Full wwPDB EM Validation Report ⓘ

May 14, 2024 – 01:35 pm BST

PDB ID	:	4CG6
EMDB ID	:	EMD-2512
Title	:	Cryo-em of the Sec61-complex bound to the 80s ribosome translating a membrane-inserting substrate
Authors	:	Gogala, M.; Becker, T.; Beatrix, B.; Barrio-Garcia, C.; Berninghausen, O.; Beckmann, R.
Deposited on	:	2013-11-21
Resolution	:	7.80 Å(reported)
Based on initial model	:	2WWB

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:

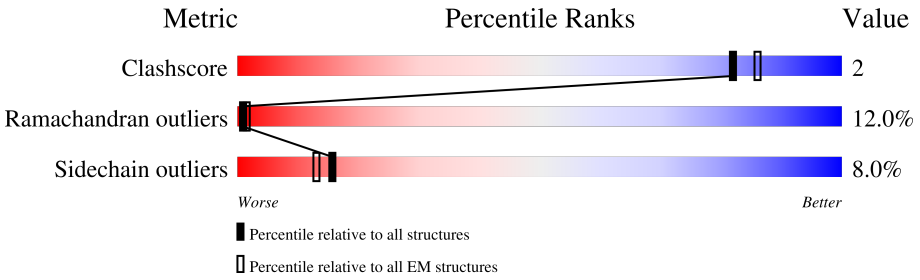
EMDB validation analysis	:	0.0.1.dev92
MolProbity	:	4.02b-467
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ	:	1.9.13
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36.2

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
ELECTRON MICROSCOPY

The reported resolution of this entry is 7.80 Å.

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



Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	158937	4297
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=5% The upper red bar (where present) indicates the fraction of residues that have poor fit to the EM map (all-atom inclusion < 40%). The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	476	45% 73% 15% 5% • 5%
2	B	68	51% 81% 10% 9%
3	C	96	19% 32% 5% 63%
4	D	17	35% 94% 6%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 4383 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 PROTEIN TRANSPORT PROTEIN SEC61 SUBUNIT ALPHA ISOFORM 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	452	3477	2275	560	619	23	0	0

- Molecule 2 is a protein called PROTEIN TRANSPORT PROTEIN SEC61 SUBUNIT GAMMA.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	62	494	326	86	79	3	0	0

- Molecule 3 is a protein called PROTEIN TRANSPORT PROTEIN SEC61 SUBUNIT BETA.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	C	36	281	188	44	47	2	0	0

- Molecule 4 is a protein called PEPTIDE.

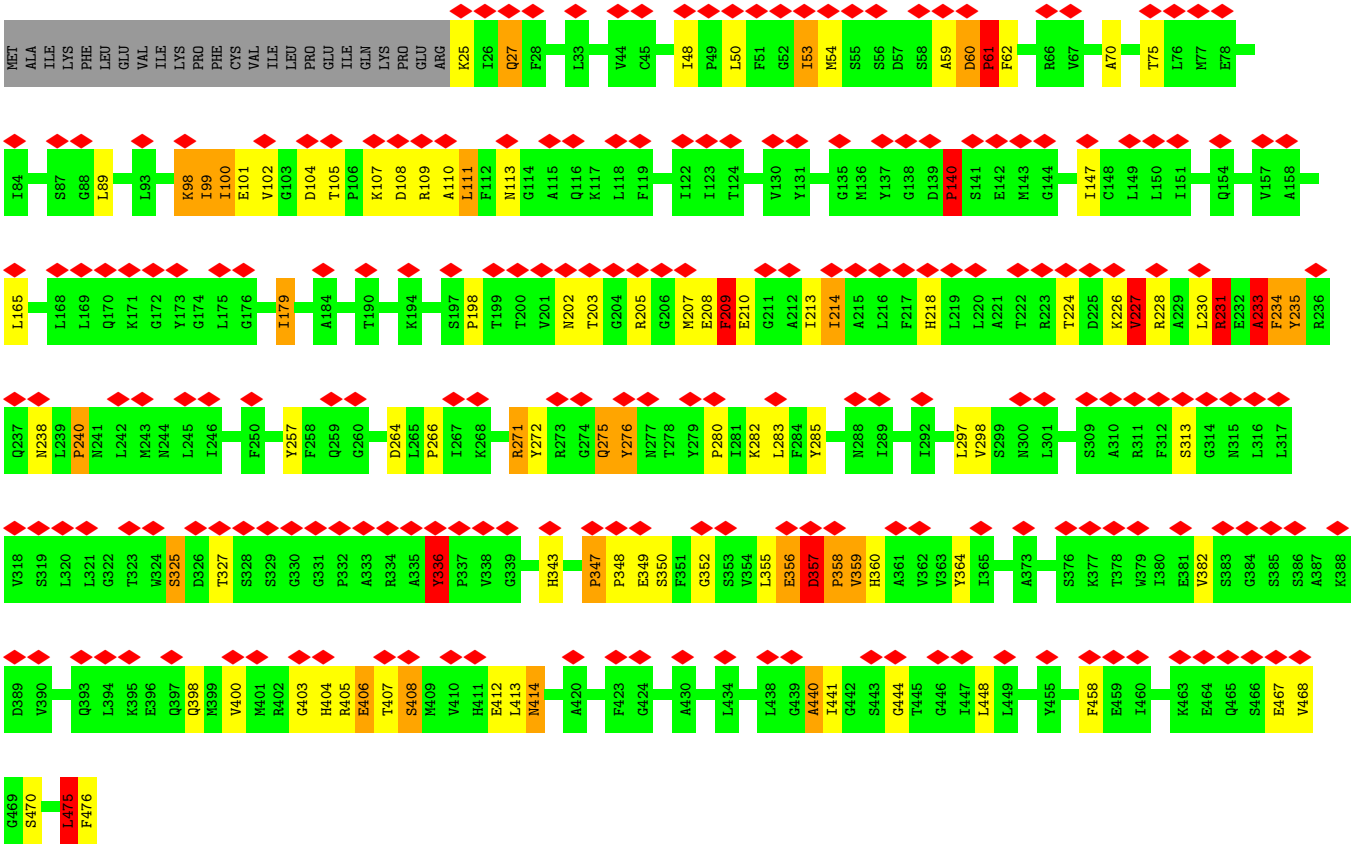
Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
4	D	17	131	93	17	21	0	0

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.

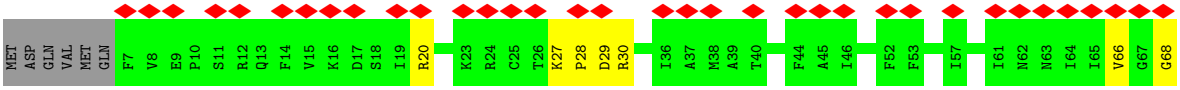
• Molecule 1: PROTEIN TRANSPORT PROTEIN SEC61 SUBUNIT ALPHA ISOFORM 1

Chain A:



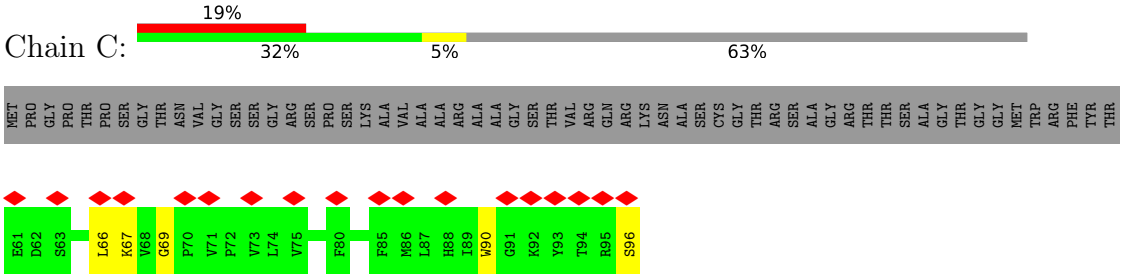
• Molecule 2: PROTEIN TRANSPORT PROTEIN SEC61 SUBUNIT GAMMA

Chain B:



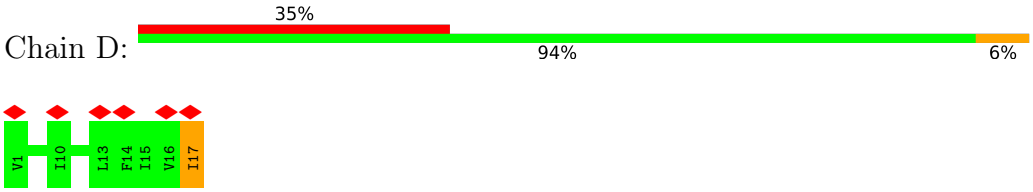
• Molecule 3: PROTEIN TRANSPORT PROTEIN SEC61 SUBUNIT BETA

Chain C:



• Molecule 4: PEPTIDE

Chain D:



4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	30455	Depositor
Resolution determination method	Not provided	
CTF correction method	ON 3D-VOLUME (SPIDER)	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	200	Depositor
Electron dose ($e^-/Å^2$)	25	Depositor
Minimum defocus (nm)	1300	Depositor
Maximum defocus (nm)	4000	Depositor
Magnification	148721	Depositor
Image detector	TVIPS TEMCAM-F416 (4k x 4k)	Depositor
Maximum map value	0.793	Depositor
Minimum map value	-0.351	Depositor
Average map value	0.001	Depositor
Map value standard deviation	0.059	Depositor
Recommended contour level	0.1	Depositor
Map size (Å)	455.36322, 455.36322, 455.36322	wwPDB
Map dimensions	368, 368, 368	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.2374, 1.2374, 1.2374	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	A	0.93	1/3552 (0.0%)	1.20	26/4815 (0.5%)
2	B	1.15	1/504 (0.2%)	1.00	1/673 (0.1%)
3	C	1.12	1/289 (0.3%)	1.04	1/391 (0.3%)
4	D	1.69	2/133 (1.5%)	0.94	1/179 (0.6%)
All	All	1.00	5/4478 (0.1%)	1.17	29/6058 (0.5%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand.A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	8

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	68	GLY	C-O	-14.50	1.00	1.23
3	C	96	SER	C-O	-12.08	1.00	1.23
4	D	17	ILE	C-OXT	-12.06	1.00	1.23
4	D	17	ILE	C-O	-12.06	1.00	1.23
1	A	476	PHE	C-O	-12.03	1.00	1.23

All (29) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	336	TYR	CB-CG-CD1	7.71	125.63	121.00
1	A	336	TYR	CB-CG-CD2	-7.09	116.75	121.00
1	A	405	ARG	C-N-CA	6.92	139.00	121.70
1	A	60	ASP	N-CA-CB	6.61	122.49	110.60
1	A	364	TYR	CB-CG-CD2	-6.53	117.08	121.00
1	A	140	PRO	CA-N-CD	-6.52	102.37	111.50
2	B	68	GLY	CA-C-O	-6.44	109.00	120.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	325	SER	N-CA-CB	6.28	119.92	110.50
1	A	227	VAL	CB-CA-C	6.22	123.22	111.40
1	A	364	TYR	CB-CG-CD1	6.14	124.69	121.00
1	A	240	PRO	CA-N-CD	-5.92	103.22	111.50
1	A	235	TYR	CB-CA-C	5.80	122.01	110.40
1	A	233	ALA	N-CA-CB	5.79	118.21	110.10
1	A	234	PHE	CB-CG-CD1	5.69	124.78	120.80
1	A	111	LEU	N-CA-CB	5.39	121.19	110.40
1	A	271	ARG	N-CA-CB	5.32	120.18	110.60
1	A	475	LEU	N-CA-CB	5.29	120.99	110.40
3	C	96	SER	CA-C-O	-5.29	108.99	120.10
1	A	61	PRO	CA-N-CD	-5.29	104.10	111.50
4	D	17	ILE	CA-C-O	-5.28	109.01	120.10
1	A	209	PHE	CB-CG-CD1	5.28	124.50	120.80
1	A	476	PHE	CA-C-O	-5.28	109.02	120.10
1	A	257	TYR	CB-CG-CD2	-5.21	117.88	121.00
1	A	104	ASP	C-N-CA	5.19	134.68	121.70
1	A	336	TYR	CB-CA-C	5.17	120.75	110.40
1	A	179	ILE	N-CA-CB	5.07	122.47	110.80
1	A	408	SER	N-CA-C	-5.06	97.34	111.00
1	A	240	PRO	N-CA-C	5.03	125.17	112.10
1	A	27	GLN	N-CA-CB	5.01	119.62	110.60

There are no chirality outliers.

All (8) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	203	THR	Peptide
1	A	272	TYR	Peptide
1	A	276	TYR	Sidechain
1	A	313	SER	Peptide
1	A	403	GLY	Peptide
1	A	406	GLU	Peptide
1	A	414	ASN	Peptide
1	A	440	ALA	Peptide

5.2 Too-close contacts (i)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within

the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3477	0	3575	19	0
2	B	494	0	527	0	0
3	C	281	0	294	1	0
4	D	131	0	147	2	0
All	All	4383	0	4543	22	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 2.

All (22) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:358:PRO:O	1:A:359:VAL:HG23	1.52	1.10
1:A:356:GLU:O	1:A:358:PRO:HD3	1.64	0.96
1:A:358:PRO:O	1:A:359:VAL:CG2	2.30	0.77
1:A:356:GLU:O	1:A:358:PRO:CD	2.33	0.76
4:D:17:ILE:OXT	4:D:17:ILE:HG22	1.92	0.68
1:A:357:ASP:O	1:A:359:VAL:N	2.30	0.65
1:A:99:ILE:HG23	1:A:100:ILE:H	1.64	0.63
1:A:343:HIS:CE1	1:A:360:HIS:HE1	2.17	0.62
4:D:17:ILE:OXT	4:D:17:ILE:CG2	2.49	0.60
1:A:448:LEU:HD22	1:A:448:LEU:H	1.67	0.59
1:A:358:PRO:O	1:A:359:VAL:CB	2.57	0.52
1:A:231:ARG:HG2	1:A:233:ALA:H	1.75	0.51
1:A:357:ASP:O	1:A:358:PRO:C	2.48	0.49
1:A:227:VAL:HG12	1:A:228:ARG:H	1.79	0.48
1:A:355:LEU:C	1:A:357:ASP:H	2.18	0.47
1:A:343:HIS:CE1	1:A:360:HIS:CE1	2.99	0.47
3:C:66:LEU:H	3:C:66:LEU:HD23	1.82	0.45
1:A:347:PRO:HG3	1:A:355:LEU:HD23	1.98	0.45
1:A:214:ILE:HD13	1:A:214:ILE:H	1.83	0.44
1:A:347:PRO:HB2	1:A:348:PRO:HD2	2.01	0.43
1:A:352:GLY:O	1:A:355:LEU:HD11	2.18	0.43
1:A:440:ALA:HB3	1:A:444:GLY:C	2.42	0.40

There are no symmetry-related clashes.

5.3 Torsion angles (i)

5.3.1 Protein backbone (i)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
1	A	450/476 (94%)	344 (76%)	47 (10%)	59 (13%)	0 5
2	B	60/68 (88%)	54 (90%)	1 (2%)	5 (8%)	1 12
3	C	34/96 (35%)	29 (85%)	2 (6%)	3 (9%)	1 11
4	D	15/17 (88%)	15 (100%)	0	0	100 100
All	All	559/657 (85%)	442 (79%)	50 (9%)	67 (12%)	1 6

All (67) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	27	GLN
1	A	50	LEU
1	A	59	ALA
1	A	60	ASP
1	A	61	PRO
1	A	70	ALA
1	A	75	THR
1	A	98	LYS
1	A	99	ILE
1	A	100	ILE
1	A	102	VAL
1	A	105	THR
1	A	110	ALA
1	A	113	ASN
1	A	140	PRO
1	A	179	ILE
1	A	207	MET
1	A	209	PHE
1	A	227	VAL
1	A	233	ALA
1	A	238	ASN
1	A	240	PRO

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Mol	Chain	Res	Type
1	A	275	GLN
1	A	325	SER
1	A	327	THR
1	A	336	TYR
1	A	347	PRO
1	A	349	GLU
1	A	350	SER
1	A	357	ASP
1	A	358	PRO
1	A	359	VAL
1	A	398	GLN
1	A	400	VAL
1	A	406	GLU
1	A	408	SER
1	A	412	GLU
1	A	441	ILE
1	A	470	SER
1	A	475	LEU
2	B	30	ARG
1	A	101	GLU
1	A	107	LYS
1	A	111	LEU
1	A	271	ARG
2	B	27	LYS
2	B	66	VAL
3	C	67	LYS
3	C	69	GLY
1	A	108	ASP
1	A	109	ARG
1	A	147	ILE
1	A	231	ARG
1	A	280	PRO
1	A	467	GLU
2	B	29	ASP
1	A	53	ILE
1	A	266	PRO
3	C	90	TRP
1	A	62	PHE
1	A	224	THR
1	A	356	GLU
1	A	407	THR
1	A	382	VAL

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Mol	Chain	Res	Type
1	A	468	VAL
1	A	198	PRO
2	B	28	PRO

5.3.2 Protein sidechains (i)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
1	A	375/398 (94%)	338 (90%)	37 (10%)	8 26
2	B	53/59 (90%)	52 (98%)	1 (2%)	57 75
3	C	32/74 (43%)	32 (100%)	0	100 100
4	D	16/16 (100%)	16 (100%)	0	100 100
All	All	476/547 (87%)	438 (92%)	38 (8%)	16 35

All (38) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	25	LYS
1	A	48	ILE
1	A	53	ILE
1	A	54	MET
1	A	61	PRO
1	A	89	LEU
1	A	98	LYS
1	A	140	PRO
1	A	165	LEU
1	A	202	ASN
1	A	205	ARG
1	A	208	GLU
1	A	209	PHE
1	A	210	GLU
1	A	213	ILE
1	A	214	ILE
1	A	218	HIS
1	A	226	LYS

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Mol	Chain	Res	Type
1	A	230	LEU
1	A	231	ARG
1	A	234	PHE
1	A	235	TYR
1	A	264	ASP
1	A	275	GLN
1	A	276	TYR
1	A	282	LYS
1	A	283	LEU
1	A	285	TYR
1	A	297	LEU
1	A	298	VAL
1	A	336	TYR
1	A	357	ASP
1	A	404	HIS
1	A	413	LEU
1	A	414	ASN
1	A	458	PHE
1	A	475	LEU
2	B	20	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	315	ASN
1	A	343	HIS
1	A	360	HIS
1	A	411	HIS
1	A	414	ASN
2	B	58	HIS

5.3.3 RNA (i)

There are no RNA molecules in this entry.

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

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates (i)

There are no monosaccharides in this entry.

5.6 Ligand geometry (i)

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.

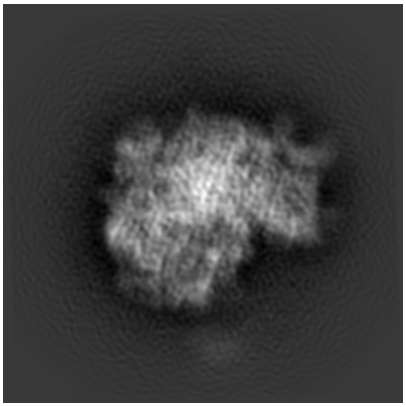
6 Map visualisation

This section contains visualisations of the EMDB entry EMD-2512. These allow visual inspection of the internal detail of the map and identification of artifacts.

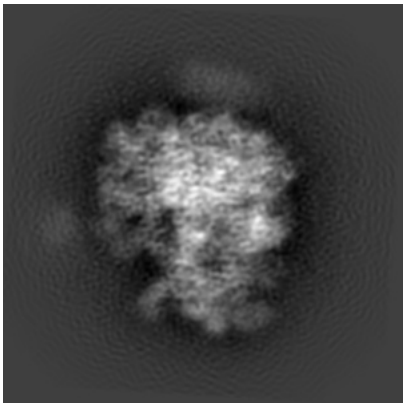
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections

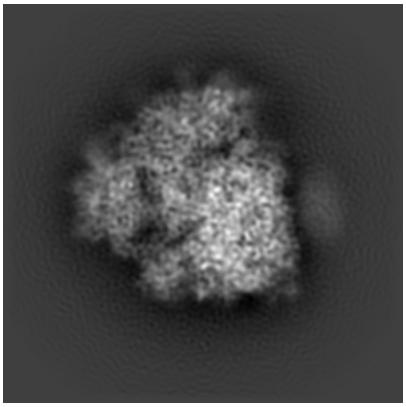
6.1.1 Primary map



X



Y

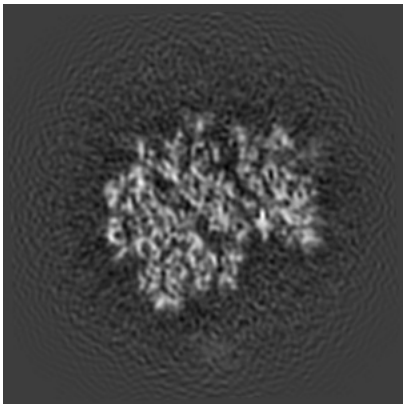


Z

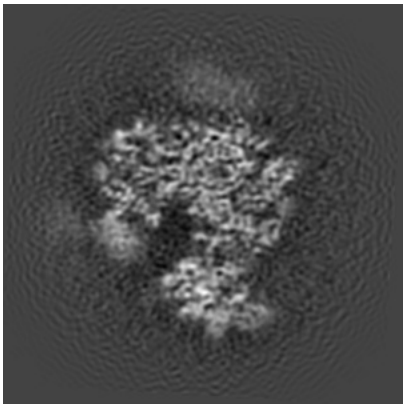
The images above show the map projected in three orthogonal directions.

6.2 Central slices

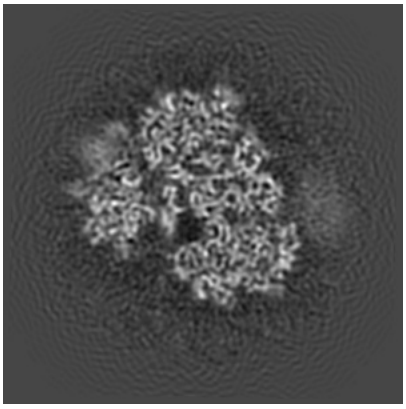
6.2.1 Primary map



X Index: 184



Y Index: 184

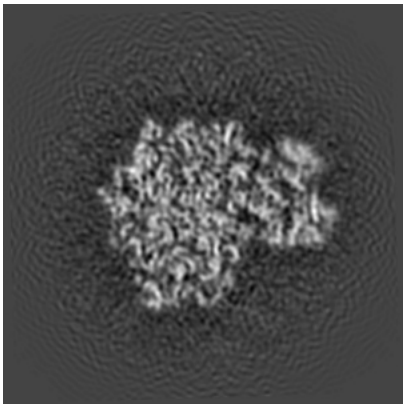


Z Index: 184

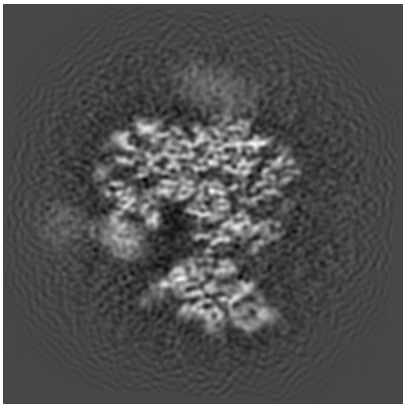
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices (i)

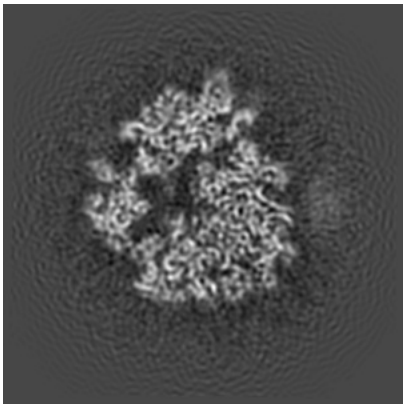
6.3.1 Primary map



X Index: 197



Y Index: 187

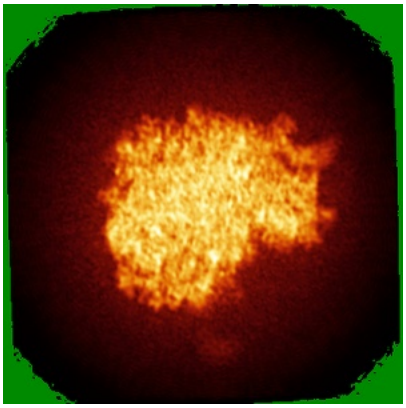


Z Index: 168

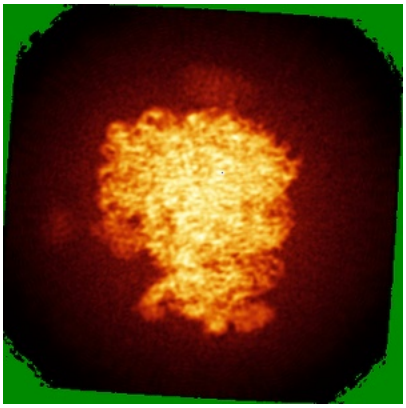
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal standard-deviation projections (False-color) (i)

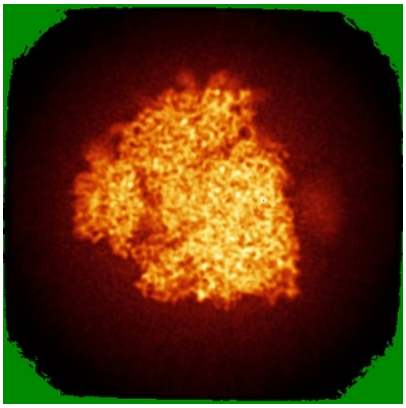
6.4.1 Primary map



X



Y

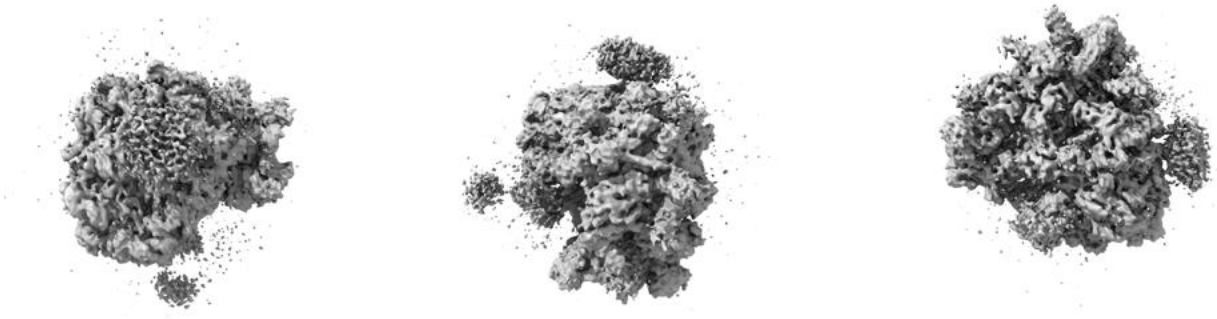


Z

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



X Y Z

The images above show the 3D surface view of the map at the recommended contour level 0.1. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

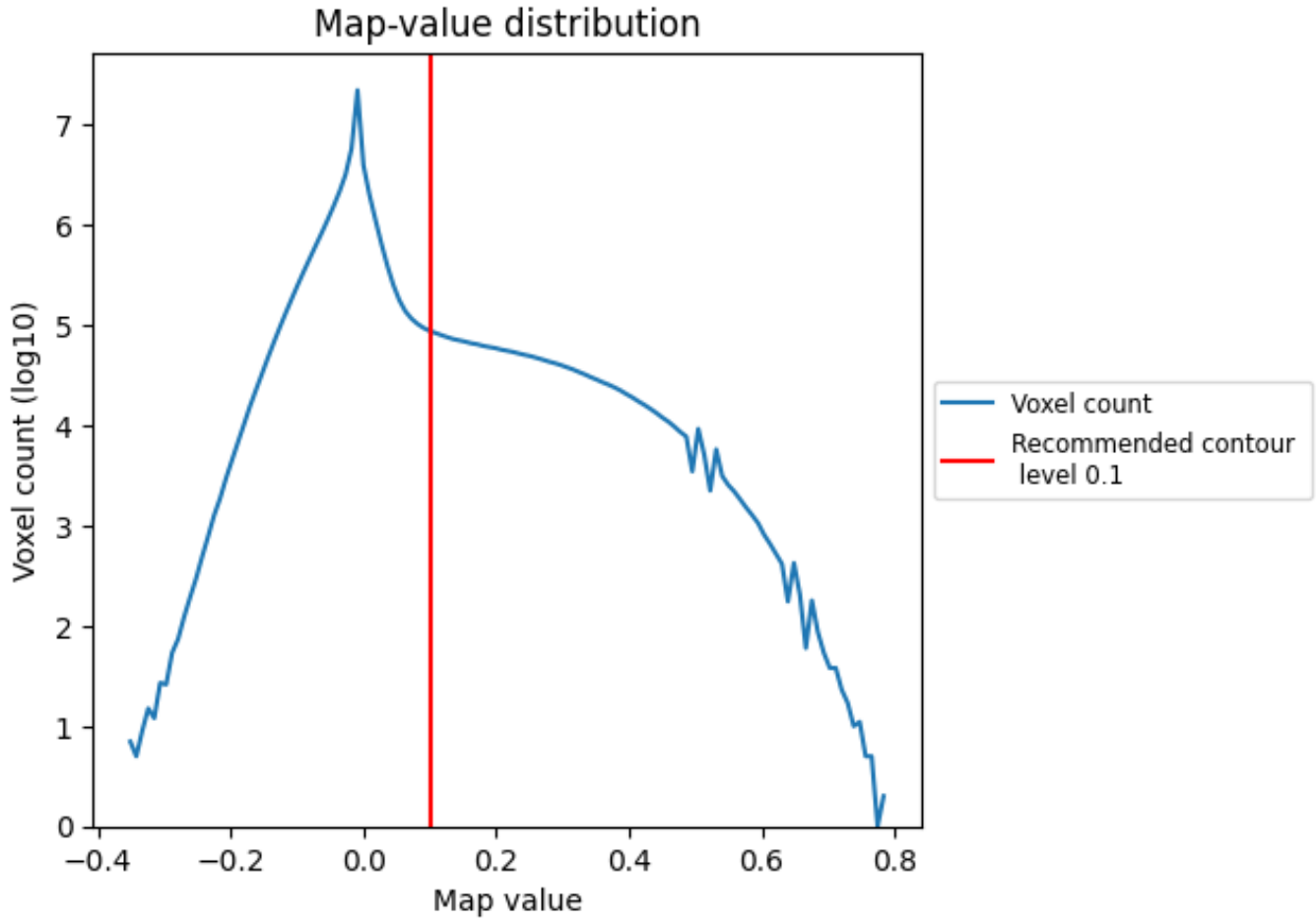
6.6 Mask visualisation (i)

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

7 Map analysis

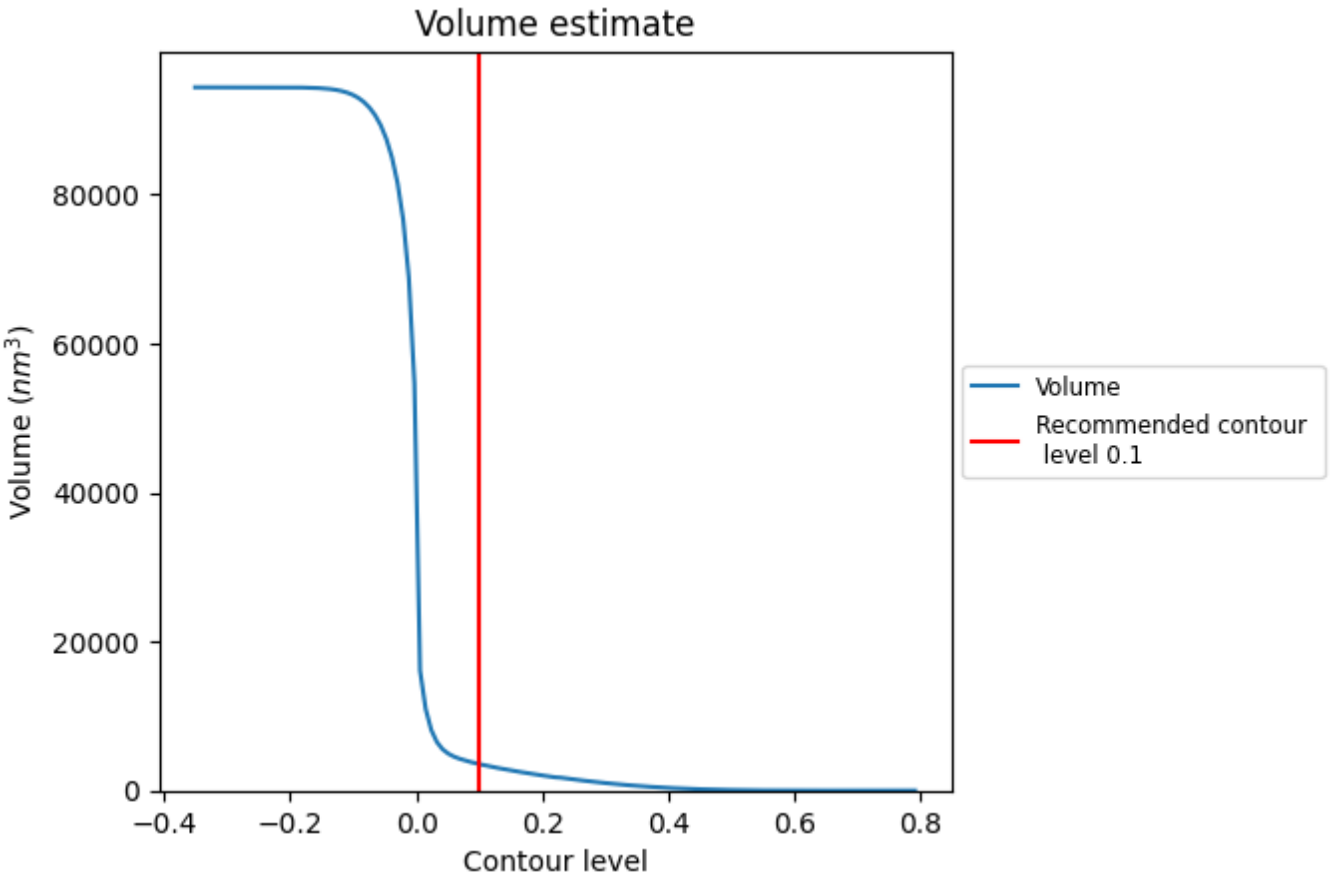
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution



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.

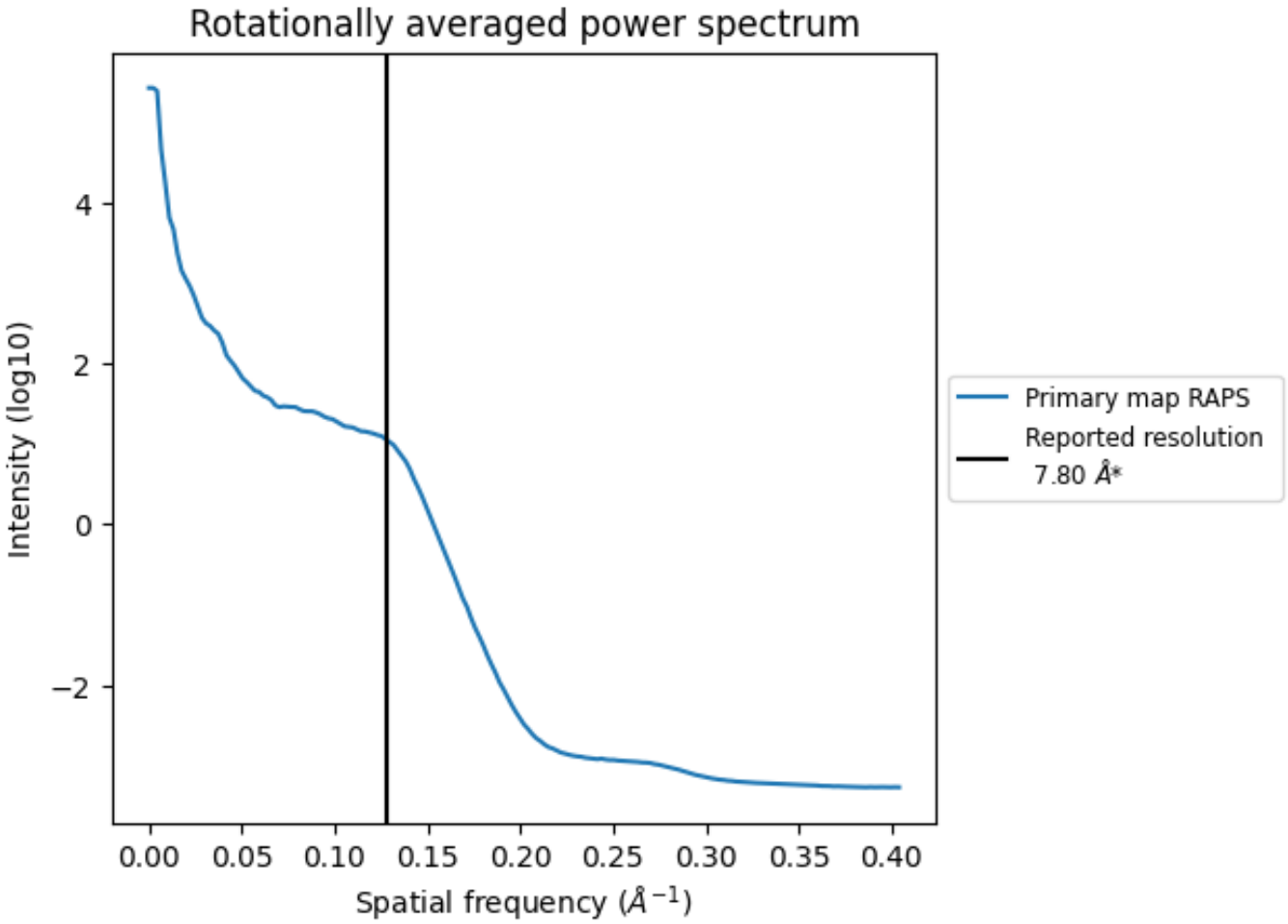
7.2 Volume estimate



The volume at the recommended contour level is 3560 nm^3; this corresponds to an approximate mass of 3215 kDa.

The volume estimate graph shows how the enclosed volume varies with the contour level. The recommended contour level is shown as a vertical line and the intersection between the line and the curve gives the volume of the enclosed surface at the given level.

7.3 Rotationally averaged power spectrum (i)



*Reported resolution corresponds to spatial frequency of 0.128 Å^{-1}

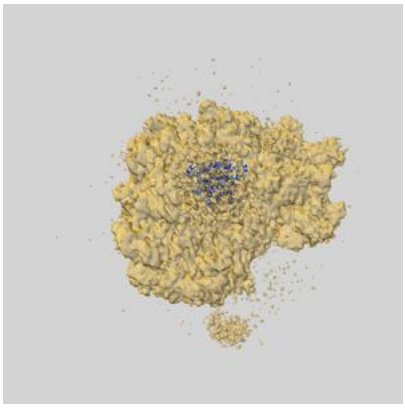
8 Fourier-Shell correlation (i)

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

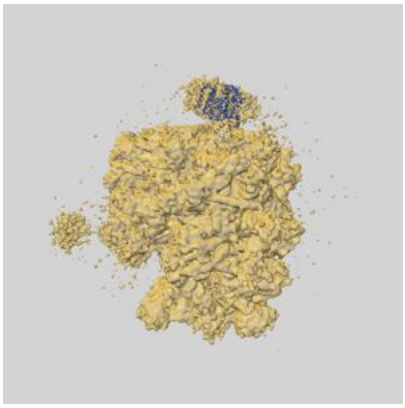
9 Map-model fit

This section contains information regarding the fit between EMDB map EMD-2512 and PDB model 4CG6. Per-residue inclusion information can be found in section 3 on page 4.

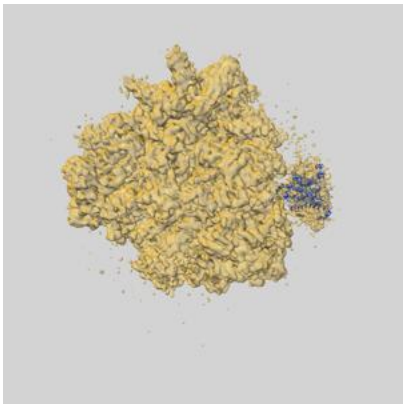
9.1 Map-model overlay



X



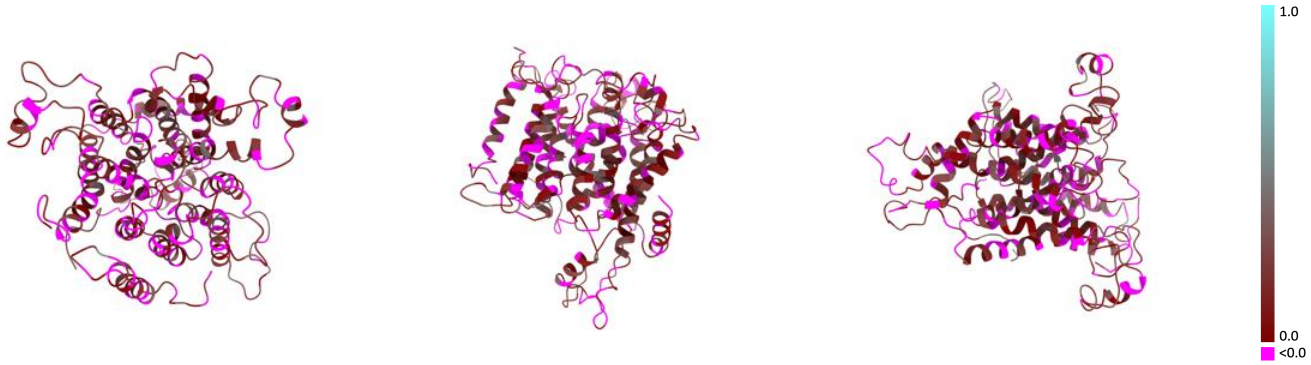
Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.1 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.

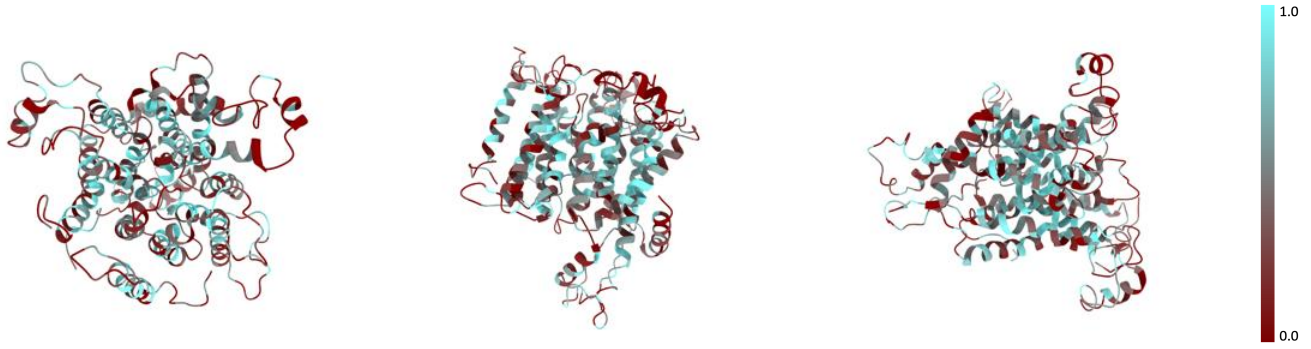
9.2 Q-score mapped to coordinate model



X Y Z

The images above show the model with each residue coloured according 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.

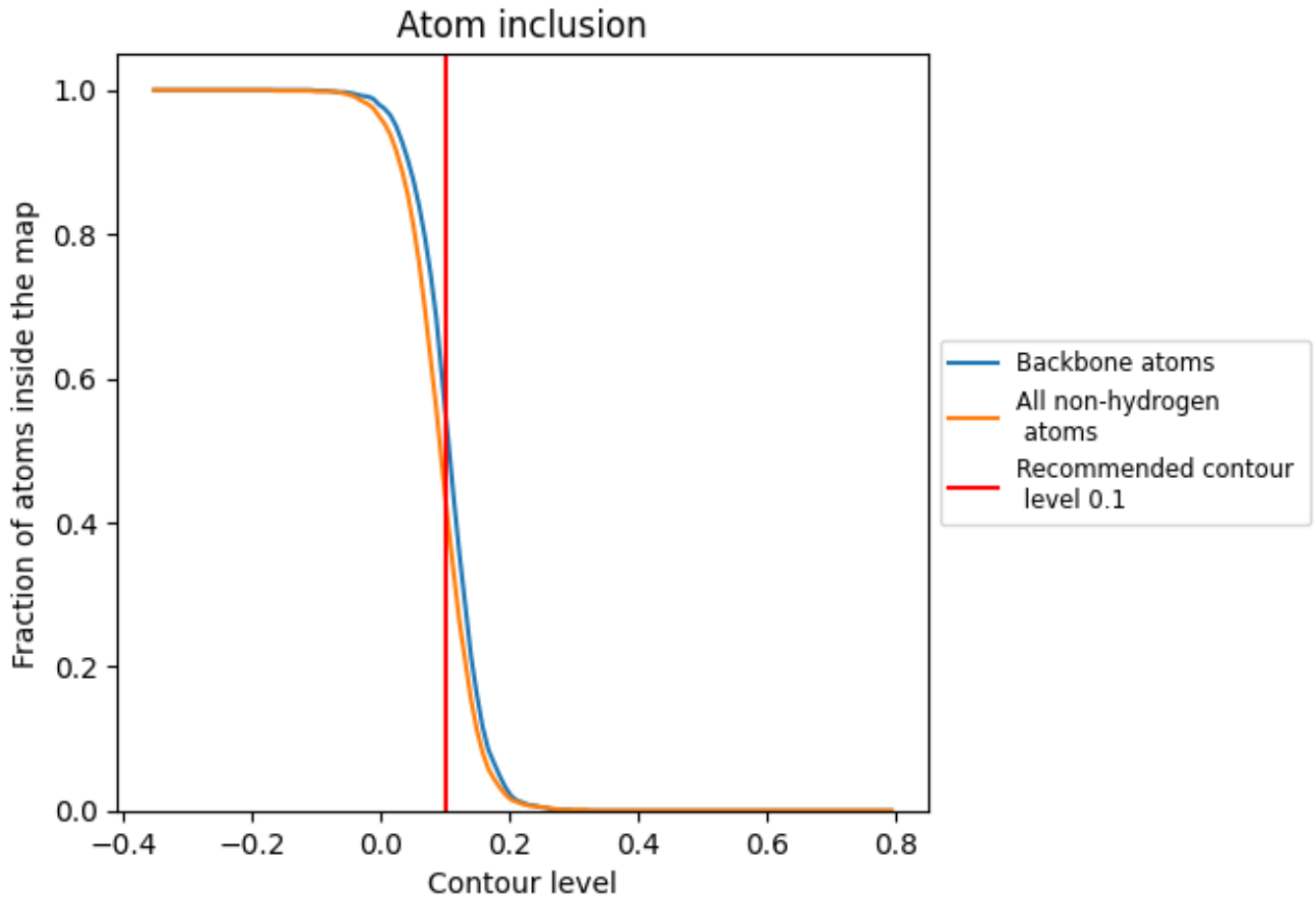
9.3 Atom inclusion mapped to coordinate model



X Y Z

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 (0.1).

9.4 Atom inclusion (i)



At the recommended contour level, 56% of all backbone atoms, 44% 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 (0.1) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.4370	0.0830
A	0.4510	0.0910
B	0.3770	0.0400
C	0.3760	0.0630
D	0.4350	0.0950