



wwPDB EM Validation Summary Report ⓘ

Mar 30, 2026 – 06:56 AM UTC

PDB ID : 6ZIQ / pdb_00006ziq
EMDB ID : EMD-11228
Title : bovine ATP synthase stator domain, state 1
Authors : Spikes, T.E.; Montgomery, M.G.; Walker, J.E.
Deposited on : 2020-06-26
Resolution : 4.33 Å (reported)
Based on initial models : 2CLY, 2WSS, 2V7Q

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.dev132
Mogul : 2022.3.0, CSD as543be (2022)
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

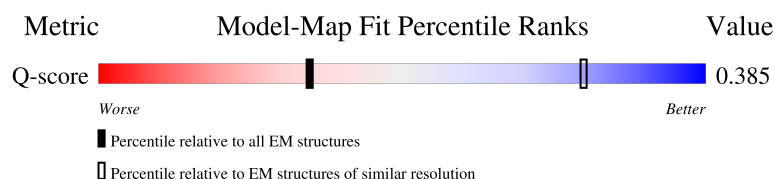
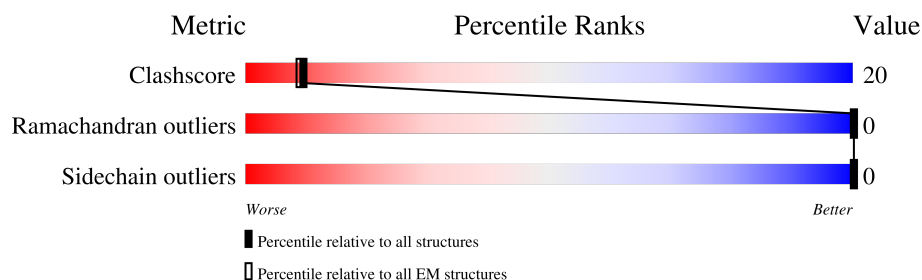
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 4.33 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	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
Q-score	-	25397	3854 (3.83 - 4.83)

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	8	66	14% 33% 29% 38%
2	a	226	21% 64% 36%
3	d	160	19% 61% 36% .
4	e	70	30% 46% 13% 41%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
5	f	87	
6	g	102	
7	j	60	
8	k	57	
9	M	75	
9	N	75	
9	O	75	
10	b	214	
11	h	76	
12	S	190	
13	C	510	

2 Entry composition [i](#)

There are 13 unique types of molecules in this entry. The entry contains 22312 atoms, of which 11373 are hydrogens and 0 are deuteriums.

In the tables below, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called ATP synthase protein 8.

Mol	Chain	Residues	Atoms						AltConf	Trace
1	8	41	Total	C	H	N	O	S	0	0
			696	231	352	52	58	3		

- Molecule 2 is a protein called ATP synthase subunit a.

Mol	Chain	Residues	Atoms						AltConf	Trace
2	a	226	Total	C	H	N	O	S	0	0
			3611	1155	1870	276	298	12		

- Molecule 3 is a protein called ATP synthase subunit d, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
3	d	155	Total	C	H	N	O	S	0	0
			2549	821	1276	207	242	3		

- Molecule 4 is a protein called ATP synthase subunit e, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
4	e	41	Total	C	H	N	O	S	0	0
			687	218	352	61	55	1		

- Molecule 5 is a protein called ATP synthase subunit f, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
5	f	83	Total	C	H	N	O	S	0	0
			1411	456	718	120	114	3		

- Molecule 6 is a protein called ATP synthase subunit g, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
6	g	79	Total	C	H	N	O	S	0	0
			1291	420	662	100	108	1		

- Molecule 7 is a protein called ATP synthase subunit ATP5MPL, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
7	j	48	Total	C	H	N	O	S	0	0
			828	267	428	66	65	2		

- Molecule 8 is a protein called ATP synthase membrane subunit DAPIT, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
8	k	36	Total	C	H	N	O	S	0	0
			596	192	307	47	48	2		

- Molecule 9 is a protein called ATP synthase F(0) complex subunit C1, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
9	M	68	Total	C	H	N	O	S	0	0
			994	326	507	75	82	4		
9	N	75	Total	C	H	N	O	S	0	0
			1096	356	559	83	94	4		
9	O	44	Total	C	H	N	O	S	0	0
			707	234	364	51	55	3		

- Molecule 10 is a protein called ATP synthase F(0) complex subunit B1, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
10	b	209	Total	C	H	N	O	S	0	0
			3456	1095	1755	292	308	6		

- Molecule 11 is a protein called ATP synthase-coupling factor 6, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
11	h	62	Total	C	H	N	O	S	0	0
			1009	326	495	87	99	2		

- Molecule 12 is a protein called ATP synthase subunit O, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
12	S	129	Total	C	H	N	O	S	0	0
			2048	627	1057	171	186	7		

- Molecule 13 is a protein called ATP synthase subunit alpha, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
13	C	89	Total	C	H	N	O	S	0	0
			1333	409	671	115	136	2		

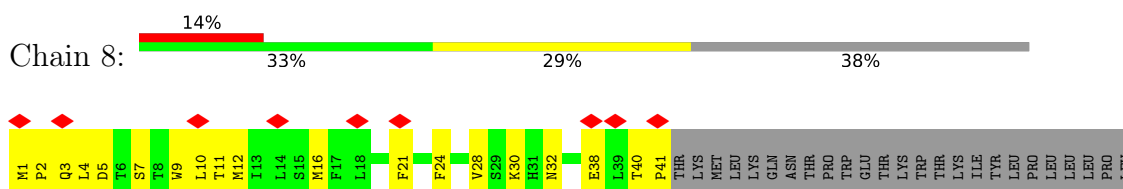
There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	1	GLU	GLN	microheterogeneity	UNP P19483

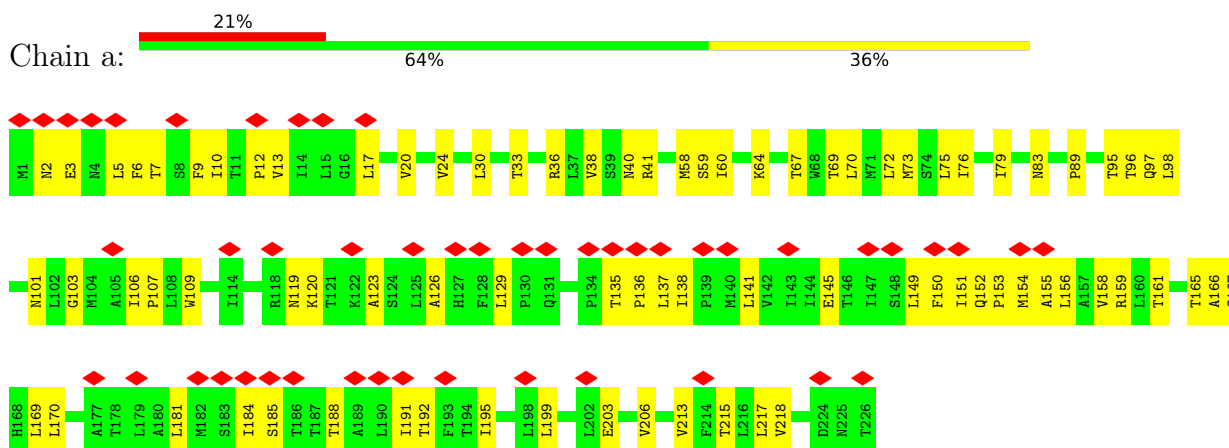
3 Residue-property plots [i](#)

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.

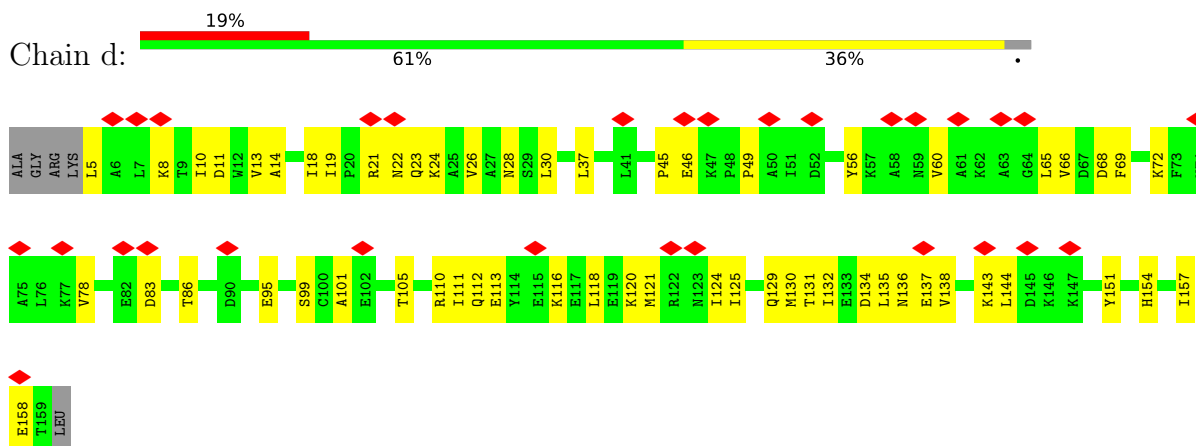
- Molecule 1: ATP synthase protein 8



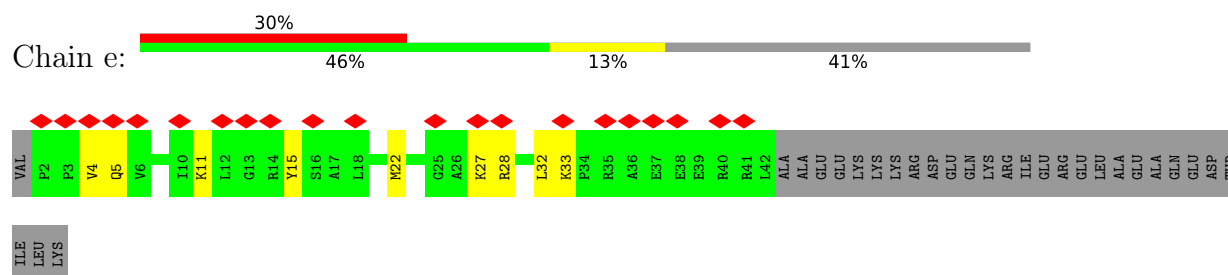
- Molecule 2: ATP synthase subunit a



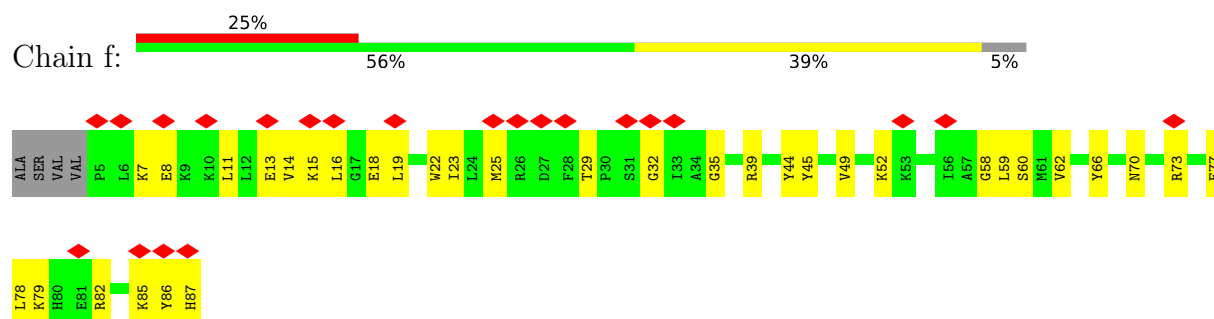
- Molecule 3: ATP synthase subunit d, mitochondrial



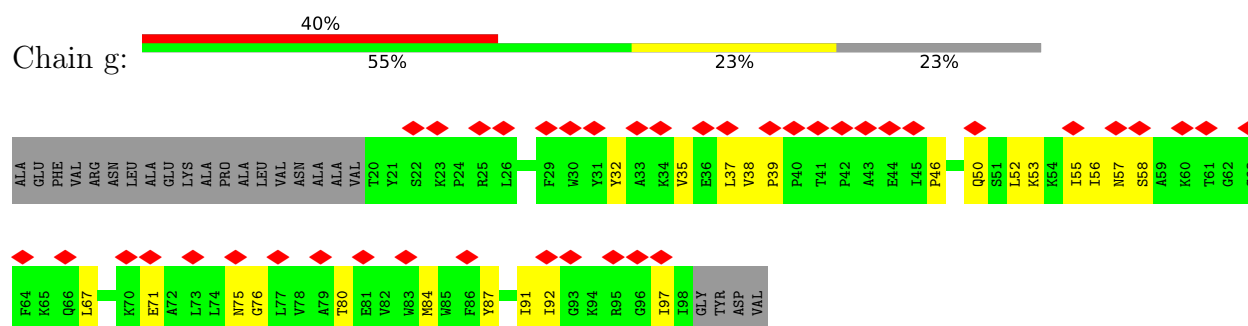
- Molecule 4: ATP synthase subunit e, mitochondrial



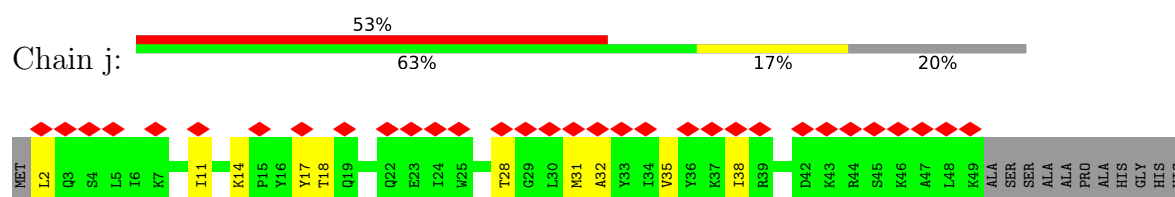
- Molecule 5: ATP synthase subunit f, mitochondrial



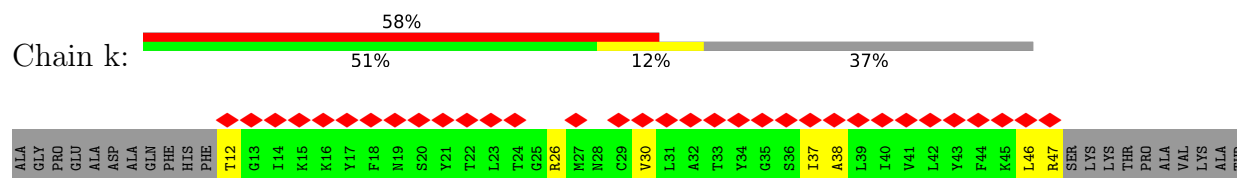
- Molecule 6: ATP synthase subunit g, mitochondrial



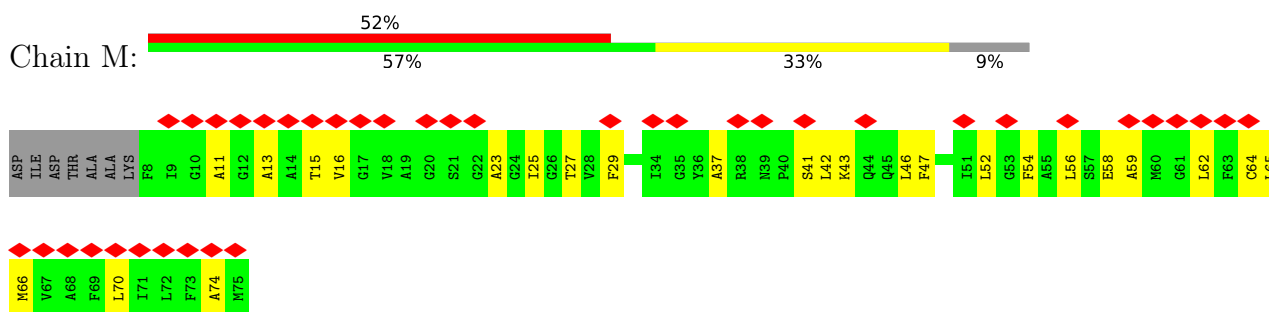
- Molecule 7: ATP synthase subunit ATP5MPL, mitochondrial



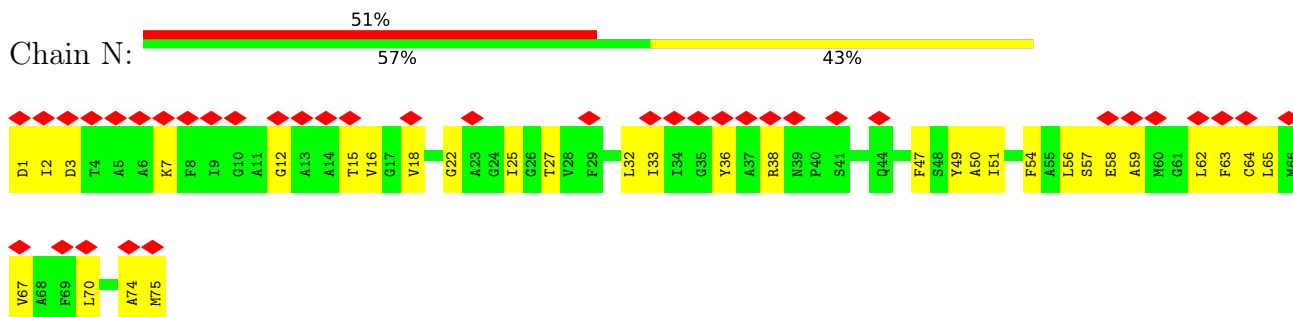
- Molecule 8: ATP synthase membrane subunit DAPIT, mitochondrial



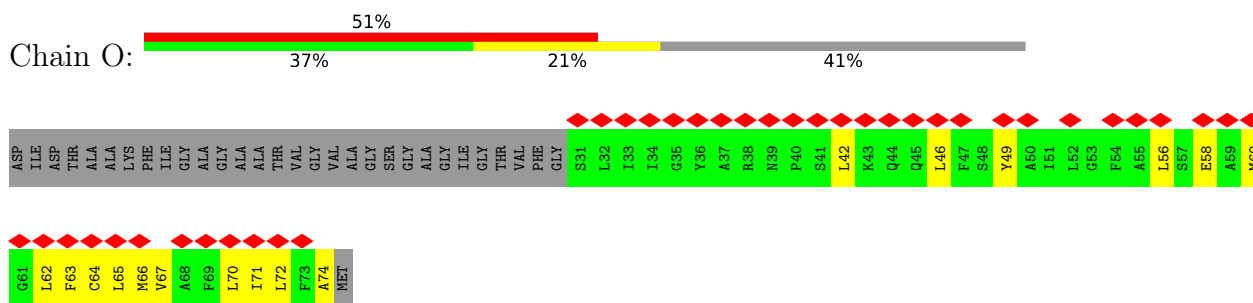
- Molecule 9: ATP synthase F(0) complex subunit C1, mitochondrial



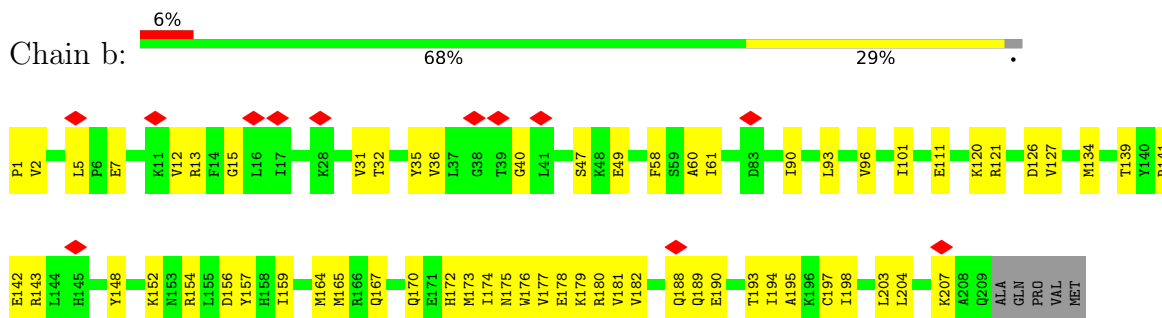
- Molecule 9: ATP synthase F(0) complex subunit C1, mitochondrial



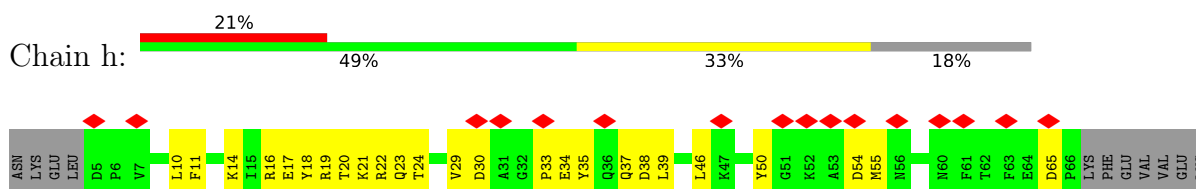
- Molecule 9: ATP synthase F(0) complex subunit C1, mitochondrial



- Molecule 10: ATP synthase F(0) complex subunit B1, mitochondrial

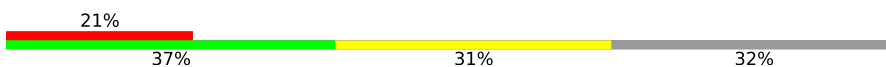


- Molecule 11: ATP synthase-coupling factor 6, mitochondrial



PRO
GLN
SER

• Molecule 12: ATP synthase subunit O, mitochondrial

Chain S: 

PHE
ALA
LEU
VAL
ASP
R6
V9
G13
I14
E15
G16
R17
Y18
A19
T20
A21
L22
A25
K28
Q29
N30
K31
L32
E33
Q34
V35
E36
K37
E38
L39
L40
R41
V42
Q43
Q44
I45
LEU
LYS
GLU
PRO
LYS
MET
ALA
ALA
SER
LEU
LEU
ASN
PRO
TYR
VAL
LYS
ARG
SER
VAL
VAL
LYS

VAL
LYS
SER
SER
SER
MET
THR
ALA
GLY
LYS
LYS
PHE
SER
PRO
LEU
THR
SER
ASN
LEU
ILE
ASN
LEU
LEU
ALA
GLU
ASN
GLY
ARG
LEU
THR
ASN
THR
PRO
A100
V101
I102
S103
A104
M108
M109
H112
H113
G114
E115
V116
P117
C118
T119
A125
L126
D127
E128
A129
T130
E133

L134
K136
L138
K139
L142
S143
K144
G145
Q146
V147
L148
K149
L150
E151
V152
D155
F156
S157
I158
M159
M162
I163
I166
G167
E168
K169
Y170
V171
D172
M173
S174
T177
K178
I179
Q180
K181
L182
S183
R184
A185
M186
R187
E188
ILE
LEU

• Molecule 13: ATP synthase subunit alpha, mitochondrial

Chain C: 

GLU
LYS
THR
THR
A6
E7
V8
S9
S10
I11
I12
E13
E14
I16
L17
D20
T21
S22
V23
D24
L25
E26
E27
T28
V31
L32
S33
I34
G35
D36
G37
I38
A39
R40
V41
H42
G43
L44
R45
M46
V47
Q48
A49
E50
E51
E54
F55
L59
S63
L64
N65
L66
E67

P68
D69
N70
V71
G72
V75
N78
D79
K80
L81
I82
G85
K89
R90
T91
G92
A93
I94
VAL
ASP
VAL
VAL
PRO
ILE
GLY
VAL
GLY
GLY
GLN
GLY
ILE
LYS
SER
THR
VAL
VAL
GLN
ASP
SER
LEU
VAL
VAL
D20
T21
S22
V23
D24
L25
E26
E27
T28
V31
L32
S33
I34
G35
D36
G37
I38
A39
R40
V41
H42
G43
L44
R45
M46
V47
Q48
A49
E50
E51
E54
F55
L59
S63
L64
N65
L66
E67

ALA
PRO
GLY
ILE
ILE
PRO
ARG
ILE
SER
VAL
ARG
TYR
GLY
VAL
GLY
GLN
MET
GLY
ILE
LYS
SER
ALA
VAL
VAL
SER
LEU
VAL
VAL
PRO
ILE
GLY
VAL
GLY
GLY
GLN
ARG
GLY
THR
LYS
ALA
GLY
GLU
GLY
THR
THR
LYS
SER
THR
VAL
VAL
GLN
ASP
SER
LEU
VAL
VAL
D20
T21
S22
V23
D24
L25
E26
E27
T28
V31
L32
S33
I34
G35
D36
G37
I38
A39
R40
V41
H42
G43
L44
R45
M46
V47
Q48
A49
E50
E51
E54
F55
L59
S63
L64
N65
L66
E67

THR
ASP
GLU
LYS
LYS
LEU
TYR
CYS
ILE
TYR
ILE
TYR
VAL
GLY
GLN
ILE
ALA
VAL
VAL
GLY
GLY
LYS
ARG
SER
THR
VAL
VAL
GLN
ASP
SER
LEU
VAL
VAL
D20
T21
S22
V23
D24
L25
E26
E27
T28
V31
L32
S33
I34
G35
D36
G37
I38
A39
R40
V41
H42
G43
L44
R45
M46
V47
Q48
A49
E50
E51
E54
F55
L59
S63
L64
N65
L66
E67

MET
GLY
GLU
TYR
PHE
ARG
ASP
ASN
SER
ARG
LEU
VAL
HIS
ALA
HIS
VAL
VAL
ILE
ILE
GLY
GLY
GLY
LYS
ASP
ASP
LEU
SER
THR
VAL
VAL
GLN
ASP
SER
LEU
VAL
VAL
D20
T21
S22
V23
D24
L25
E26
E27
T28
V31
L32
S33
I34
G35
D36
G37
I38
A39
R40
V41
H42
G43
L44
R45
M46
V47
Q48
A49
E50
E51
E54
F55
L59
S63
L64
N65
L66
E67

ASN
ASP
ALA
PHE
GLY
GLY
SER
SER
ARG
LEU
THR
ALA
MET
LYS
LEU
PRO
VAL
VAL
ILE
ILE
GLY
GLY
THR
THR
GLN
MET
LYS
LEU
SER
THR
VAL
VAL
GLN
ASP
SER
LEU
VAL
VAL
D20
T21
S22
V23
D24
L25
E26
E27
T28
V31
L32
S33
I34
G35
D36
G37
I38
A39
R40
V41
H42
G43
L44
R45
M46
V47
Q48
A49
E50
E51
E54
F55
L59
S63
L64
N65
L66
E67

ARG
VAL
GLY
SER
MET
ALA
ALA
GLY
GLY
THR
THR
GLN
MET
LYS
LEU
PRO
VAL
VAL
ILE
ILE
GLY
GLY
THR
THR
GLN
MET
LYS
LEU
SER
THR
VAL
VAL
GLN
ASP
SER
LEU
VAL
VAL
D20
T21
S22
V23
D24
L25
E26
E27
T28
V31
L32
S33
I34
G35
D36
G37
I38
A39
R40
V41
H42
G43
L44
R45
M46
V47
Q48
A49
E50
E51
E54
F55
L59
S63
L64
N65
L66
E67

TYR
SER
PRO
MET
ALA
LEU
GLY
GLY
GLY
GLY
THR
THR
GLN
MET
LYS
LEU
PRO
VAL
VAL
ILE
ILE
GLY
GLY
THR
THR
GLN
MET
LYS
LEU
SER
THR
VAL
VAL
GLN
ASP
SER
LEU
VAL
VAL
D20
T21
S22
V23
D24
L25
E26
E27
T28
V31
L32
S33
I34
G35
D36
G37
I38
A39
R40
V41
H42
G43
L44
R45
M46
V47
Q48
A49
E50
E51
E54
F55
L59
S63
L64
N65
L66
E67

SER
ASP
ALA
LYS
LEU
GLY
GLY
ILE
VAL
THR
THR
ASN
PHE
PHE
GLY
ALA
GLY
ALA

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C2	Depositor
Number of particles used	90850	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 ($e^-/\text{\AA}^2$)	4.6	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K2 QUANTUM (4k x 4k)	Depositor
Maximum map value	0.060	Depositor
Minimum map value	-0.031	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.001	Depositor
Recommended contour level	0.0187	Depositor
Map size (Å)	524.0, 524.0, 524.0	wwPDB
Map dimensions	500, 500, 500	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.048, 1.048, 1.048	Depositor

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: M3L

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	8	0.25	0/355	0.42	0/483
2	a	0.26	0/1779	0.47	0/2433
3	d	0.21	0/1304	0.39	0/1768
4	e	0.18	0/343	0.32	0/460
5	f	0.21	0/711	0.34	0/952
6	g	0.18	0/646	0.42	0/879
7	j	0.22	0/410	0.42	0/552
8	k	0.13	0/294	0.30	0/395
9	M	0.23	0/484	0.41	0/653
9	N	0.27	0/534	0.52	0/721
9	O	0.25	0/338	0.60	0/456
10	b	0.22	0/1733	0.43	0/2334
11	h	0.23	0/526	0.49	0/707
12	S	0.20	0/1000	0.37	0/1341
13	C	0.20	0/665	0.38	0/894
All	All	0.22	0/11122	0.43	0/15028

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	8	344	352	352	30	0
2	a	1741	1870	1870	106	0
3	d	1273	1276	1275	57	0
4	e	335	352	352	8	0
5	f	693	718	718	31	0
6	g	629	662	662	21	0
7	j	400	428	428	16	0
8	k	289	307	307	7	0
9	M	487	507	506	26	0
9	N	537	559	559	41	0
9	O	343	364	363	22	0
10	b	1701	1755	1755	76	0
11	h	514	495	495	36	0
12	S	991	1057	1055	57	0
13	C	662	671	671	37	0
All	All	10939	11373	11368	447	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 20.

The worst 5 of 447 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)
2:a:106:ILE:HG13	7:j:31:MET:HE1	1.42	0.99
1:8:12:MET:HE1	2:a:20:VAL:HG21	1.48	0.94
2:a:101:ASN:ND2	2:a:161:THR:OG1	2.04	0.91
4:e:15:TYR:OH	6:g:37:LEU:O	1.91	0.88
2:a:107:PRO:HG3	7:j:31:MET:HE3	1.57	0.86

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	8	39/66 (59%)	29 (74%)	10 (26%)	0	100	100
2	a	224/226 (99%)	210 (94%)	14 (6%)	0	100	100
3	d	153/160 (96%)	134 (88%)	19 (12%)	0	100	100
4	e	39/70 (56%)	39 (100%)	0	0	100	100
5	f	81/87 (93%)	74 (91%)	7 (9%)	0	100	100
6	g	77/102 (76%)	71 (92%)	6 (8%)	0	100	100
7	j	46/60 (77%)	43 (94%)	3 (6%)	0	100	100
8	k	34/57 (60%)	32 (94%)	2 (6%)	0	100	100
9	M	65/75 (87%)	62 (95%)	3 (5%)	0	100	100
9	N	72/75 (96%)	64 (89%)	8 (11%)	0	100	100
9	O	41/75 (55%)	38 (93%)	3 (7%)	0	100	100
10	b	207/214 (97%)	196 (95%)	11 (5%)	0	100	100
11	h	60/76 (79%)	49 (82%)	11 (18%)	0	100	100
12	S	125/190 (66%)	114 (91%)	11 (9%)	0	100	100
13	C	87/510 (17%)	78 (90%)	9 (10%)	0	100	100
All	All	1350/2043 (66%)	1233 (91%)	117 (9%)	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	8	41/66 (62%)	41 (100%)	0	100	100
2	a	200/200 (100%)	200 (100%)	0	100	100
3	d	139/142 (98%)	139 (100%)	0	100	100
4	e	34/59 (58%)	34 (100%)	0	100	100
5	f	72/75 (96%)	72 (100%)	0	100	100
6	g	67/83 (81%)	67 (100%)	0	100	100

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
7	j	42/49 (86%)	42 (100%)	0	100	100
8	k	31/46 (67%)	31 (100%)	0	100	100
9	M	45/50 (90%)	45 (100%)	0	100	100
9	N	50/50 (100%)	50 (100%)	0	100	100
9	O	34/50 (68%)	34 (100%)	0	100	100
10	b	186/190 (98%)	186 (100%)	0	100	100
11	h	56/70 (80%)	56 (100%)	0	100	100
12	S	110/165 (67%)	110 (100%)	0	100	100
13	C	73/413 (18%)	73 (100%)	0	100	100
All	All	1180/1708 (69%)	1180 (100%)	0	100	100

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

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 11 such sidechains are listed below:

Mol	Chain	Res	Type
5	f	70	ASN
9	N	44	GLN
10	b	122	HIS
10	b	98	GLN
2	a	119	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

3 non-standard protein/DNA/RNA residues are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
9	M3L	N	43	9	10,11,12	0.53	0	9,14,16	0.64	0
9	M3L	O	43	9	10,11,12	0.57	0	9,14,16	0.55	0
9	M3L	M	43	9	10,11,12	0.44	0	9,14,16	0.40	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
9	M3L	N	43	9	-	6/9/10/12	-
9	M3L	O	43	9	-	2/9/10/12	-
9	M3L	M	43	9	-	2/9/10/12	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

5 of 10 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
9	M	43	M3L	N-CA-CB-CG
9	M	43	M3L	C-CA-CB-CG
9	N	43	M3L	N-CA-CB-CG
9	N	43	M3L	C-CA-CB-CG
9	N	43	M3L	CD-CE-NZ-CM2

There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
9	M	43	M3L	2	0

5.5 Carbohydrates

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.

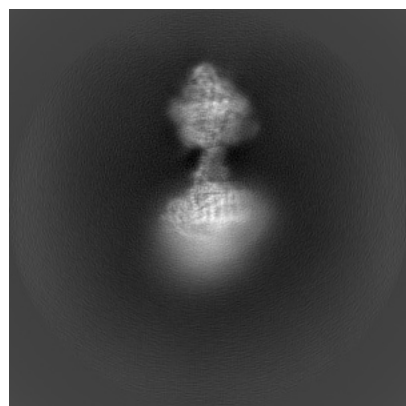
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-11228. These allow visual inspection of the internal detail of the map and identification of artifacts.

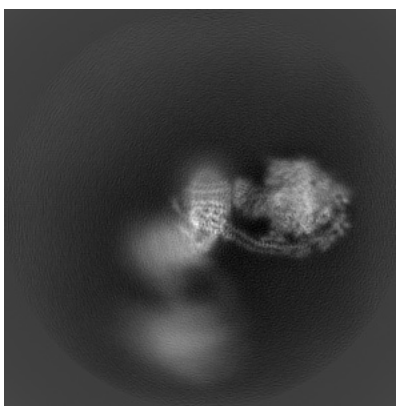
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

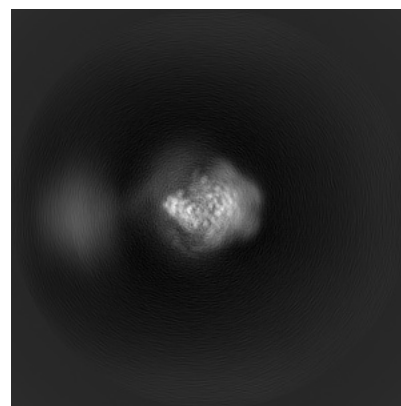
6.1.1 Primary map



X

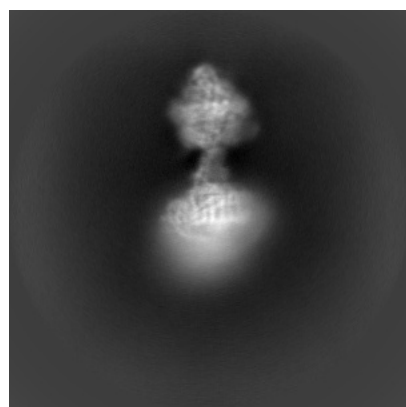


Y

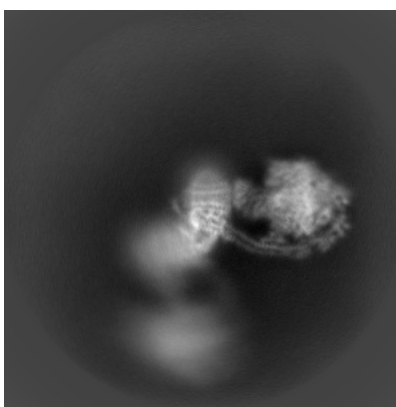


Z

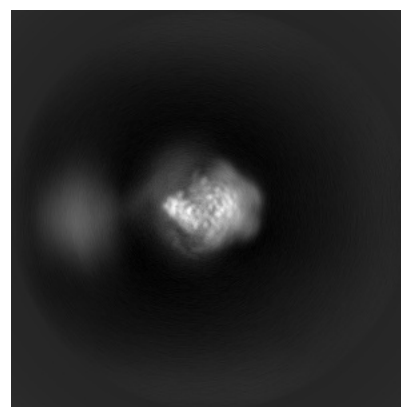
6.1.2 Raw map



X



Y

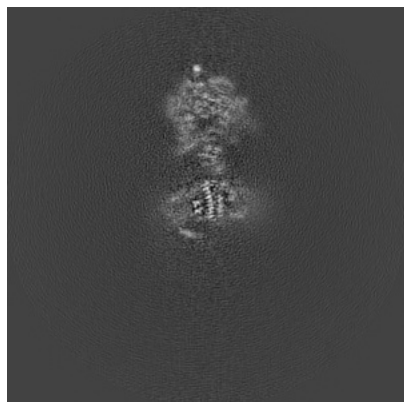


Z

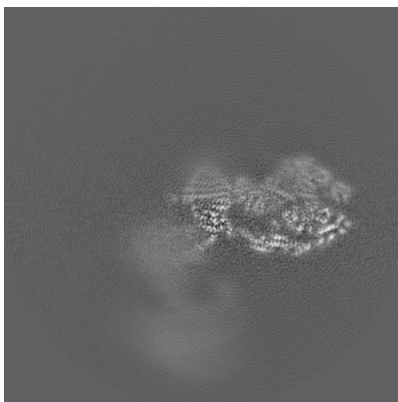
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

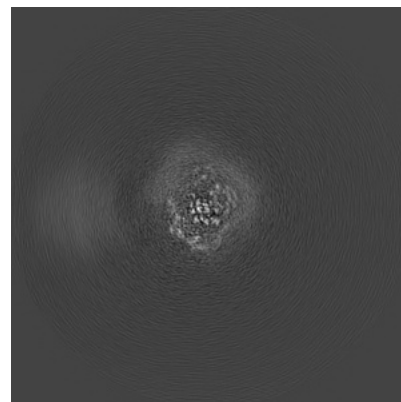
6.2.1 Primary map



X Index: 250

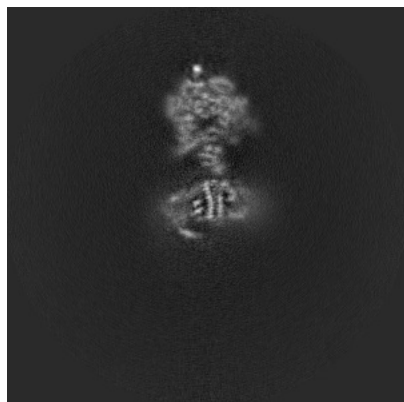


Y Index: 250

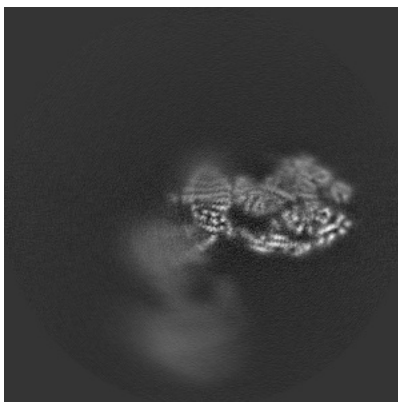


Z Index: 250

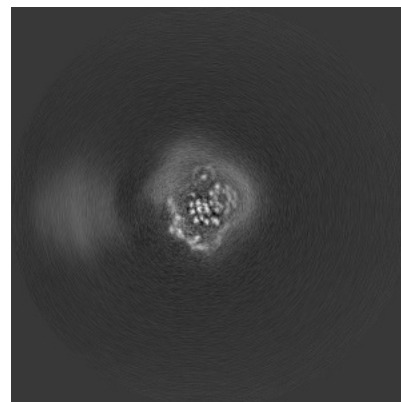
6.2.2 Raw map



X Index: 250



Y Index: 250

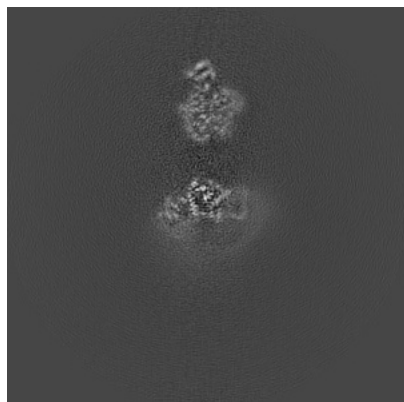


Z Index: 250

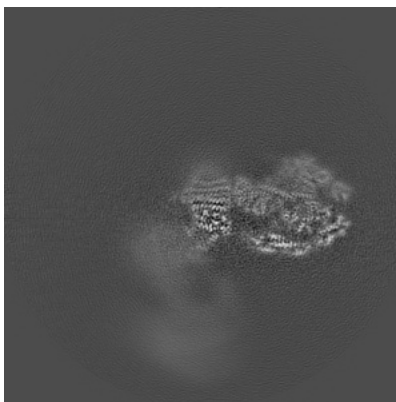
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

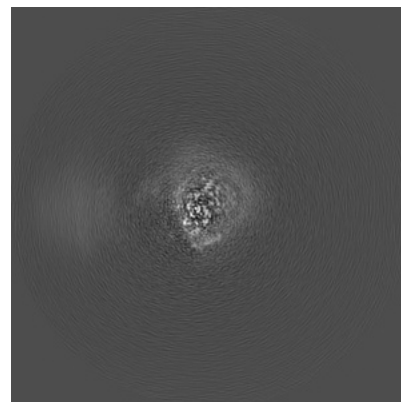
6.3.1 Primary map



X Index: 231

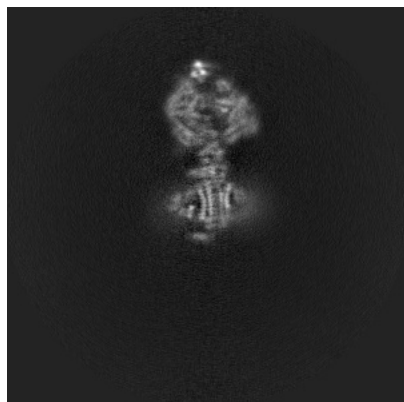


Y Index: 252

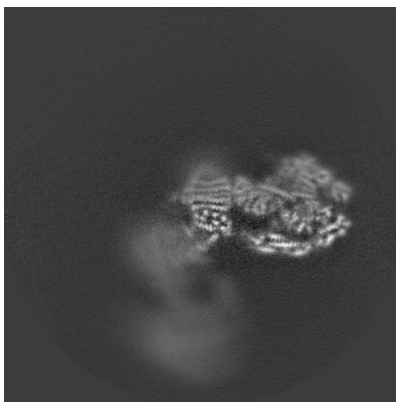


Z Index: 259

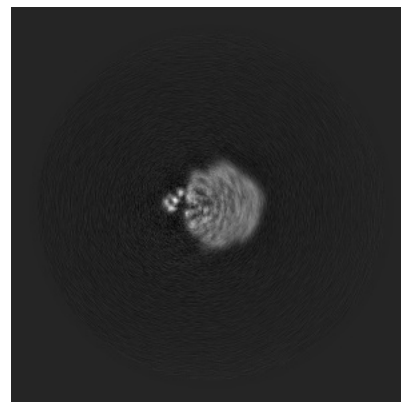
6.3.2 Raw map



X Index: 258



Y Index: 252

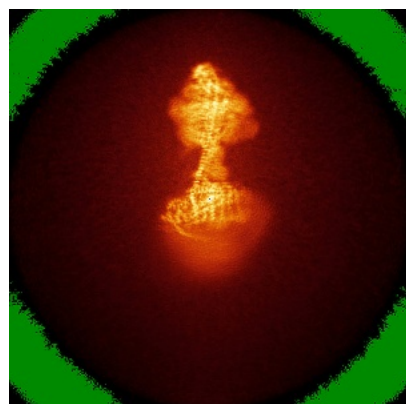


Z Index: 377

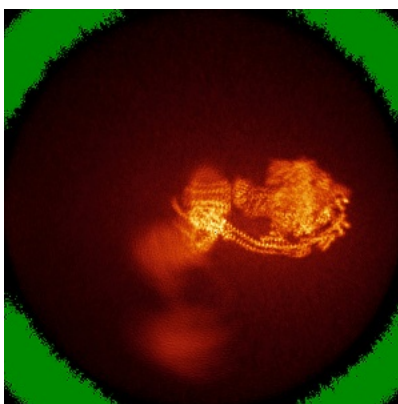
The images above show the largest variance slices of the map in three orthogonal directions.

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

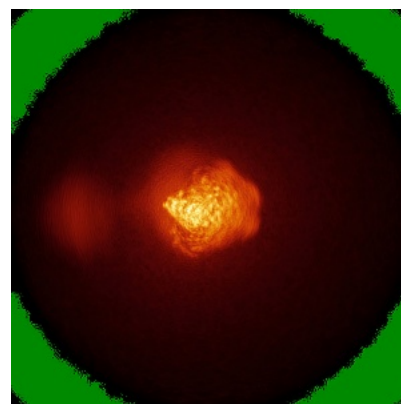
6.4.1 Primary map



X



Y



Z

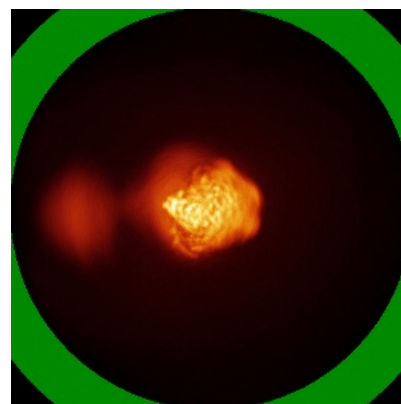
6.4.2 Raw map



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.

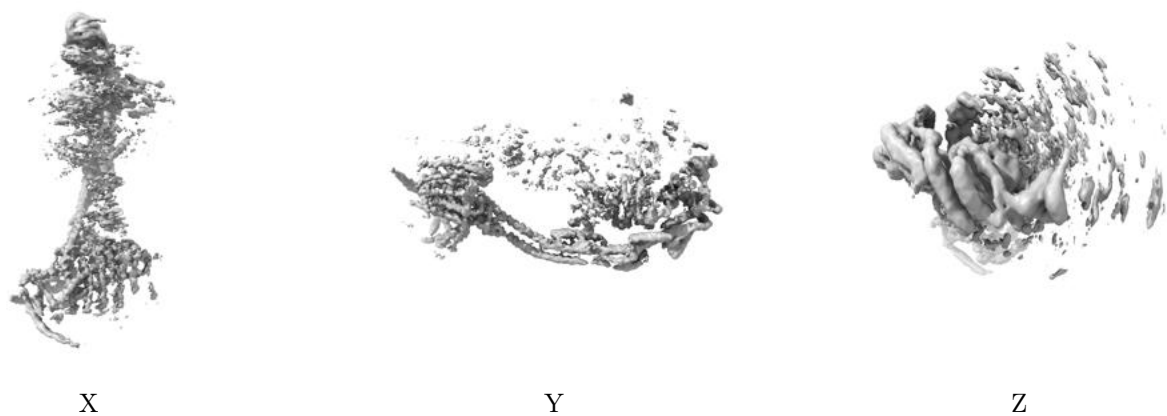
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.0187. 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.

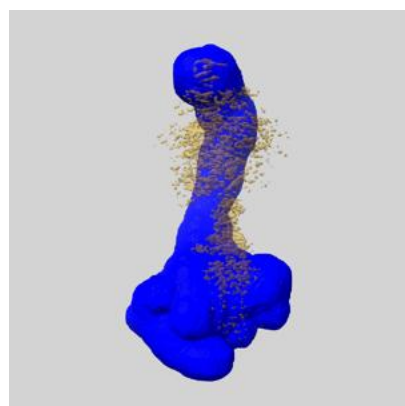
6.6 Mask visualisation [i](#)

This section shows the 3D surface view of the primary map at 50% transparency overlaid with the specified mask at 0% transparency

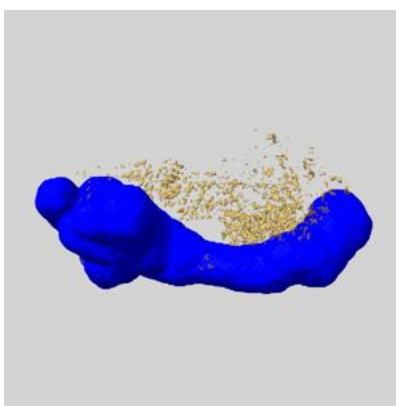
A mask typically either:

- Encompasses the whole structure
- Separates out a domain, a functional unit, a monomer or an area of interest from a larger structure

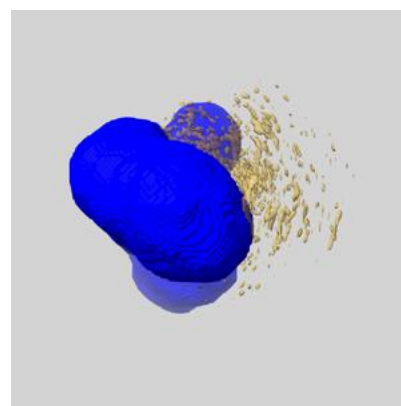
6.6.1 emd_11228_msk_1.map [i](#)



X



Y

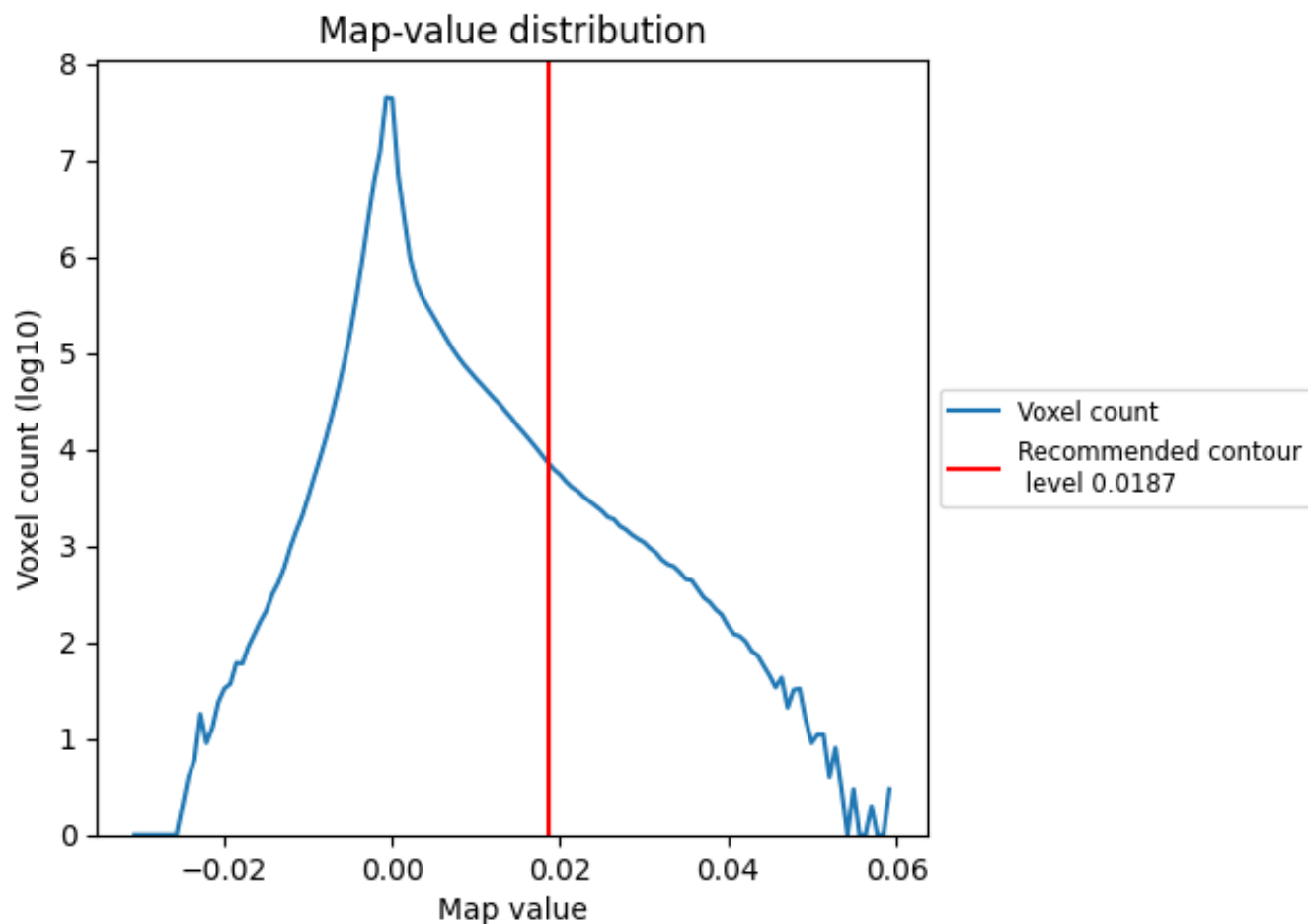


Z

7 Map analysis [i](#)

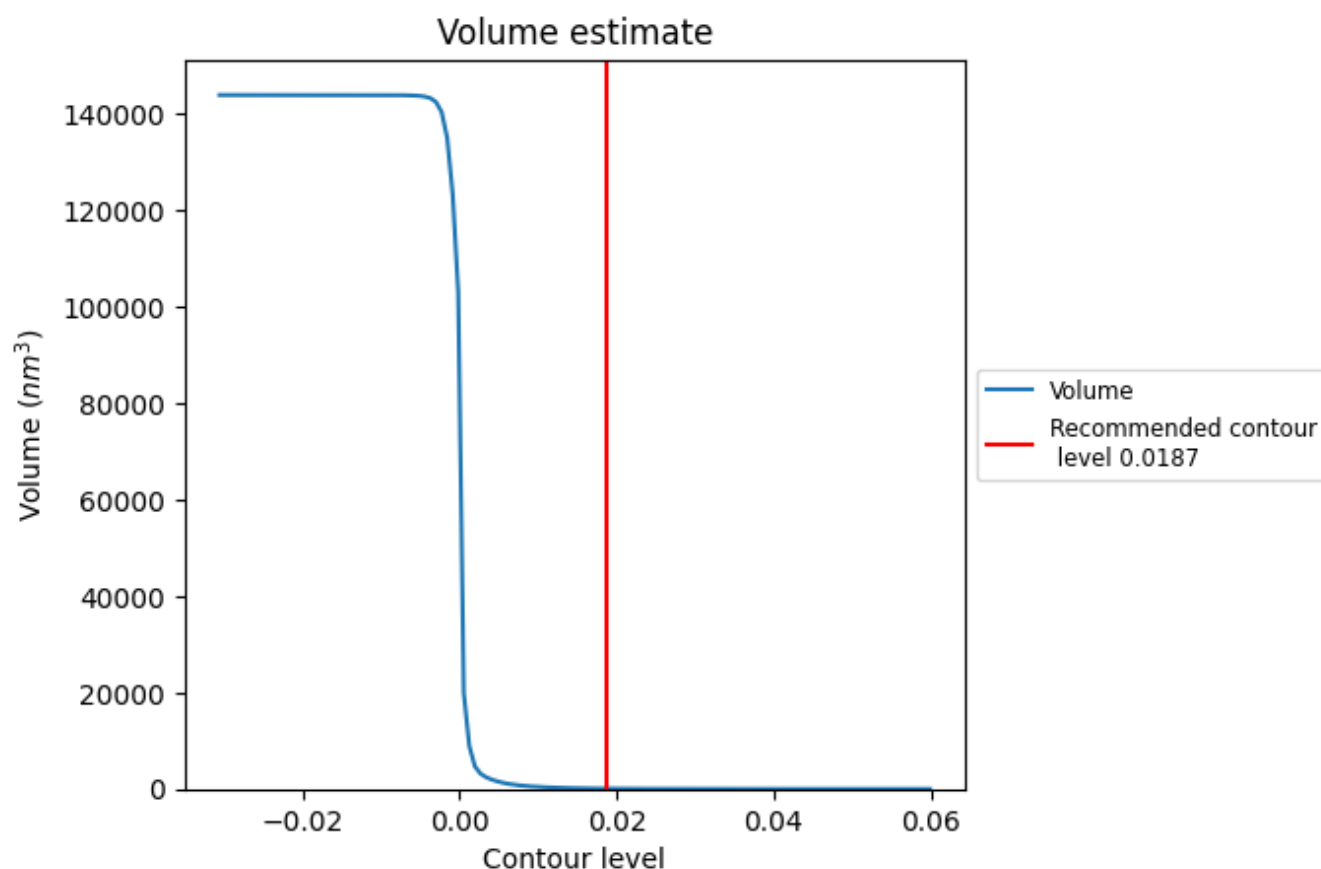
This section contains the results of statistical analysis of the map.

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.

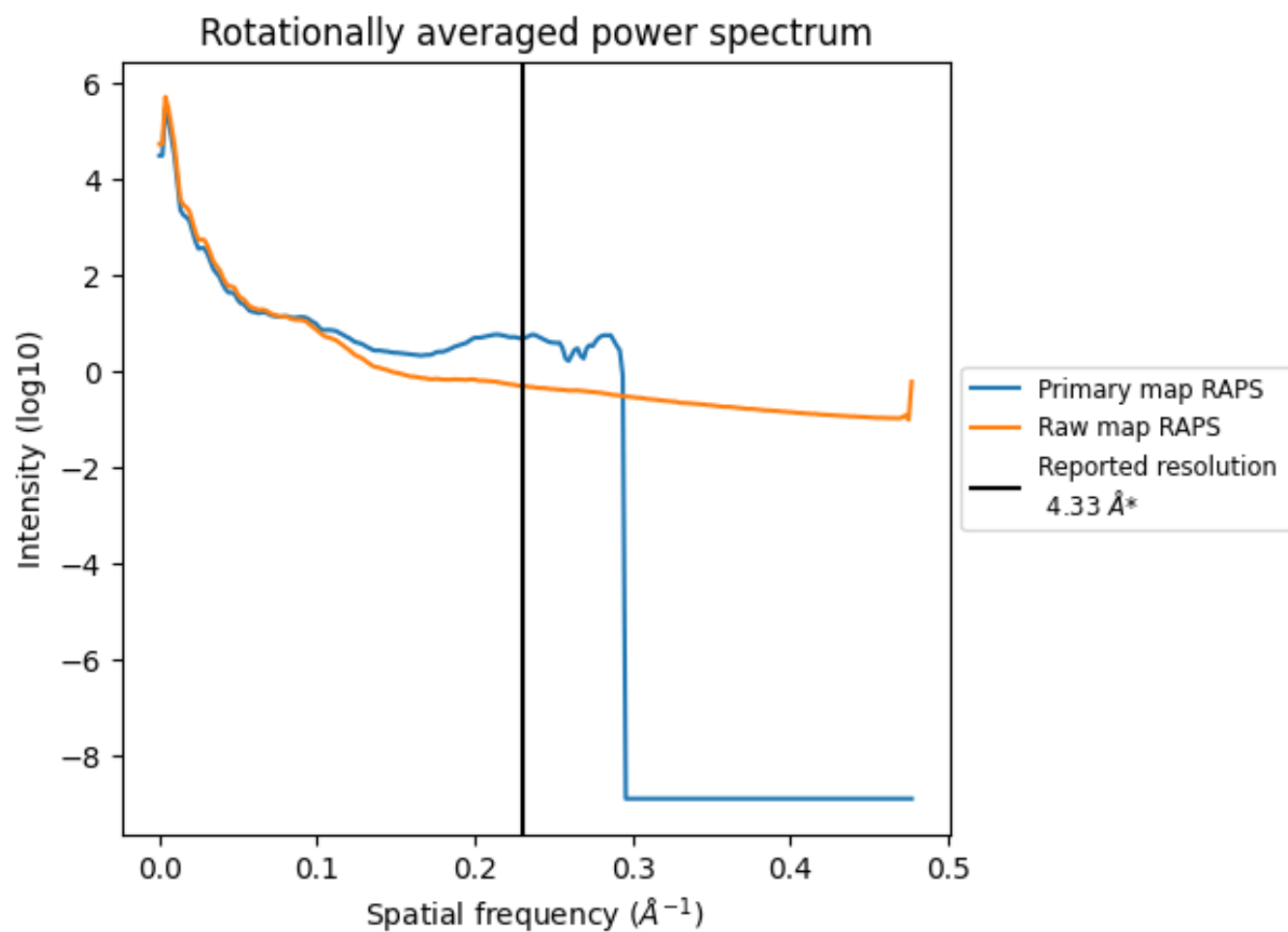
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 68 nm^3 ; this corresponds to an approximate mass of 62 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 ⓘ

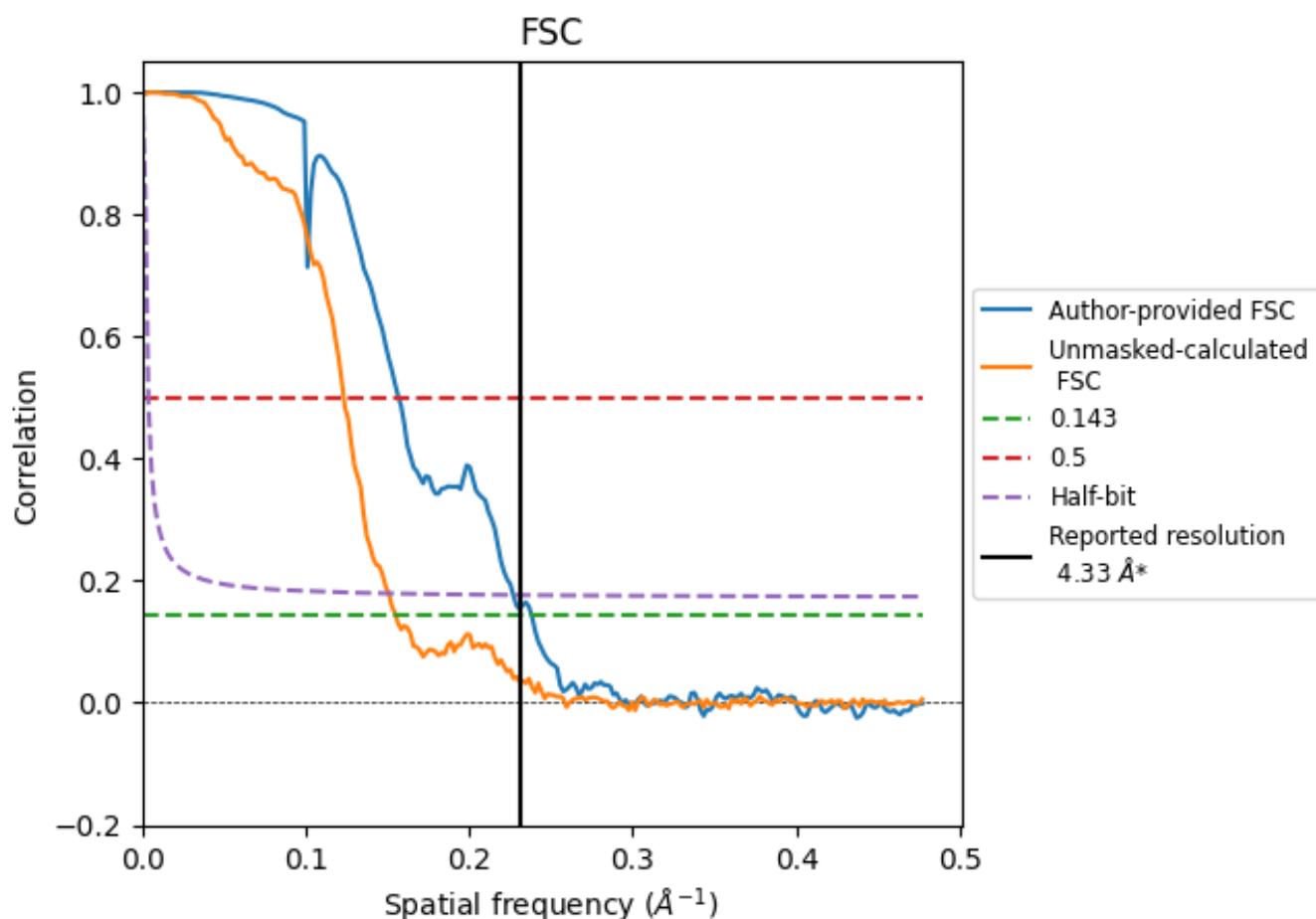


*Reported resolution corresponds to spatial frequency of 0.231 Å⁻¹

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 0.231 Å⁻¹

8.2 Resolution estimates [i](#)

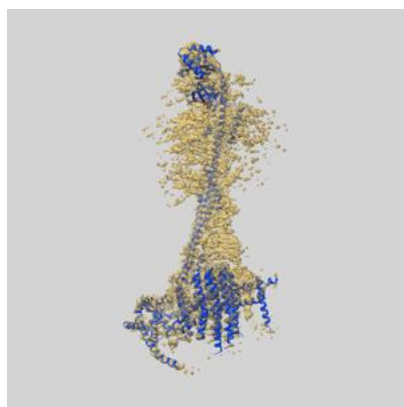
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	4.33	-	-
Author-provided FSC curve	4.20	6.38	4.41
Unmasked-calculated*	6.45	8.11	6.63

*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 6.45 differs from the reported value 4.33 by more than 10 %

9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-11228 and PDB model 6ZIQ. Per-residue inclusion information can be found in section [3](#) on page [7](#).

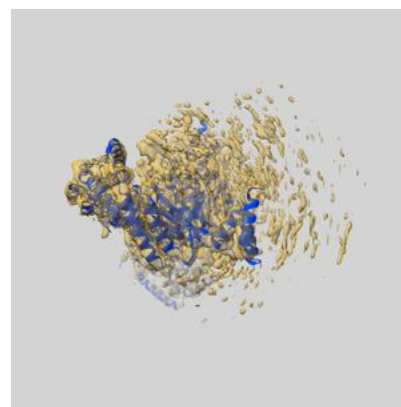
9.1 Map-model overlay [i](#)



X



Y



Z

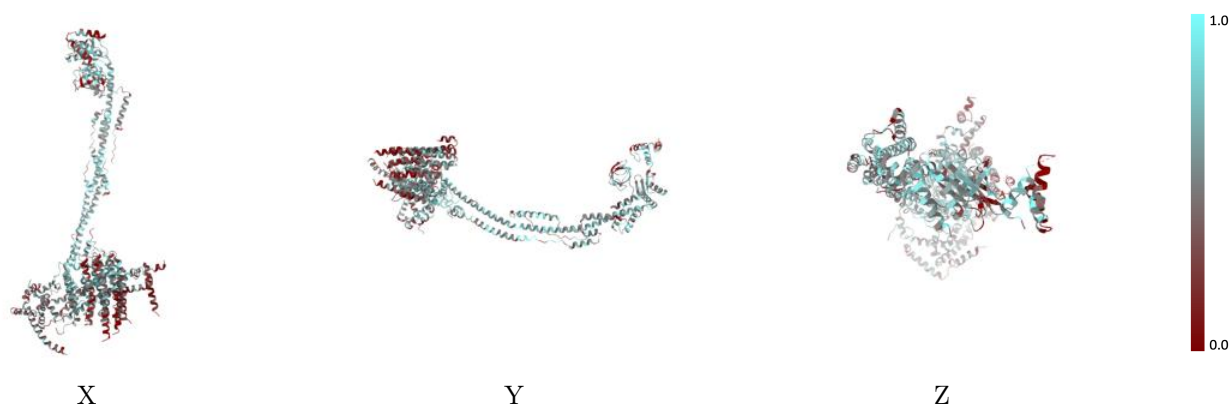
The images above show the 3D surface view of the map at the recommended contour level 0.0187 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



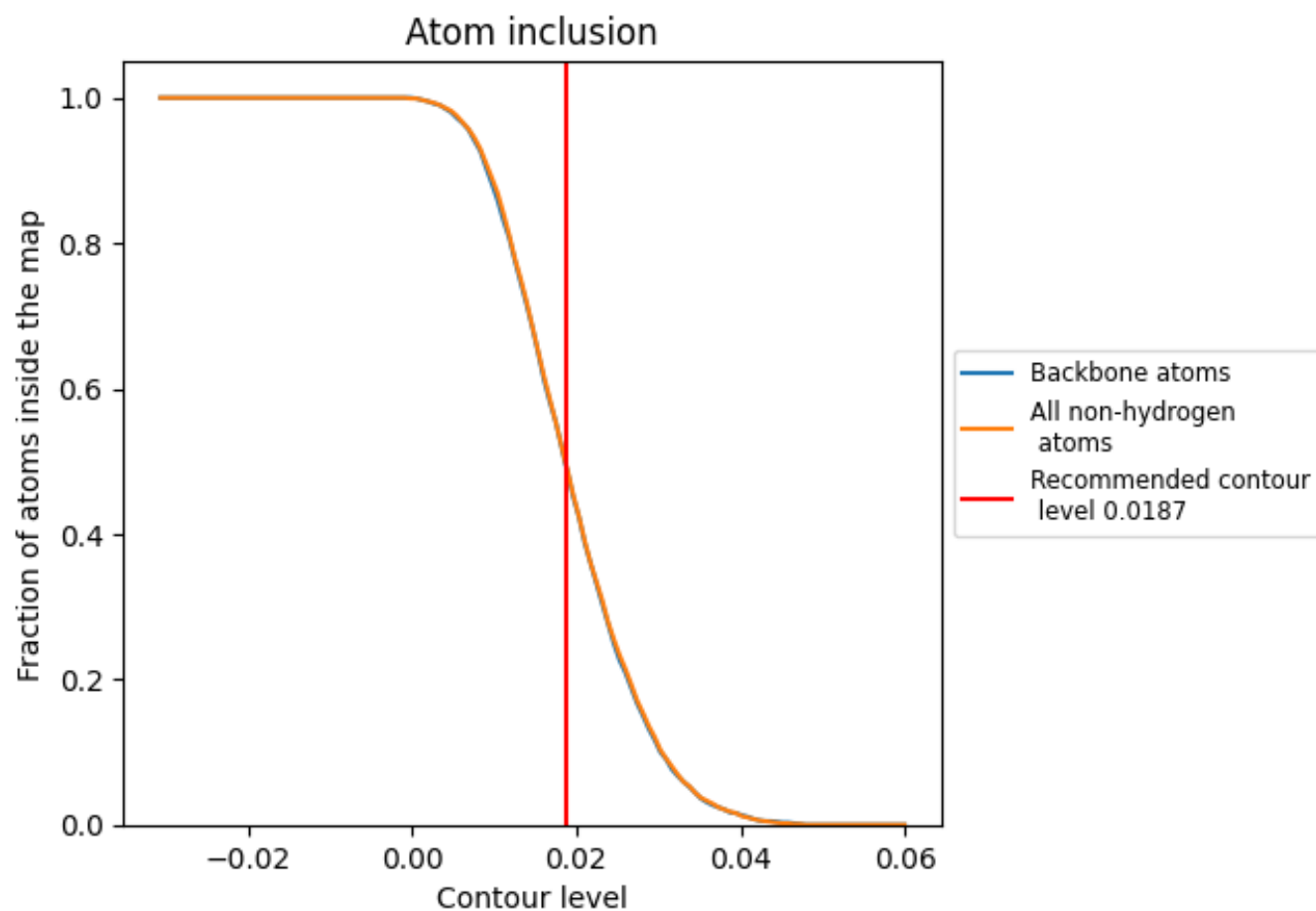
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.0187).

9.4 Atom inclusion [i](#)



At the recommended contour level, 50% of all backbone atoms, 50% 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 (0.0187) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.4970	 0.3850
8	 0.5640	 0.4680
C	 0.4980	 0.4010
M	 0.3750	 0.3840
N	 0.3790	 0.3810
O	 0.2240	 0.3610
S	 0.4810	 0.3240
a	 0.5650	 0.4300
b	 0.6080	 0.3970
d	 0.5810	 0.3970
e	 0.4140	 0.3410
f	 0.5510	 0.4200
g	 0.3790	 0.3380
h	 0.4810	 0.3010
j	 0.3470	 0.3870
k	 0.1960	 0.3220

