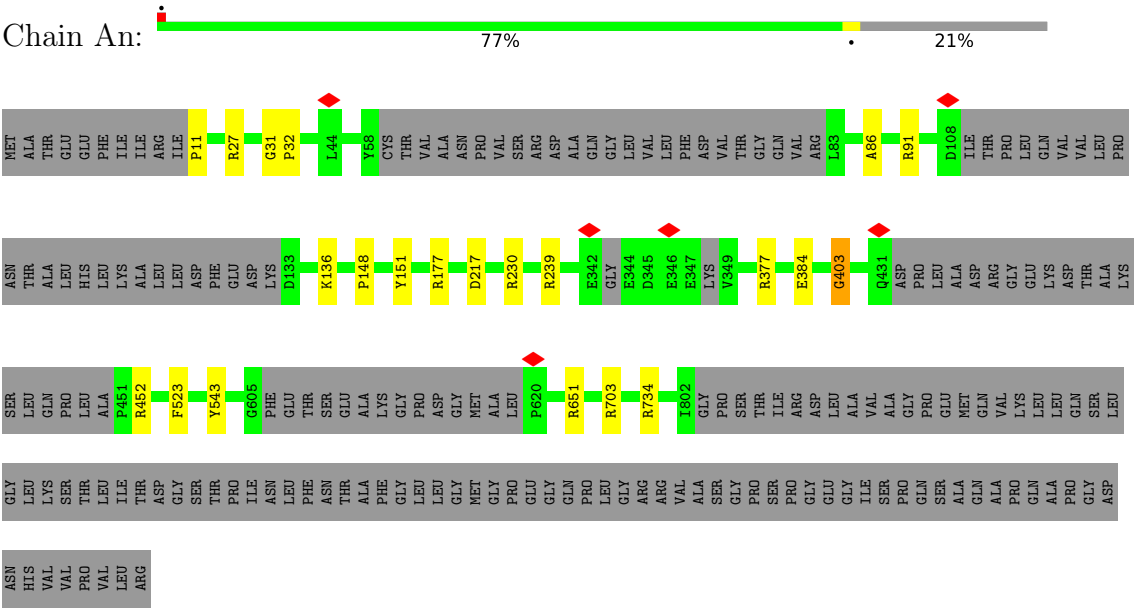
- Molecule 1: Major vault protein



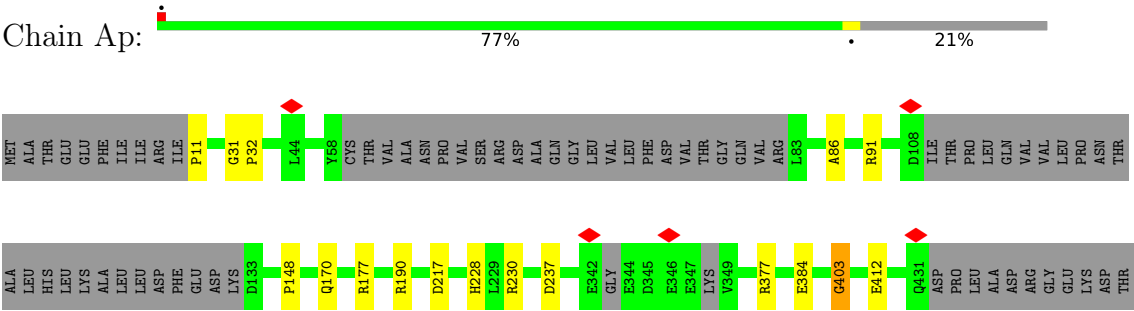
- Molecule 1: Major vault protein



• Molecule 1: Major vault protein

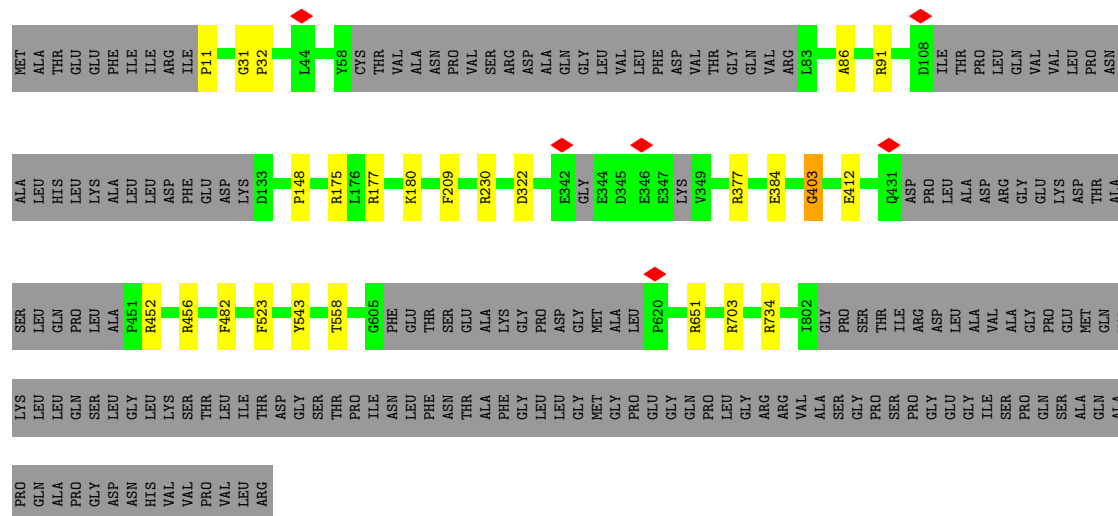
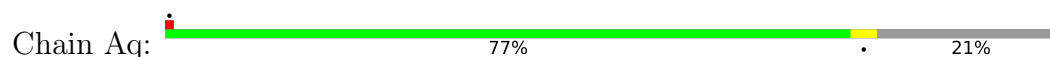


• Molecule 1: Major vault protein

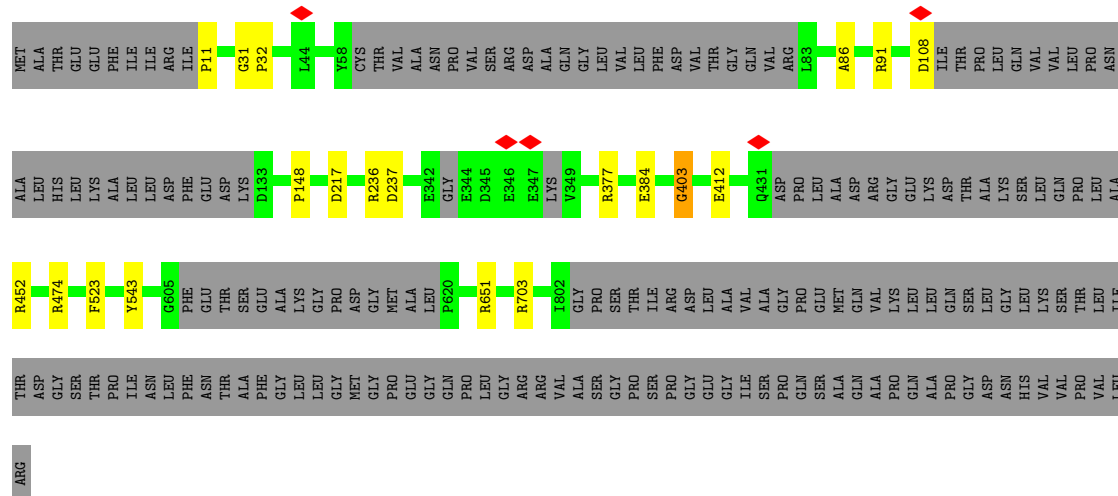
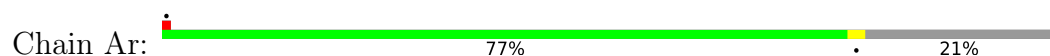




- Molecule 1: Major vault protein

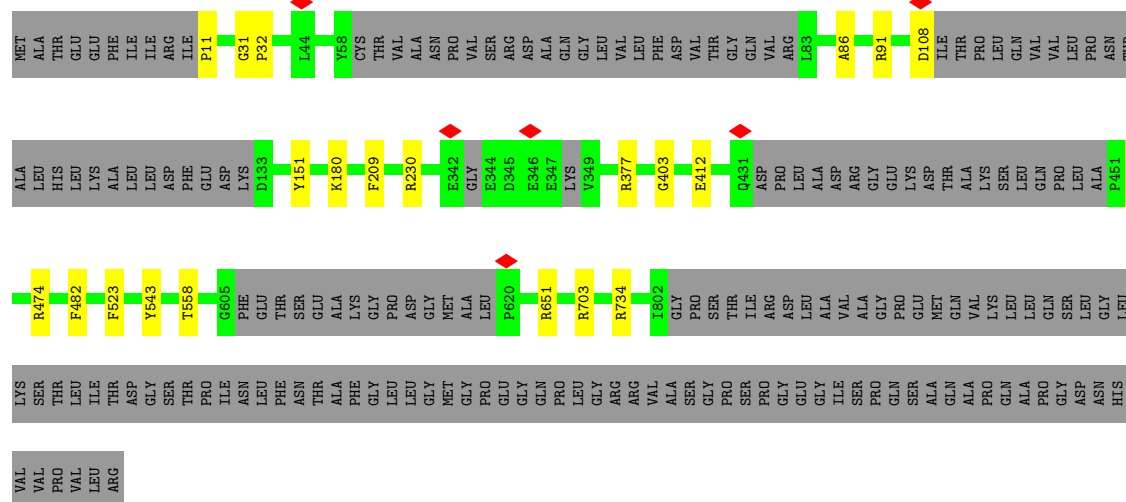


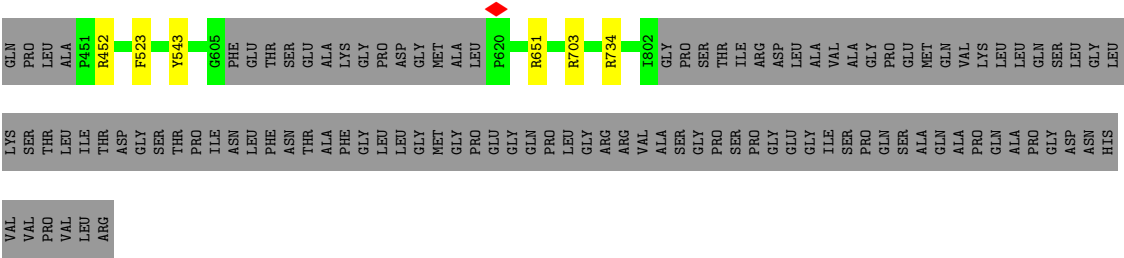
- Molecule 1: Major vault protein



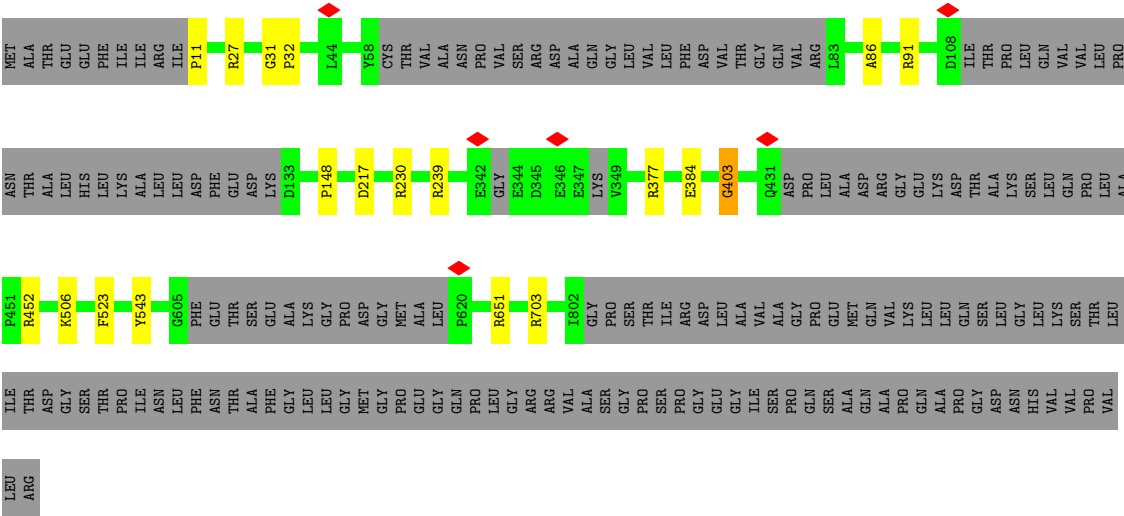
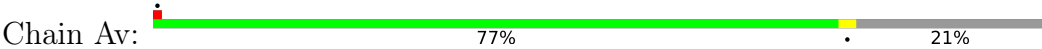
- Molecule 1: Major vault protein

Chain As:  77% 21%

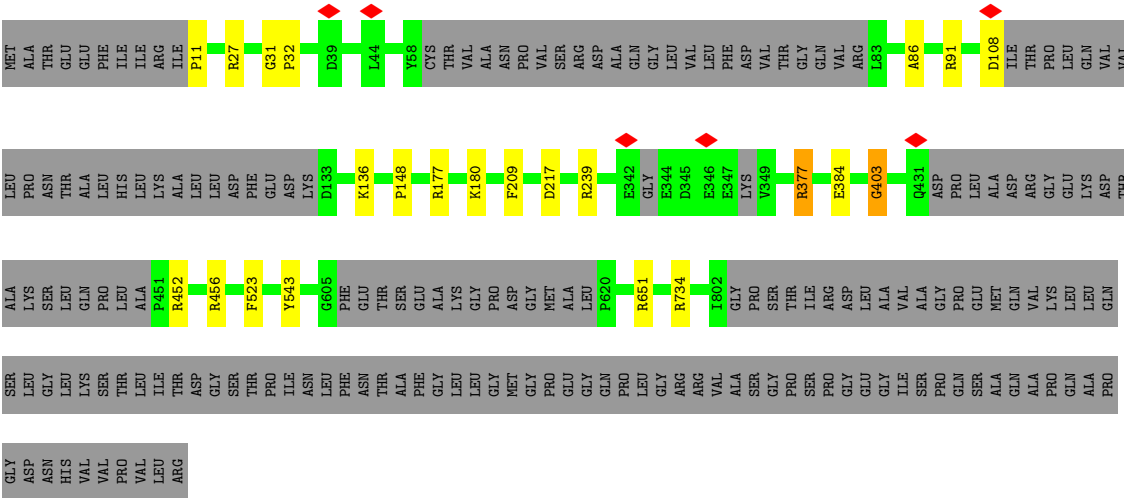
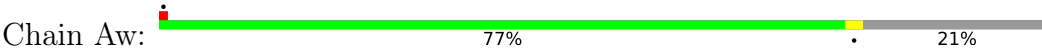




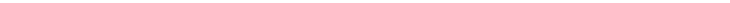
• Molecule 1: Major vault protein

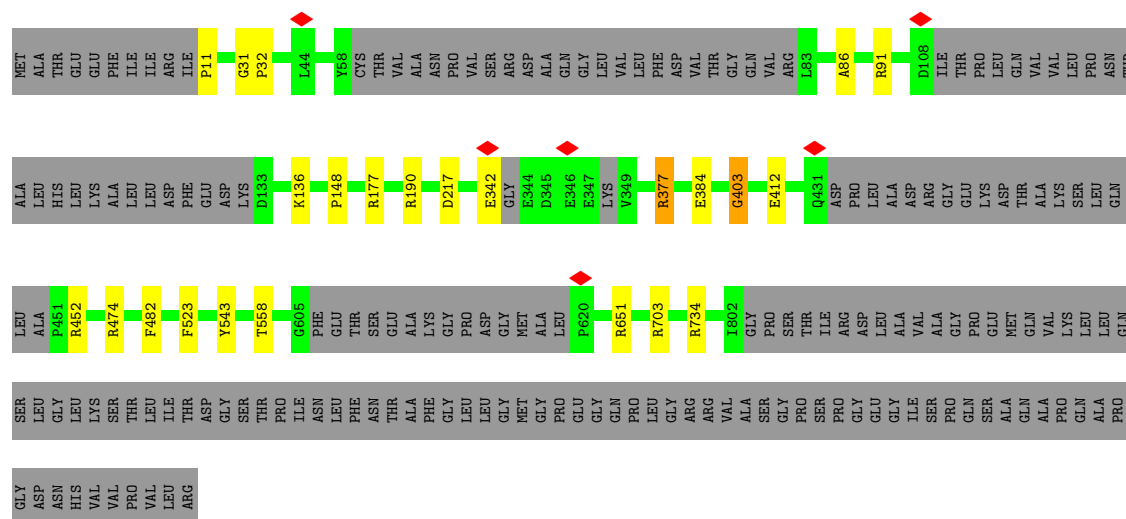


• Molecule 1: Major vault protein

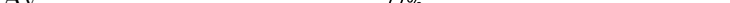


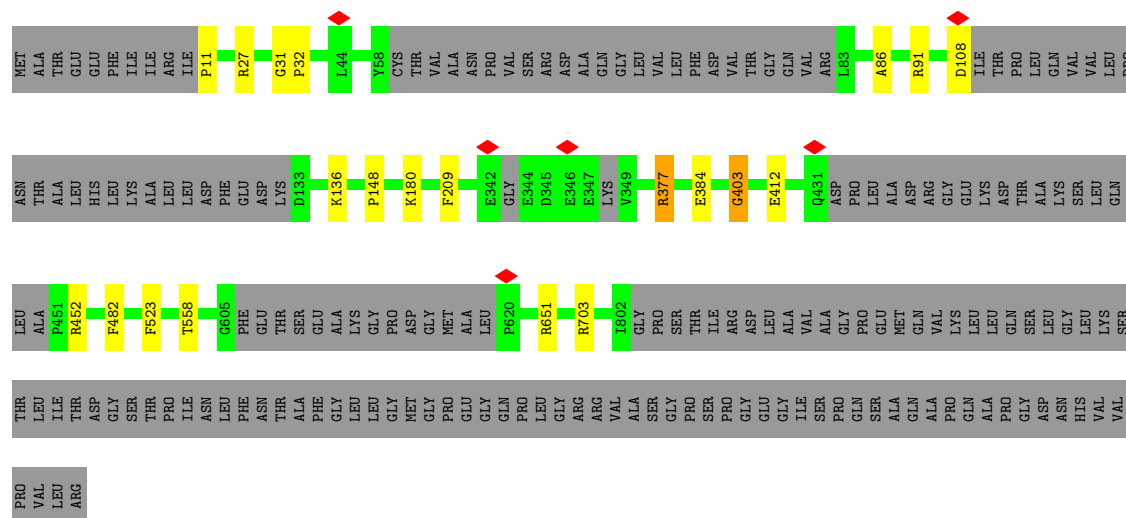
• Molecule 1: Major vault protein

Chain Ax:  77% 21%

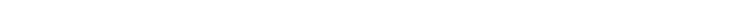


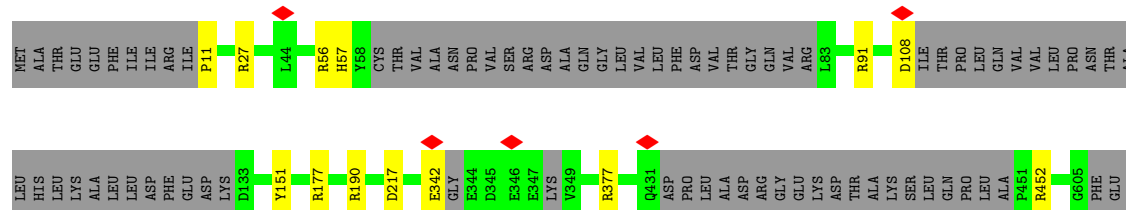
- Molecule 1: Major vault protein

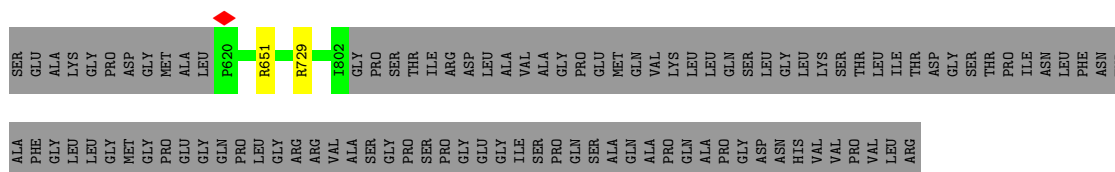
Chain A_y:  77% 21%



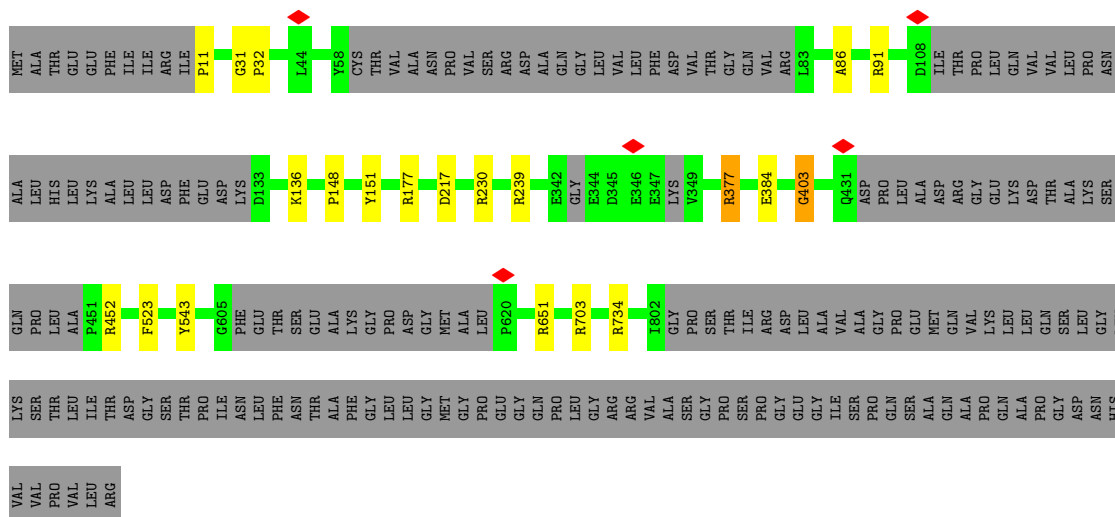
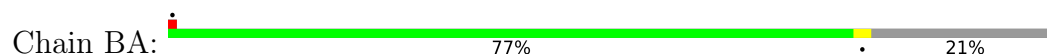
- Molecule 1: Major vault protein

Chain Az:  78% 21%

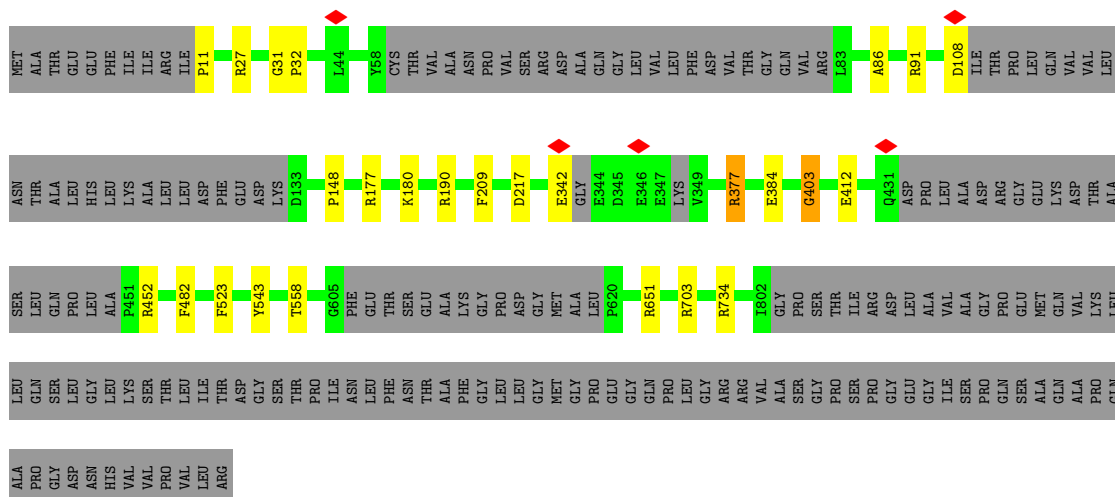
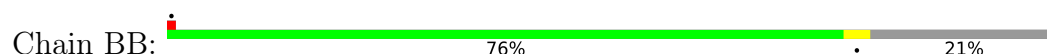




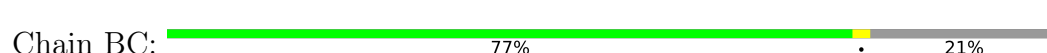
• Molecule 1: Major vault protein

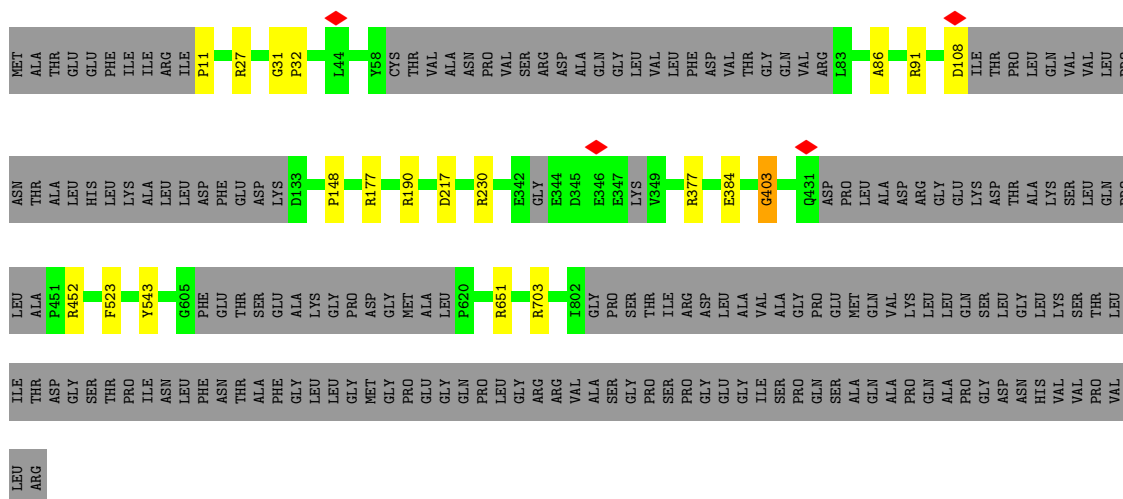


• Molecule 1: Major vault protein

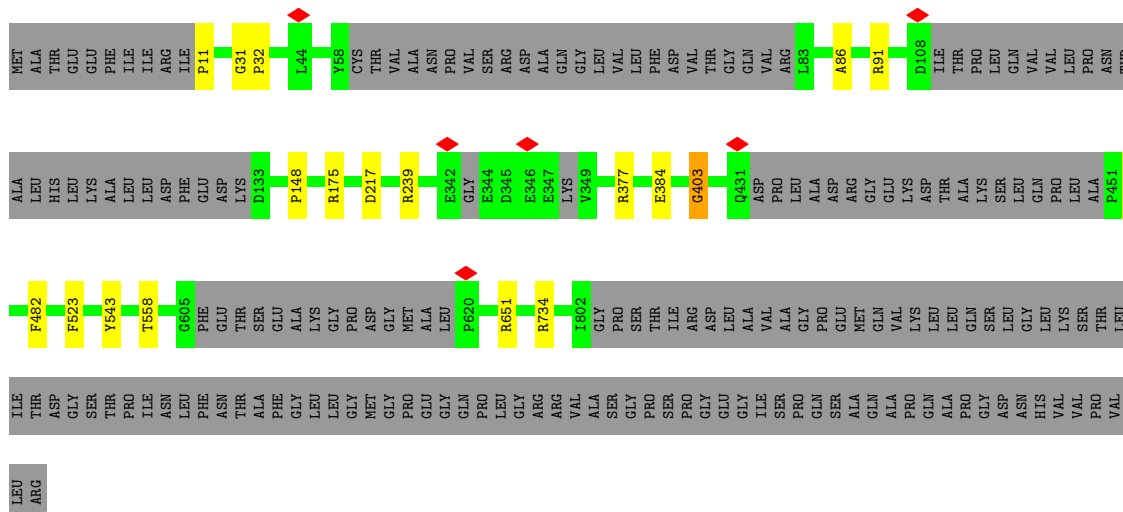
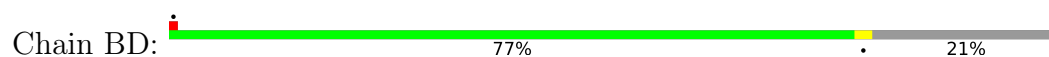


• Molecule 1: Major vault protein

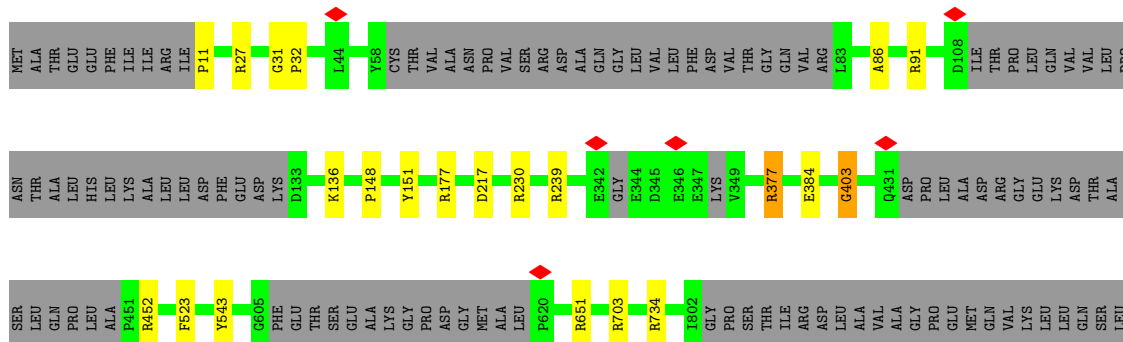
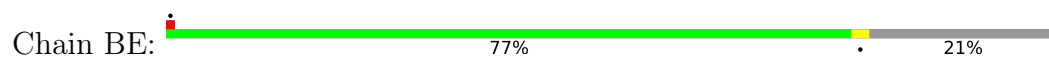




- Molecule 1: Major vault protein



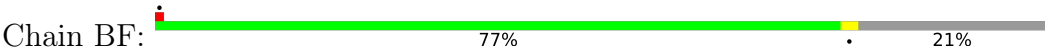
- Molecule 1: Major vault protein



GLY
LEU
LYS
SER
THR
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TLE
THR
ASP
GLY
SER
THR
PRO
TLE
ASN
LEU
PHE
ASN
THR
ALA
PHE
GLY
LEU
LEU
GLY
MET
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PRO
GLY
GLY
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PRO
LEU
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ARG
ARG
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ALA
PRO
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ALA
PRO
GLY
ASP

ASN
HIS
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VAL
PRO
VAL
LEU
ARG

- Molecule 1: Major vault protein



MET
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GLU
GLU
PHE
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ARG
TLE
P11
R27
G31
P32
I44
Y58
CYS
THR
VAL
ALA
ASN
PRO
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SER
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ASP
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GLY
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VAL
LEU
PHE
ASP
VAL
THR
GLY
GLN
VAL
ARG
L83
A86
R91
D108
TLE
THR
PRO
LEU
GLN
VAL
VAL
LEU
PRO

ASN
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HIS
LEU
LYS
ALA
LEU
ASP
PHE
GLU
ASP
D133
P148
R177
D217
R230
R236
D237
F238
R239
E342
E344
D345
E346
E347
V349
R377
E384
Q403
E412
Q431
ASP
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ASP
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R451
R452
F523
Y543
G605
PHE
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GLY
MET
ALA
ALA
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P650
R651
R703
R734
I802
GLY
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ARG

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	7367	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	40	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	5000	Depositor
Magnification	Not provided	
Image detector	GATAN K2 QUANTUM (4k x 4k)	Depositor
Maximum map value	0.054	Depositor
Minimum map value	-0.038	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.002	Depositor
Recommended contour level	0.00713	Depositor
Map size (Å)	736.0, 736.0, 736.0	wwPDB
Map dimensions	640, 640, 640	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.15, 1.15, 1.15	Depositor

5 Model quality

5.1 Standard geometry

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	A0	0.72	0/5747	1.28	10/7784 (0.1%)
1	A1	0.72	0/5747	1.33	24/7784 (0.3%)
1	A2	0.72	0/5747	1.34	21/7784 (0.3%)
1	A3	0.72	0/5747	1.34	17/7784 (0.2%)
1	A4	0.72	0/5747	1.34	23/7784 (0.3%)
1	A5	0.72	0/5747	1.34	21/7784 (0.3%)
1	A6	0.72	0/5747	1.33	20/7784 (0.3%)
1	A7	0.72	0/5747	1.34	21/7784 (0.3%)
1	A8	0.72	0/5747	1.34	26/7784 (0.3%)
1	A9	0.72	0/5747	1.34	21/7784 (0.3%)
1	Ac	0.72	0/5747	1.34	19/7784 (0.2%)
1	Ad	0.72	0/5747	1.34	19/7784 (0.2%)
1	Ae	0.72	0/5747	1.34	22/7784 (0.3%)
1	Af	0.72	0/5747	1.34	22/7784 (0.3%)
1	Ag	0.72	0/5747	1.34	21/7784 (0.3%)
1	Ah	0.72	0/5747	1.34	22/7784 (0.3%)
1	Ai	0.72	0/5747	1.34	26/7784 (0.3%)
1	Aj	0.72	0/5747	1.34	25/7784 (0.3%)
1	Ak	0.72	0/5747	1.34	20/7784 (0.3%)
1	Al	0.72	0/5747	1.33	23/7784 (0.3%)
1	Am	0.72	0/5747	1.34	24/7784 (0.3%)
1	An	0.72	0/5747	1.34	23/7784 (0.3%)
1	Ap	0.72	0/5747	1.34	24/7784 (0.3%)
1	Aq	0.72	0/5747	1.34	23/7784 (0.3%)
1	Ar	0.72	0/5747	1.34	19/7784 (0.2%)
1	As	0.72	0/5747	1.34	15/7784 (0.2%)
1	At	0.72	0/5747	1.34	22/7784 (0.3%)
1	Au	0.72	0/5747	1.34	20/7784 (0.3%)
1	Av	0.72	0/5747	1.33	19/7784 (0.2%)
1	Aw	0.72	0/5747	1.33	21/7784 (0.3%)
1	Ax	0.72	0/5747	1.34	23/7784 (0.3%)
1	Ay	0.72	0/5747	1.34	18/7784 (0.2%)
1	Az	0.72	0/5747	1.28	12/7784 (0.2%)
1	BA	0.72	0/5747	1.34	23/7784 (0.3%)

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
1	BB	0.72	0/5747	1.33	21/7784 (0.3%)
1	BC	0.72	0/5747	1.33	19/7784 (0.2%)
1	BD	0.72	0/5747	1.34	19/7784 (0.2%)
1	BE	0.72	0/5747	1.34	22/7784 (0.3%)
1	BF	0.72	0/5747	1.34	26/7784 (0.3%)
All	All	0.72	0/224133	1.33	816/303576 (0.3%)

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	A0	0	1
1	A1	0	2
1	A2	0	1
1	A3	0	2
1	A4	0	2
1	A5	0	3
1	A6	0	2
1	A7	0	3
1	A8	0	2
1	A9	0	2
1	Ac	0	1
1	Ad	0	1
1	Ae	0	1
1	Af	0	2
1	Ag	0	1
1	Ai	0	1
1	Aj	0	1
1	Ak	0	2
1	Al	0	2
1	Am	0	2
1	An	0	2
1	Ap	0	1
1	Aq	0	1
1	Ar	0	2
1	As	0	3
1	At	0	2
1	Au	0	2
1	Av	0	1
1	Aw	0	1

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Mol	Chain	#Chirality outliers	#Planarity outliers
1	Ax	0	2
1	Ay	0	1
1	Az	0	2
1	BA	0	2
1	BB	0	1
1	BC	0	1
1	BD	0	1
1	BE	0	2
1	BF	0	1
All	All	0	62

There are no bond length outliers.

The worst 5 of 816 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	An	403	GLY	N-CA-C	7.02	124.33	115.21
1	Az	11	PRO	CA-N-CD	-6.87	102.39	112.00
1	Ar	403	GLY	N-CA-C	6.73	123.96	115.21
1	Ac	403	GLY	N-CA-C	6.65	123.86	115.21
1	Ak	11	PRO	CA-N-CD	-6.65	102.69	112.00

There are no chirality outliers.

5 of 62 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A0	377	ARG	Sidechain
1	A1	151	TYR	Sidechain
1	A1	377	ARG	Sidechain
1	A2	151	TYR	Sidechain
1	A3	151	TYR	Sidechain

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	A0	5648	5654	5652	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A1	5648	5654	5652	2	0
1	A2	5648	5654	5652	2	0
1	A3	5648	5654	5652	2	0
1	A4	5648	5654	5652	1	0
1	A5	5648	5654	5652	3	0
1	A6	5648	5654	5652	1	0
1	A7	5648	5654	5652	1	0
1	A8	5648	5654	5652	2	0
1	A9	5648	5654	5652	1	0
1	Ac	5648	5654	5652	1	0
1	Ad	5648	5654	5652	1	0
1	Ae	5648	5654	5652	2	0
1	Af	5648	5654	5652	2	0
1	Ag	5648	5654	5652	2	0
1	Ah	5648	5654	5652	3	0
1	Ai	5648	5654	5652	0	0
1	Aj	5648	5654	5652	1	0
1	Ak	5648	5654	5652	1	0
1	Al	5648	5654	5652	1	0
1	Am	5648	5654	5652	2	0
1	An	5648	5654	5652	1	0
1	Ap	5648	5654	5652	1	0
1	Aq	5648	5654	5652	3	0
1	Ar	5648	5654	5652	1	0
1	As	5648	5654	5652	2	0
1	At	5648	5654	5652	2	0
1	Au	5648	5654	5652	1	0
1	Av	5648	5650	5652	1	0
1	Aw	5648	5654	5652	2	0
1	Ax	5648	5654	5652	2	0
1	Ay	5648	5654	5652	3	0
1	Az	5648	5654	5652	0	0
1	BA	5648	5654	5652	1	0
1	BB	5648	5654	5652	3	0
1	BC	5648	5654	5652	1	0
1	BD	5648	5654	5652	2	0
1	BE	5648	5654	5652	1	0
1	BF	5648	5654	5652	1	0
All	All	220272	220502	220428	59	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.

The worst 5 of 59 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:A6:384:GLU:HA	1:A6:403:GLY:HA2	1.98	0.46
1:An:384:GLU:HA	1:An:403:GLY:HA2	1.98	0.46
1:Am:384:GLU:HA	1:Am:403:GLY:HA2	1.99	0.45
1:Ac:384:GLU:HA	1:Ac:403:GLY:HA2	1.99	0.45
1:BD:384:GLU:HA	1:BD:403:GLY:HA2	1.99	0.44

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	A0	699/893 (78%)	675 (97%)	24 (3%)	0	100	100
1	A1	699/893 (78%)	677 (97%)	22 (3%)	0	100	100
1	A2	699/893 (78%)	677 (97%)	22 (3%)	0	100	100
1	A3	699/893 (78%)	676 (97%)	23 (3%)	0	100	100
1	A4	699/893 (78%)	678 (97%)	21 (3%)	0	100	100
1	A5	699/893 (78%)	677 (97%)	22 (3%)	0	100	100
1	A6	699/893 (78%)	677 (97%)	22 (3%)	0	100	100
1	A7	699/893 (78%)	676 (97%)	23 (3%)	0	100	100
1	A8	699/893 (78%)	677 (97%)	22 (3%)	0	100	100
1	A9	699/893 (78%)	676 (97%)	23 (3%)	0	100	100
1	Ac	699/893 (78%)	678 (97%)	21 (3%)	0	100	100
1	Ad	699/893 (78%)	677 (97%)	22 (3%)	0	100	100
1	Ae	699/893 (78%)	677 (97%)	22 (3%)	0	100	100
1	Af	699/893 (78%)	679 (97%)	20 (3%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	Ag	699/893 (78%)	679 (97%)	20 (3%)	0	100	100
1	Ah	699/893 (78%)	677 (97%)	22 (3%)	0	100	100
1	Ai	699/893 (78%)	677 (97%)	22 (3%)	0	100	100
1	Aj	699/893 (78%)	677 (97%)	22 (3%)	0	100	100
1	Ak	699/893 (78%)	678 (97%)	21 (3%)	0	100	100
1	Al	699/893 (78%)	677 (97%)	22 (3%)	0	100	100
1	Am	699/893 (78%)	677 (97%)	22 (3%)	0	100	100
1	An	699/893 (78%)	679 (97%)	20 (3%)	0	100	100
1	Ap	699/893 (78%)	679 (97%)	20 (3%)	0	100	100
1	Aq	699/893 (78%)	678 (97%)	21 (3%)	0	100	100
1	Ar	699/893 (78%)	677 (97%)	22 (3%)	0	100	100
1	As	699/893 (78%)	677 (97%)	22 (3%)	0	100	100
1	At	699/893 (78%)	678 (97%)	21 (3%)	0	100	100
1	Au	699/893 (78%)	678 (97%)	21 (3%)	0	100	100
1	Av	699/893 (78%)	677 (97%)	22 (3%)	0	100	100
1	Aw	699/893 (78%)	678 (97%)	21 (3%)	0	100	100
1	Ax	699/893 (78%)	677 (97%)	22 (3%)	0	100	100
1	Ay	699/893 (78%)	677 (97%)	22 (3%)	0	100	100
1	Az	699/893 (78%)	677 (97%)	22 (3%)	0	100	100
1	BA	699/893 (78%)	677 (97%)	22 (3%)	0	100	100
1	BB	699/893 (78%)	678 (97%)	21 (3%)	0	100	100
1	BC	699/893 (78%)	678 (97%)	21 (3%)	0	100	100
1	BD	699/893 (78%)	677 (97%)	22 (3%)	0	100	100
1	BE	699/893 (78%)	676 (97%)	23 (3%)	0	100	100
1	BF	699/893 (78%)	676 (97%)	23 (3%)	0	100	100
All	All	27261/34827 (78%)	26413 (97%)	848 (3%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains ⓘ

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

entries.

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A0	607/755 (80%)	605 (100%)	2 (0%)	91	95
1	A1	607/755 (80%)	606 (100%)	1 (0%)	92	96
1	A2	607/755 (80%)	606 (100%)	1 (0%)	92	96
1	A3	607/755 (80%)	605 (100%)	2 (0%)	91	95
1	A4	607/755 (80%)	606 (100%)	1 (0%)	92	96
1	A5	607/755 (80%)	605 (100%)	2 (0%)	91	95
1	A6	607/755 (80%)	605 (100%)	2 (0%)	91	95
1	A7	607/755 (80%)	605 (100%)	2 (0%)	91	95
1	A8	607/755 (80%)	605 (100%)	2 (0%)	91	95
1	A9	607/755 (80%)	605 (100%)	2 (0%)	91	95
1	Ac	607/755 (80%)	605 (100%)	2 (0%)	91	95
1	Ad	607/755 (80%)	605 (100%)	2 (0%)	91	95
1	Ae	607/755 (80%)	606 (100%)	1 (0%)	92	96
1	Af	607/755 (80%)	606 (100%)	1 (0%)	92	96
1	Ag	607/755 (80%)	605 (100%)	2 (0%)	91	95
1	Ah	607/755 (80%)	607 (100%)	0	100	100
1	Ai	607/755 (80%)	606 (100%)	1 (0%)	92	96
1	Aj	607/755 (80%)	606 (100%)	1 (0%)	92	96
1	Ak	607/755 (80%)	605 (100%)	2 (0%)	91	95
1	Al	607/755 (80%)	604 (100%)	3 (0%)	86	92
1	Am	607/755 (80%)	606 (100%)	1 (0%)	92	96
1	An	607/755 (80%)	606 (100%)	1 (0%)	92	96
1	Ap	607/755 (80%)	606 (100%)	1 (0%)	92	96
1	Aq	607/755 (80%)	606 (100%)	1 (0%)	92	96
1	Ar	607/755 (80%)	605 (100%)	2 (0%)	91	95
1	As	607/755 (80%)	605 (100%)	2 (0%)	91	95
1	At	607/755 (80%)	606 (100%)	1 (0%)	92	96
1	Au	607/755 (80%)	606 (100%)	1 (0%)	92	96
1	Av	607/755 (80%)	606 (100%)	1 (0%)	92	96

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	Aw	607/755 (80%)	605 (100%)	2 (0%)	91	95
1	Ax	607/755 (80%)	605 (100%)	2 (0%)	91	95
1	Ay	607/755 (80%)	606 (100%)	1 (0%)	92	96
1	Az	607/755 (80%)	605 (100%)	2 (0%)	91	95
1	BA	607/755 (80%)	606 (100%)	1 (0%)	92	96
1	BB	607/755 (80%)	604 (100%)	3 (0%)	86	92
1	BC	607/755 (80%)	605 (100%)	2 (0%)	91	95
1	BD	607/755 (80%)	606 (100%)	1 (0%)	92	96
1	BE	607/755 (80%)	606 (100%)	1 (0%)	92	96
1	BF	607/755 (80%)	606 (100%)	1 (0%)	92	96
All	All	23673/29445 (80%)	23614 (100%)	59 (0%)	91	96

5 of 59 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	Ak	543	TYR
1	BC	543	TYR
1	Aq	543	TYR
1	BC	108	ASP
1	Az	342	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 388 such sidechains are listed below:

Mol	Chain	Res	Type
1	Aq	295	GLN
1	Aw	494	GLN
1	Ar	38	GLN
1	At	749	GLN
1	Ax	786	GLN

5.3.3 RNA ⓘ

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.

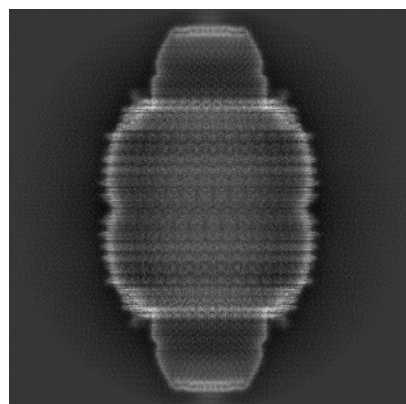
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-53805. These allow visual inspection of the internal detail of the map and identification of artifacts.

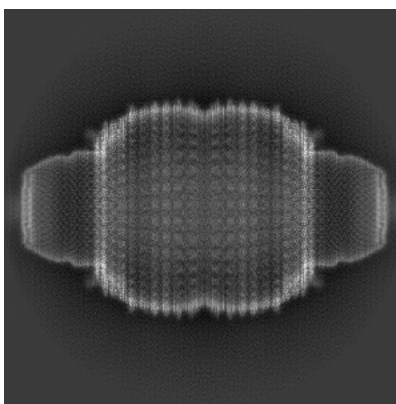
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

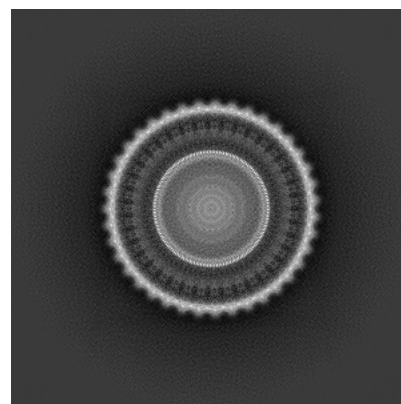
6.1.1 Primary map



X

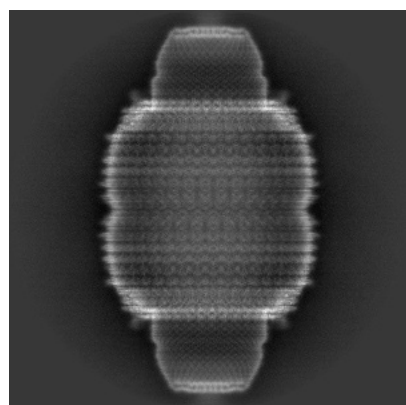


Y

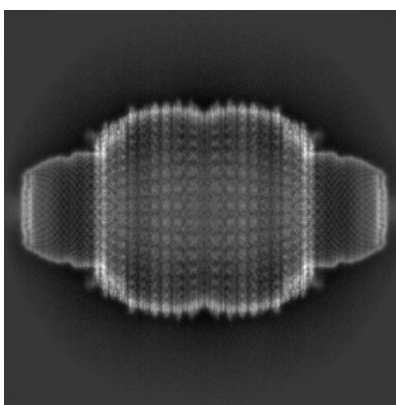


Z

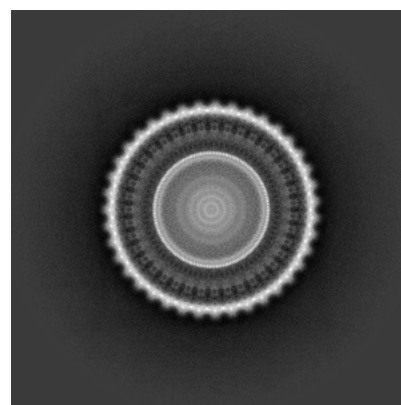
6.1.2 Raw map



X



Y

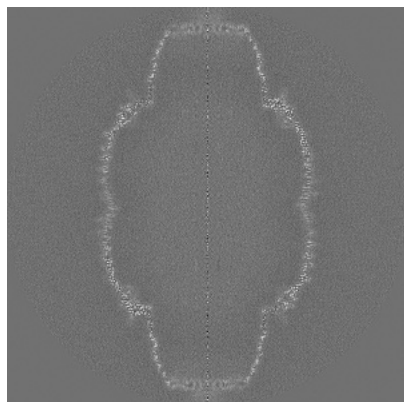


Z

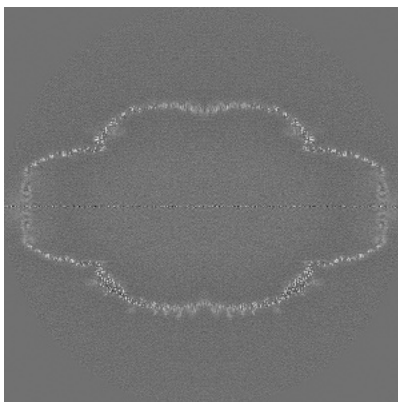
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

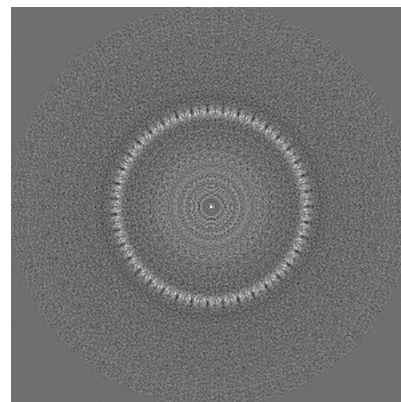
6.2.1 Primary map



X Index: 320

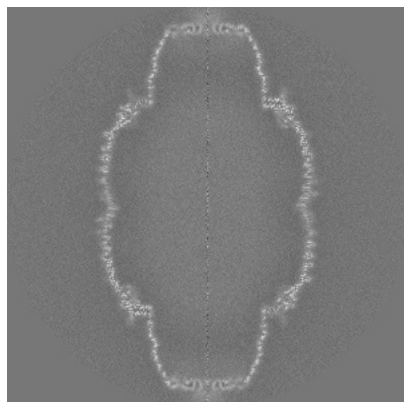


Y Index: 320

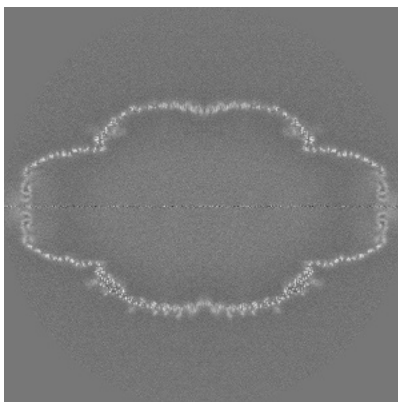


Z Index: 320

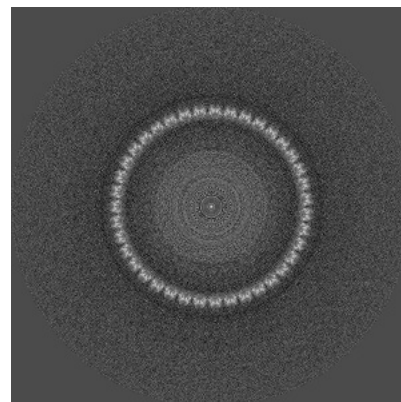
6.2.2 Raw map



X Index: 320



Y Index: 320

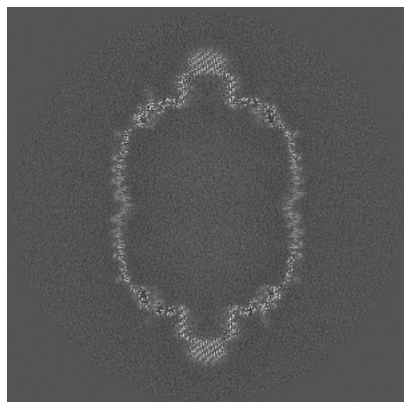


Z Index: 320

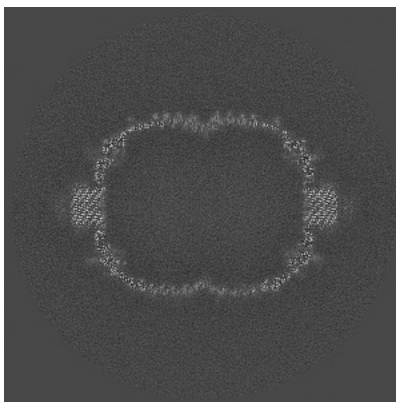
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

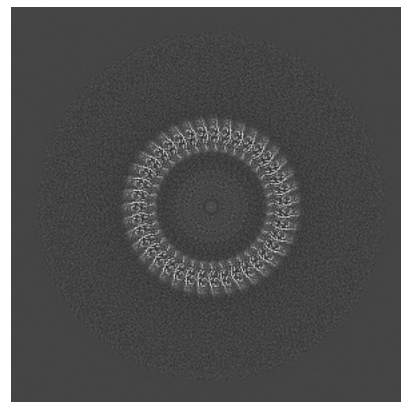
6.3.1 Primary map



X Index: 402

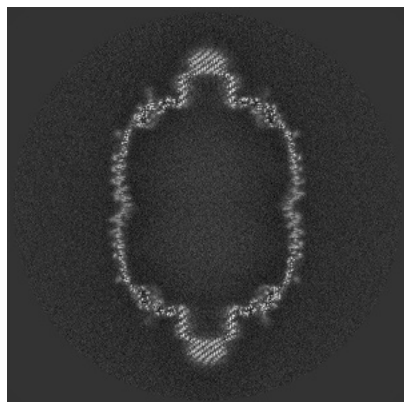


Y Index: 231

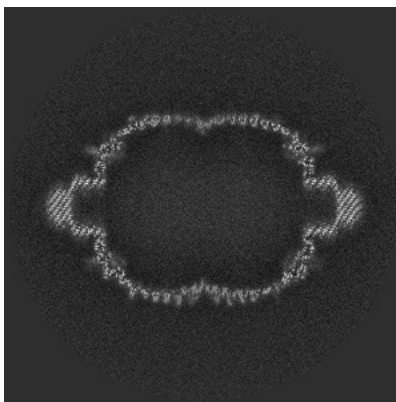


Z Index: 160

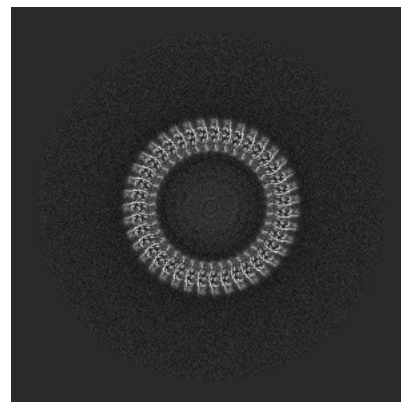
6.3.2 Raw map



X Index: 402



Y Index: 238

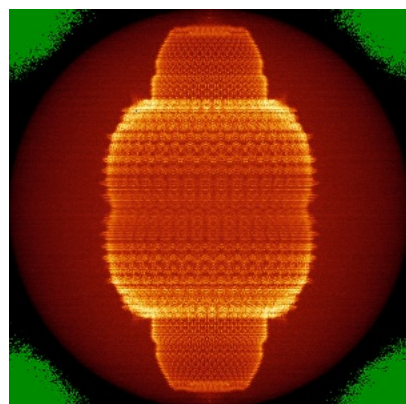


Z Index: 160

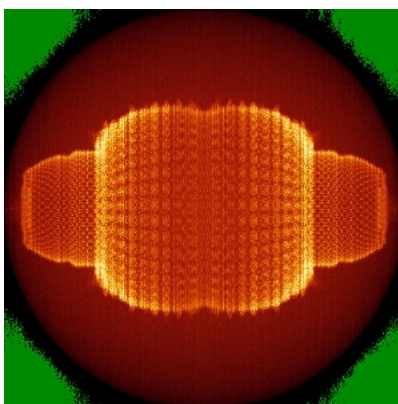
The images above show the largest variance slices of the map in three orthogonal directions.

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

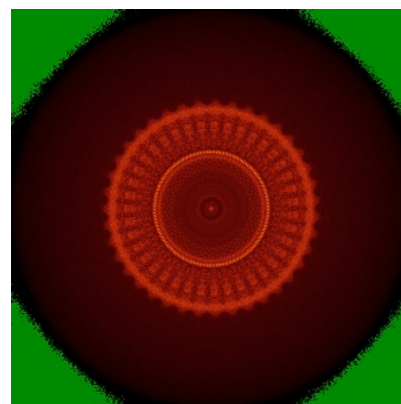
6.4.1 Primary map



X

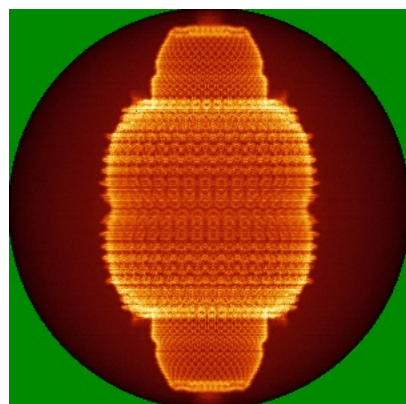


Y

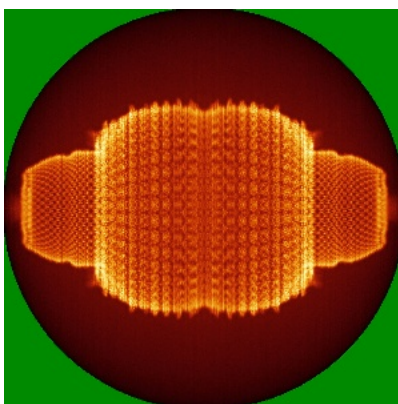


Z

6.4.2 Raw map



X



Y

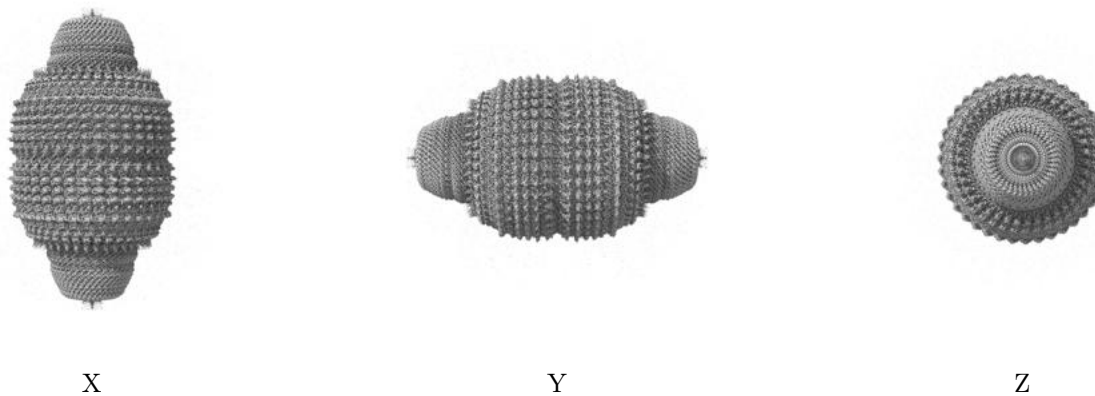


Z

The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.00713. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 Raw map



These images show the 3D surface of the raw map. The raw map's contour level was selected so that its surface encloses the same volume as the primary map does at its recommended contour level.

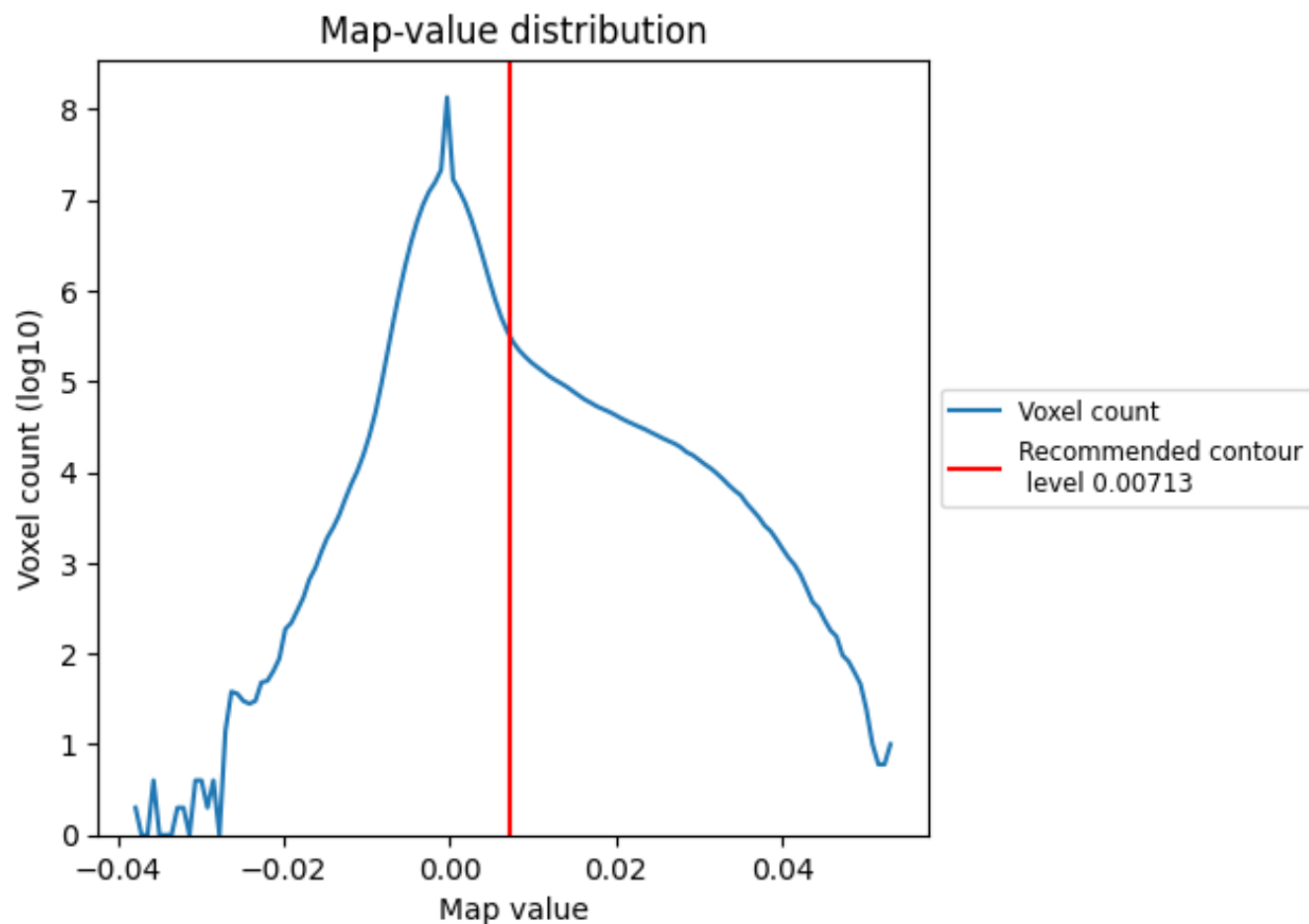
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

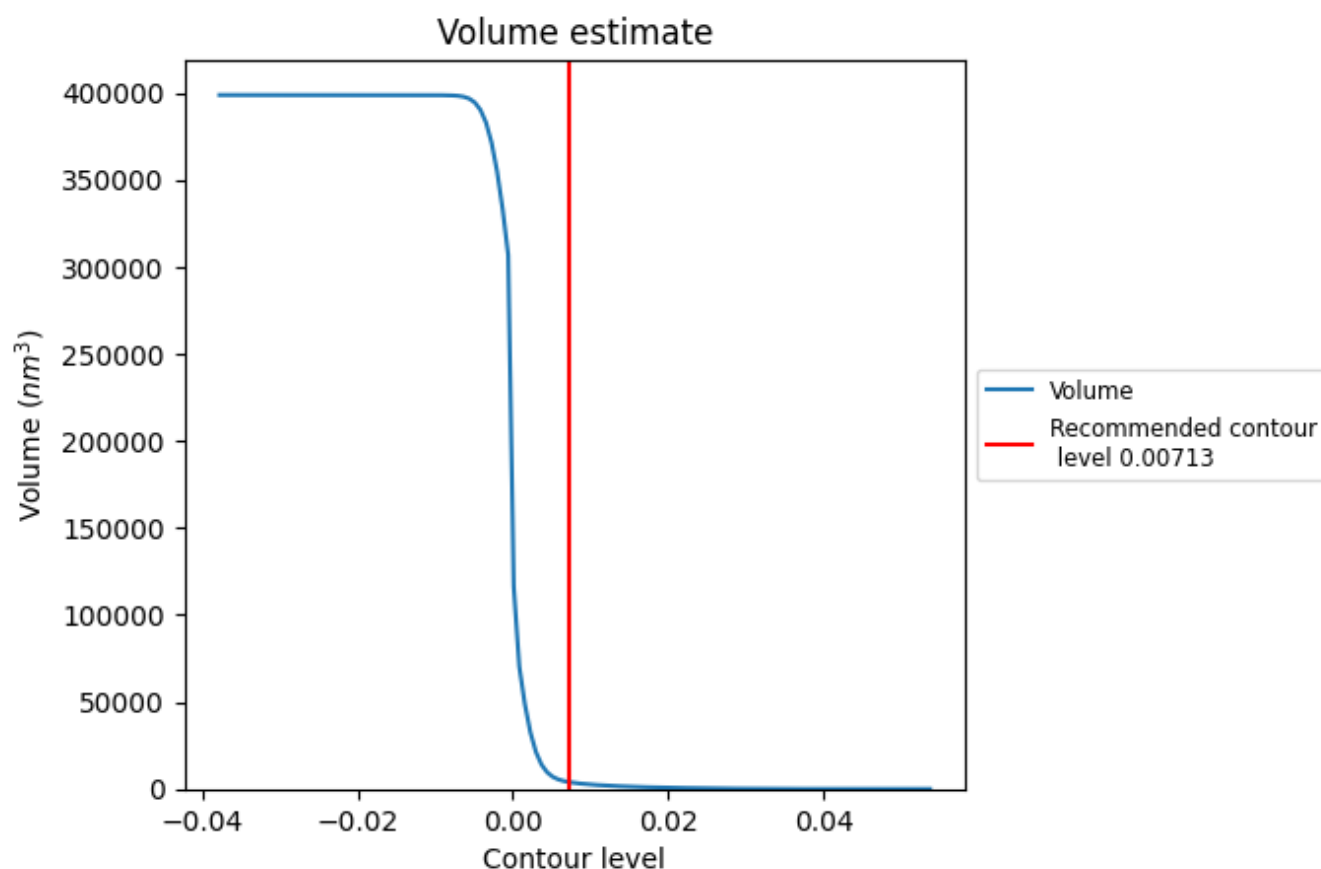
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution [i](#)



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

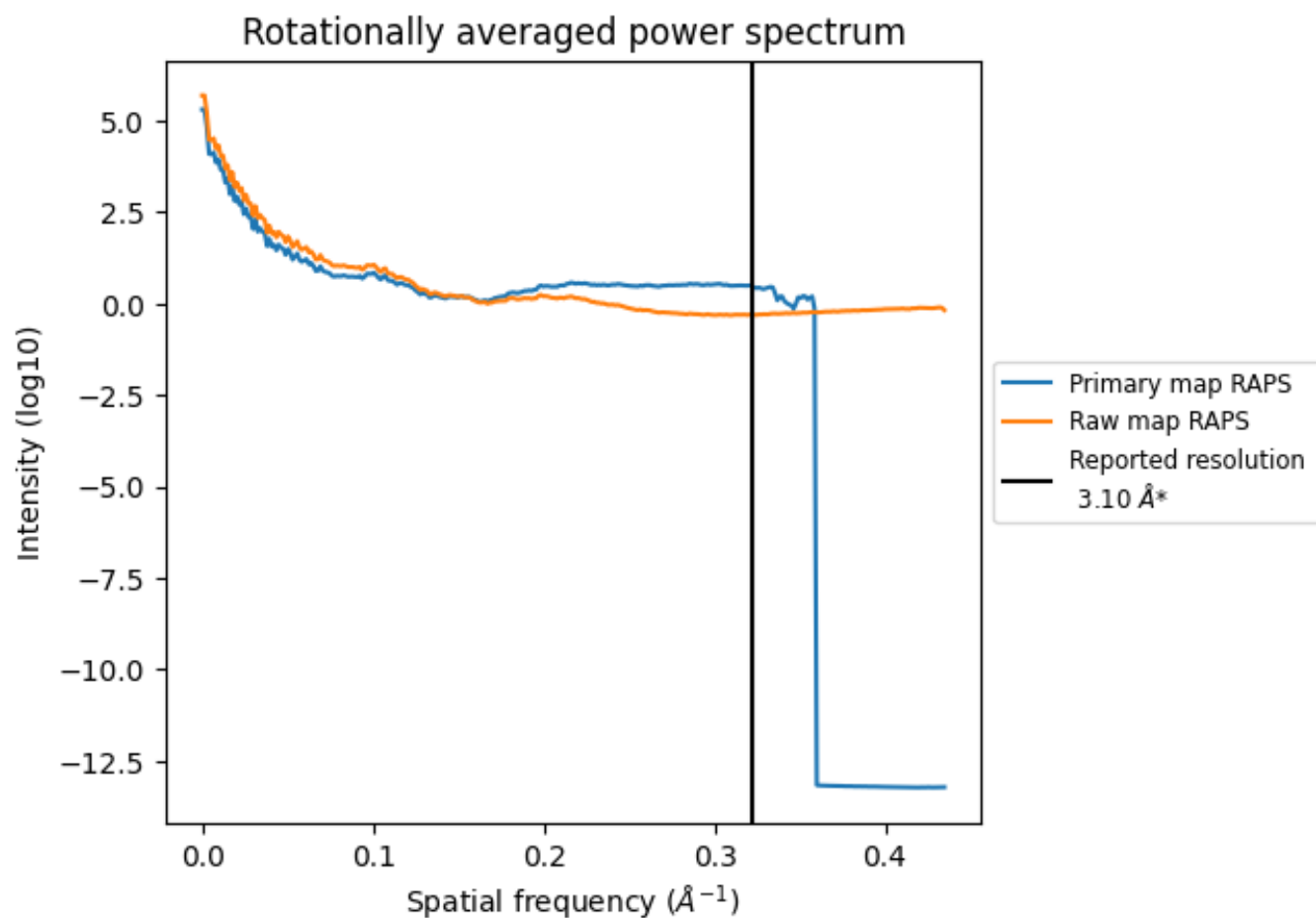
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 4041 nm³; this corresponds to an approximate mass of 3650 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 ⓘ

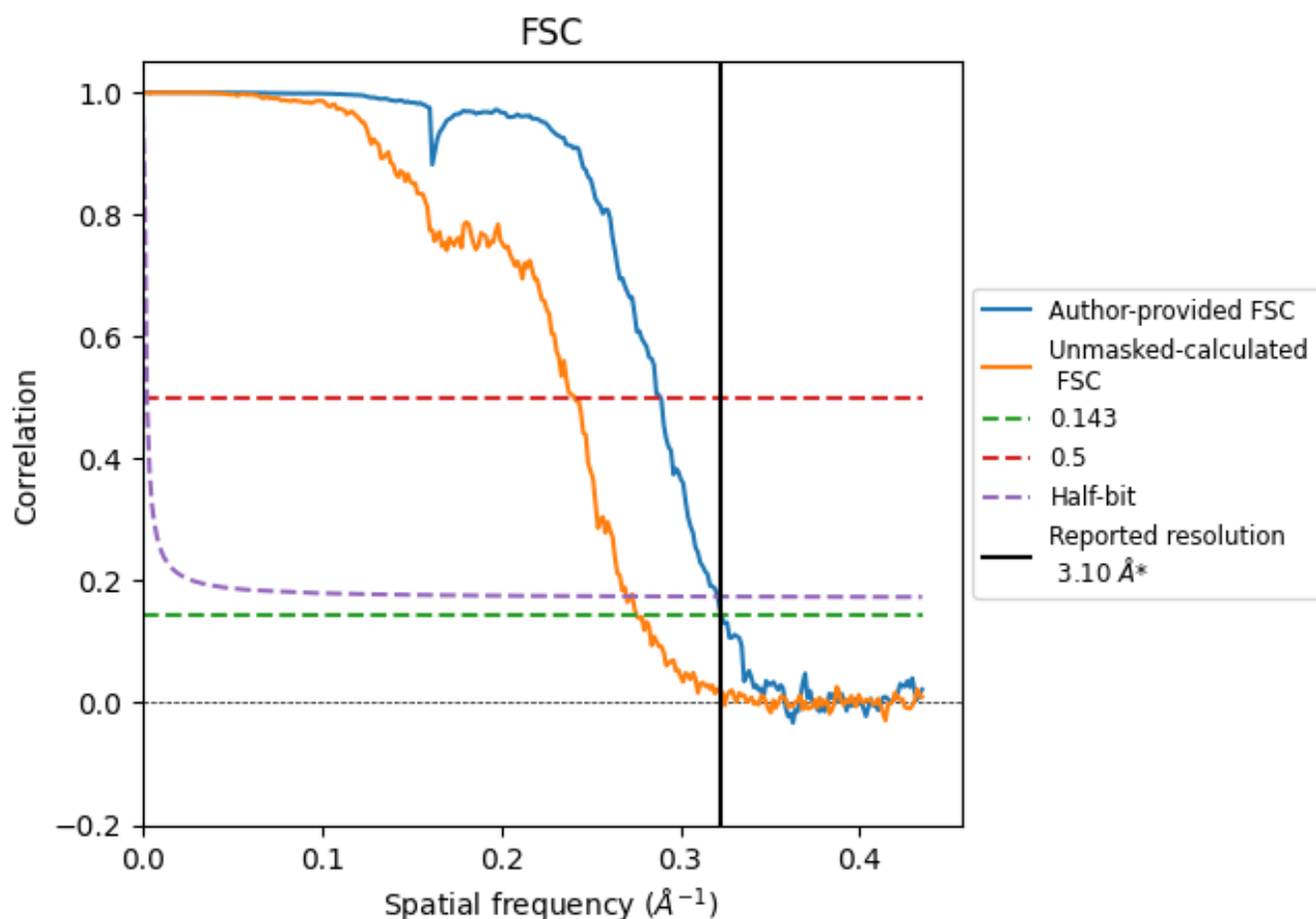


*Reported resolution corresponds to spatial frequency of 0.323 Å⁻¹

8 Fourier-Shell correlation [i](#)

Fourier-Shell Correlation (FSC) is the most commonly used method to estimate the resolution of single-particle and subtomogram-averaged maps. The shape of the curve depends on the imposed symmetry, mask and whether or not the two 3D reconstructions used were processed from a common reference. The reported resolution is shown as a black line. A curve is displayed for the half-bit criterion in addition to lines showing the 0.143 gold standard cut-off and 0.5 cut-off.

8.1 FSC [i](#)



*Reported resolution corresponds to spatial frequency of 0.323 $\text{\AA}^{-1}$

8.2 Resolution estimates [i](#)

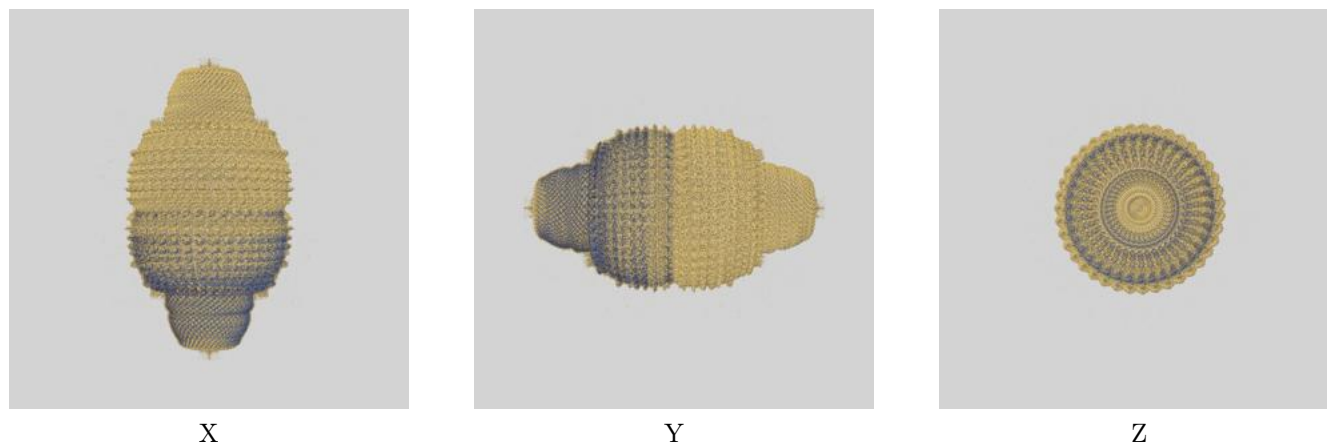
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.10	-	-
Author-provided FSC curve	3.10	3.46	3.12
Unmasked-calculated*	3.63	4.15	3.71

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 3.63 differs from the reported value 3.1 by more than 10 %

9 Map-model fit [i](#)

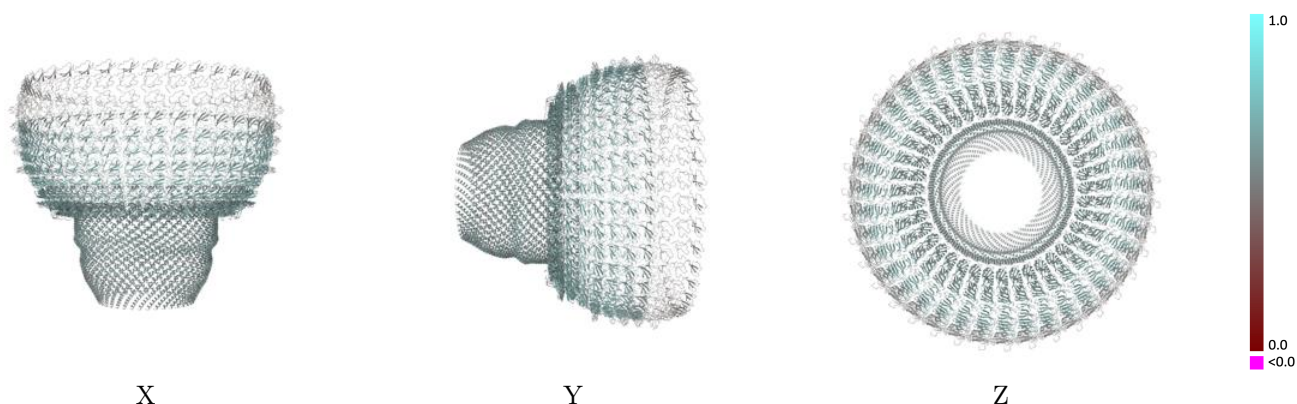
This section contains information regarding the fit between EMDB map EMD-53805 and PDB model 9R86. Per-residue inclusion information can be found in section [3](#) on page [8](#).

9.1 Map-model overlay [i](#)



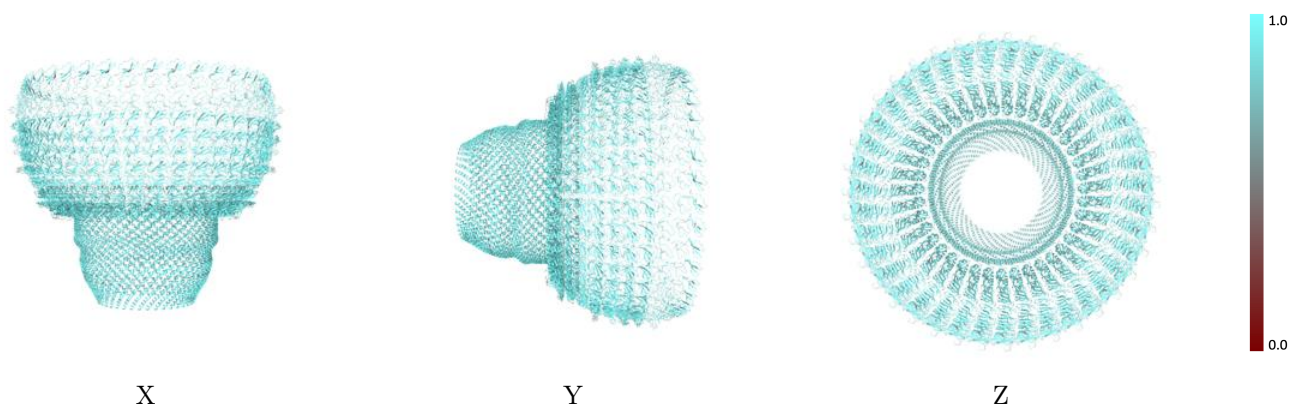
The images above show the 3D surface view of the map at the recommended contour level 0.00713 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



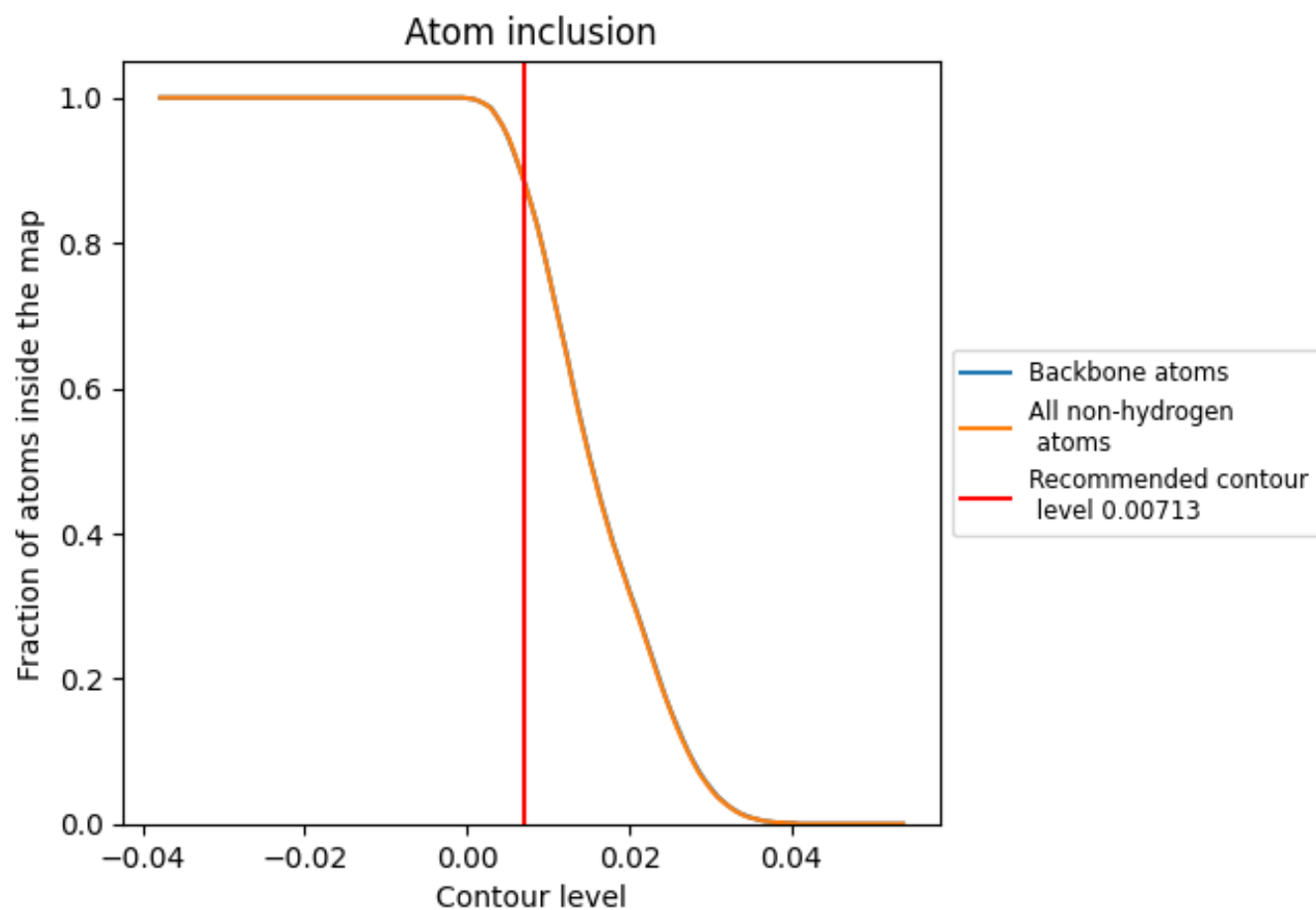
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.00713).

9.4 Atom inclusion ⓘ



At the recommended contour level, 88% of all backbone atoms, 88% 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 (0.00713) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.8820	 0.5450
A0	 0.8940	 0.5480
A1	 0.8900	 0.5440
A2	 0.8910	 0.5440
A3	 0.8930	 0.5440
A4	 0.8880	 0.5440
A5	 0.8920	 0.5460
A6	 0.8920	 0.5440
A7	 0.8890	 0.5450
A8	 0.8890	 0.5450
A9	 0.8910	 0.5440
Ac	 0.8930	 0.5450
Ad	 0.8900	 0.5440
Ae	 0.8890	 0.5440
Af	 0.8890	 0.5440
Ag	 0.8900	 0.5440
Ah	 0.8910	 0.5450
Ai	 0.8890	 0.5450
Aj	 0.8880	 0.5450
Ak	 0.8910	 0.5450
Al	 0.8890	 0.5440
Am	 0.8910	 0.5450
An	 0.8900	 0.5450
Ap	 0.8910	 0.5450
Aq	 0.8920	 0.5440
Ar	 0.8910	 0.5450
As	 0.8910	 0.5450
At	 0.8890	 0.5440
Au	 0.8890	 0.5440
Av	 0.8910	 0.5450
Aw	 0.8900	 0.5440
Ax	 0.8920	 0.5440
Ay	 0.8940	 0.5450
Az	 0.8920	 0.5460
BA	 0.8910	 0.5440



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Chain	Atom inclusion	Q-score
BB	 0.8910	 0.5450
BC	 0.8880	 0.5450
BD	 0.8900	 0.5450
BE	 0.8930	 0.5450
BF	 0.8920	 0.5440