



Full wwPDB EM Validation Report ⓘ

Jul 19, 2022 – 01:51 PM JST

PDB ID : 7WR8
EMDB ID : EMD-32718
Title : Local CryoEM structure of the SARS-CoV-2 S6P(B.1.1.529) in complex with BD55-3152 Fab
Authors : Du, S.; Xiao, J.Y.
Deposited on : 2022-01-26
Resolution : 3.50 Å(reported)

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:

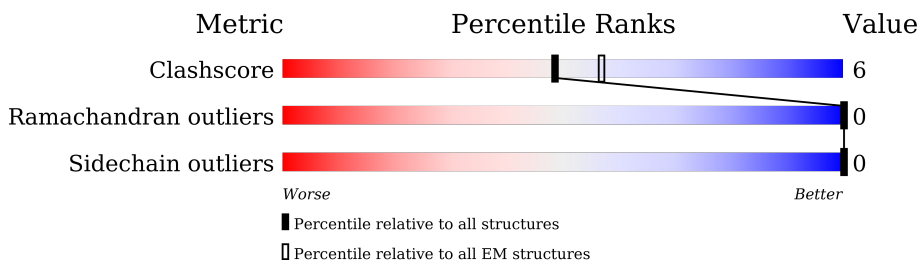
EMDB validation analysis : 0.0.1.dev8
Mogul : ?? (??), CSD ??CSD?? (????)
MolProbity : 4.02b-467
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.29

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 3.50 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 $\leq 5\%$. 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	R	193	
2	A	260	
3	B	233	
4	C	3	

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 3286 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 Spike protein S1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	R	187	1504	969	254	273	8	0	0

There are 15 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
R	339	ASP	GLY	conflict	UNP P0DTC2
R	371	LEU	SER	conflict	UNP P0DTC2
R	373	PRO	SER	conflict	UNP P0DTC2
R	375	PHE	SER	conflict	UNP P0DTC2
R	417	ASN	LYS	conflict	UNP P0DTC2
R	440	LYS	ASN	conflict	UNP P0DTC2
R	446	SER	GLY	conflict	UNP P0DTC2
R	477	ASN	SER	conflict	UNP P0DTC2
R	478	LYS	THR	conflict	UNP P0DTC2
R	484	ALA	GLU	conflict	UNP P0DTC2
R	493	ARG	GLN	conflict	UNP P0DTC2
R	496	SER	GLY	conflict	UNP P0DTC2
R	498	ARG	GLN	conflict	UNP P0DTC2
R	501	TYR	ASN	conflict	UNP P0DTC2
R	505	HIS	TYR	conflict	UNP P0DTC2

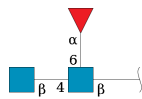
- Molecule 2 is a protein called BD55-3152H.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	A	126	964	610	170	180	4	0	0

- Molecule 3 is a protein called BD55-3152L.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	B	104	780	485	129	163	3	0	0

- Molecule 4 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose.

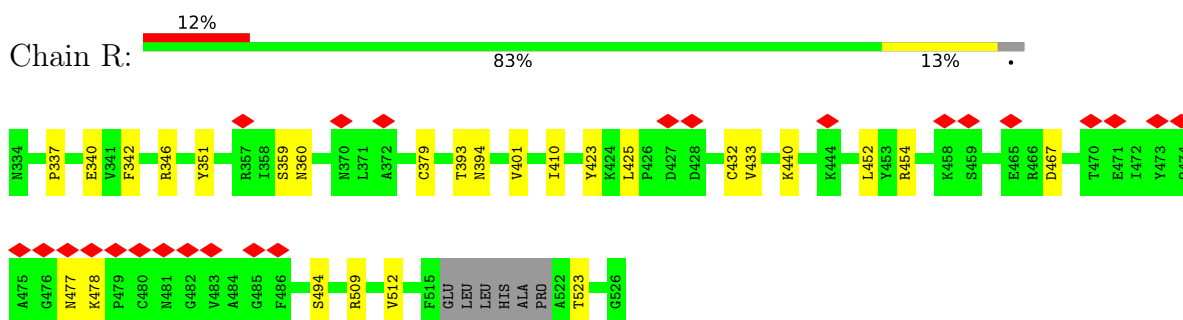


Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
4	C	3	38	22	2	14	0	0

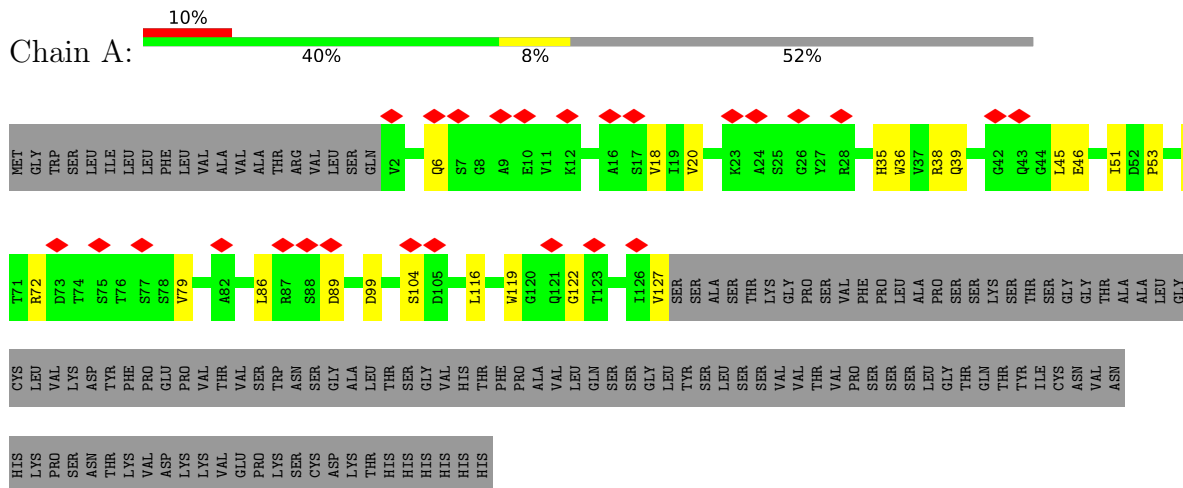
3 Residue-property plots [i](#)

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.

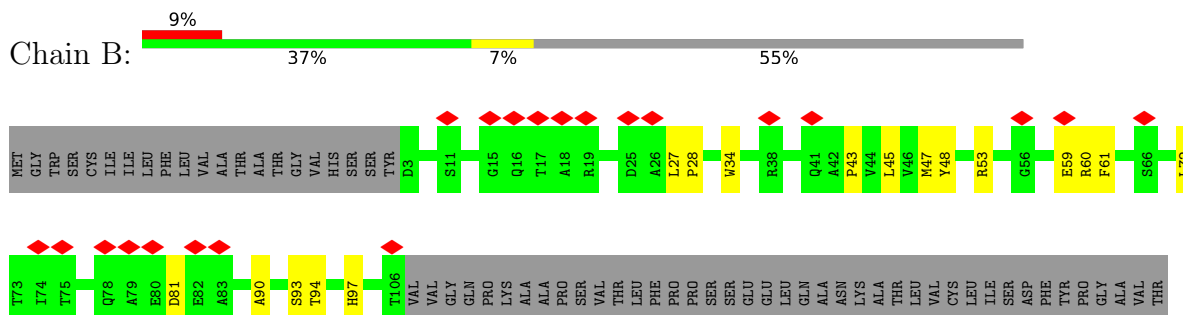
- Molecule 1: Spike protein S1



- Molecule 2: BD55-3152H



- Molecule 3: BD55-3152L



VAL
ALA
TRP
LYS
ALA
ASP
SER
SER
PRO
VAL
LYS
ALA
GLY
VAL
GLU
THR
THR
THR
PRO
SER
LYS
GLN
SER
ASN
ASN
LYS
TYR
ALA
ALA
SER
SER
TYR
LEU
SER
LEU
THR
PRO
GLU
GLN
TRP
LYS
SER
HIS
ARG
SER
TYR
SER
CYS
GLN
VAL
THR
HIS
GLU
GLY
SER
THR
VAL
GLU
LYS
THR

VAL
ALA
PRO
THR
GLU
CYS
SER

- Molecule 4: 2-acetamido-2-deoxy-beta-D-glucofuranose-(1-4)-[alpha-L-fucofuranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucofuranose

Chain C:  67% 33%

MAG1
MAG2
FOG3

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	282833	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 ($e^-/\text{\AA}^2$)	50	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	1500	Depositor
Magnification	Not provided	
Image detector	GATAN K2 QUANTUM (4k x 4k)	Depositor
Maximum map value	2.561	Depositor
Minimum map value	-1.876	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.026	Depositor
Recommended contour level	0.246	Depositor
Map size (Å)	374.4, 374.4, 374.4	wwPDB
Map dimensions	360, 360, 360	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.04, 1.04, 1.04	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: NAG, FUC

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	R	0.43	0/1547	0.59	0/2102
2	A	0.43	0/988	0.65	0/1343
3	B	0.44	0/800	0.70	1/1096 (0.1%)
All	All	0.43	0/3335	0.63	1/4541 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
3	B	27	LEU	CA-CB-CG	10.06	138.45	115.30

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	R	1504	0	1433	20	0
2	A	964	0	947	17	0
3	B	780	0	732	10	0
4	C	38	0	34	1	0
All	All	3286	0	3146	40	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 6.

All (40) 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:R:440:LYS:NZ	2:A:104:SER:H	1.45	1.13
1:R:440:LYS:HZ3	2:A:104:SER:N	1.46	1.12
3:B:34:TRP:HB2	3:B:47:MET:HB3	1.77	0.66
2:A:51:ILE:HG21	2:A:79:VAL:HG21	1.76	0.66
2:A:6:GLN:HG3	2:A:122:GLY:H	1.63	0.63
3:B:93:SER:OG	3:B:94:THR:N	2.34	0.61
2:A:38:ARG:NH1	2:A:46:GLU:OE2	2.34	0.60
2:A:39:GLN:HB2	2:A:45:LEU:HD23	1.82	0.60
1:R:360:ASN:H	1:R:523:THR:HB	1.69	0.57
3:B:60:ARG:NH1	3:B:81:ASP:OD2	2.40	0.54
1:R:440:LYS:NZ	2:A:104:SER:N	2.23	0.53
2:A:53:PRO:O	2:A:72:ARG:NH2	2.39	0.53
2:A:45:LEU:HD11	3:B:43:PRO:HG2	1.91	0.53
3:B:90:ALA:HA	3:B:97:HIS:HA	1.91	0.52
1:R:454:ARG:NH2	1:R:467:ASP:O	2.42	0.52
1:R:342:PHE:HB2	4:C:1:NAG:H82	1.92	0.52
1:R:346:ARG:NH1	3:B:28:PRO:O	2.43	0.51
2:A:86:LEU:HD13	2:A:127:VAL:HG12	1.92	0.51
1:R:359:SER:OG	1:R:394:ASN:OD1	2.29	0.50
1:R:425:LEU:HD21	1:R:512:VAL:HG11	1.95	0.48
2:A:38:ARG:NH2	2:A:89:ASP:O	2.48	0.47
1:R:337:PRO:HB2	1:R:340:GLU:HB2	1.98	0.46
1:R:477:ASN:OD1	1:R:478:LYS:N	2.48	0.46
3:B:53:ARG:NH1	3:B:59:GLU:OE1	2.48	0.46
1:R:340:GLU:HA	3:B:93:SER:HA	1.99	0.45
2:A:35:HIS:NE2	2:A:99:ASP:OD1	2.31	0.45
2:A:51:ILE:HB	2:A:70:VAL:HG21	1.98	0.45
3:B:61:PHE:HD1	3:B:72:LEU:HD21	1.83	0.44
1:R:393:THR:OG1	1:R:394:ASN:N	2.52	0.42
2:A:116:LEU:O	2:A:119:TRP:NE1	2.50	0.42
1:R:401:VAL:HG22	1:R:509:ARG:HG2	2.02	0.42
3:B:45:LEU:HD11	3:B:48:TYR:HB3	2.02	0.41
1:R:410:ILE:HD12	1:R:423:TYR:HD2	1.86	0.41
1:R:440:LYS:HZ3	2:A:104:SER:H	0.61	0.41
1:R:452:LEU:HA	1:R:494:SER:HA	2.01	0.41
1:R:433:VAL:HG22	1:R:512:VAL:HG13	2.03	0.41
2:A:18:VAL:HB	2:A:20:VAL:HG13	2.02	0.41
1:R:379:CYS:HA	1:R:432:CYS:HA	2.03	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:R:351:TYR:HE1	1:R:452:LEU:HB2	1.86	0.40
2:A:36:TRP:HZ2	2:A:79:VAL:HG13	1.86	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	R	183/193 (95%)	162 (88%)	21 (12%)	0	100	100
2	A	124/260 (48%)	109 (88%)	15 (12%)	0	100	100
3	B	102/233 (44%)	87 (85%)	15 (15%)	0	100	100
All	All	409/686 (60%)	358 (88%)	51 (12%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains [i](#)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	R	163/168 (97%)	163 (100%)	0	100	100
2	A	103/220 (47%)	103 (100%)	0	100	100
3	B	86/196 (44%)	86 (100%)	0	100	100
All	All	352/584 (60%)	352 (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. There are no such sidechains identified.

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](#)

3 monosaccharides are modelled in this entry.

There are no bond length outliers.

There are no bond angle outliers.

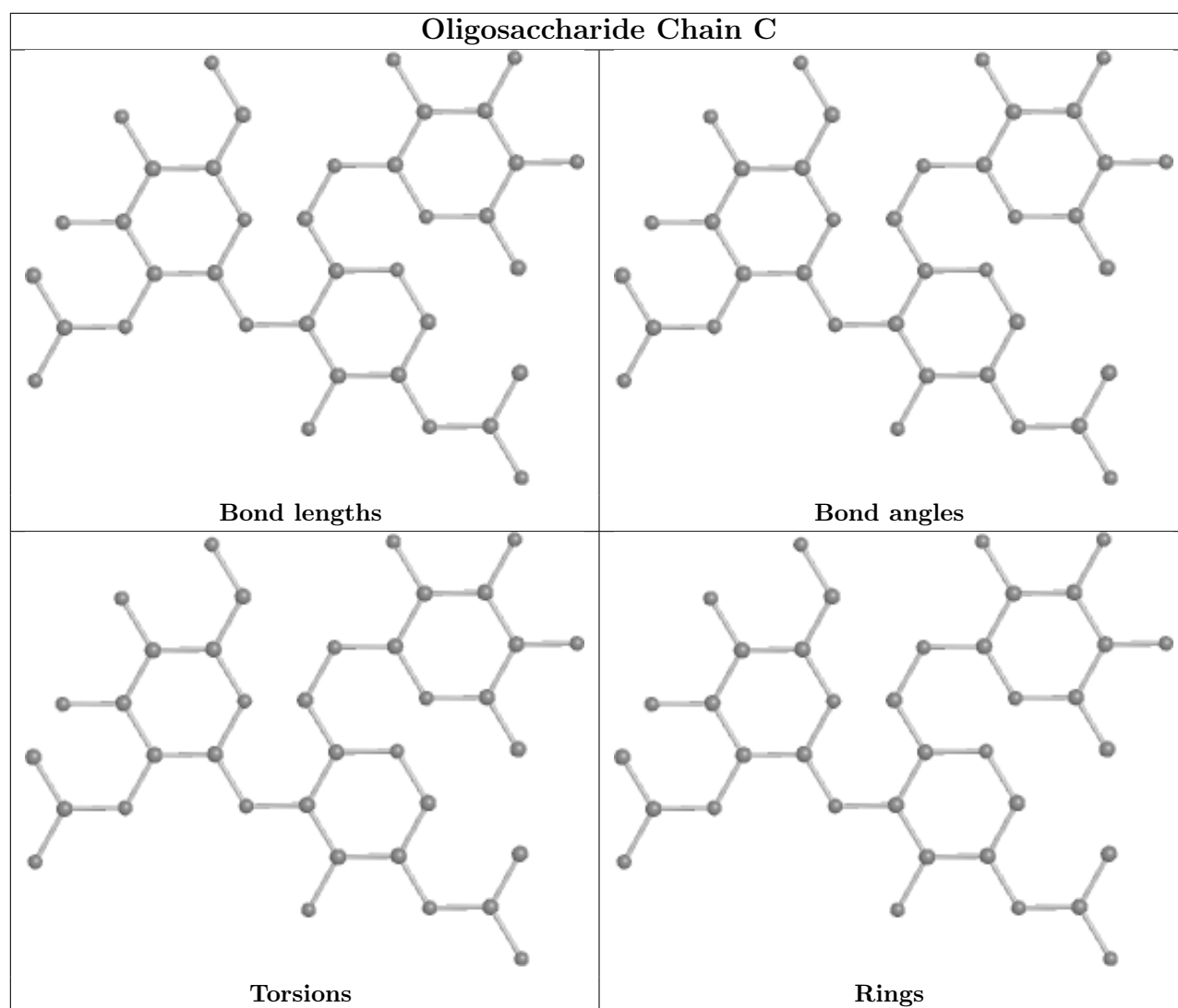
There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.



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.

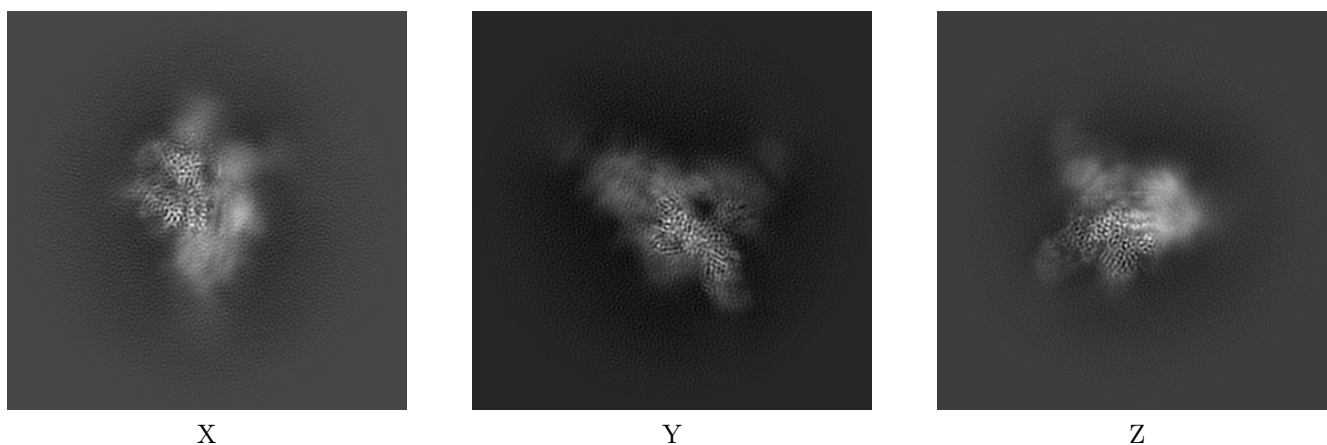
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-32718. These allow visual inspection of the internal detail of the map and identification of artifacts.

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

6.1 Orthogonal projections [i](#)

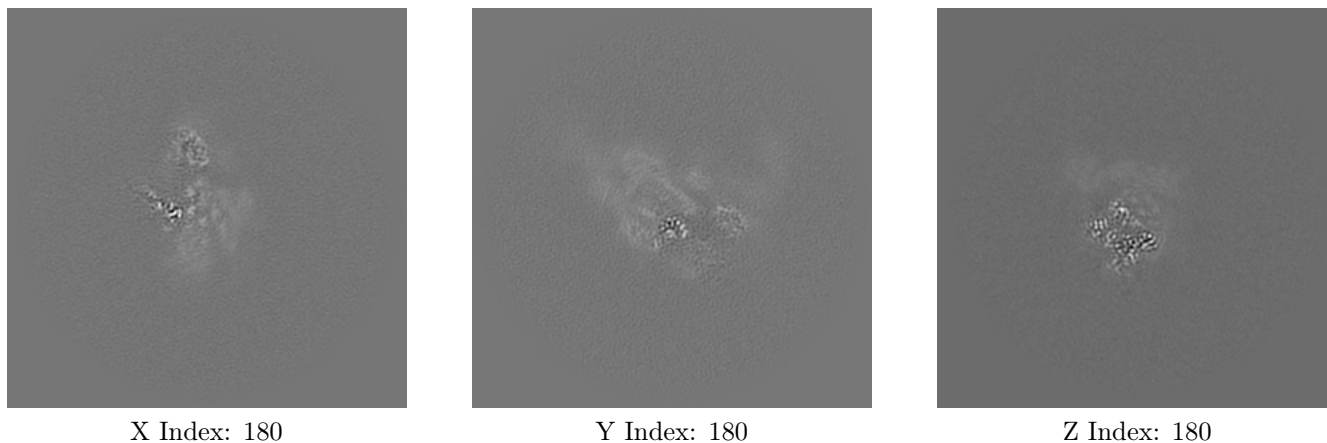
6.1.1 Primary map



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

6.2 Central slices [i](#)

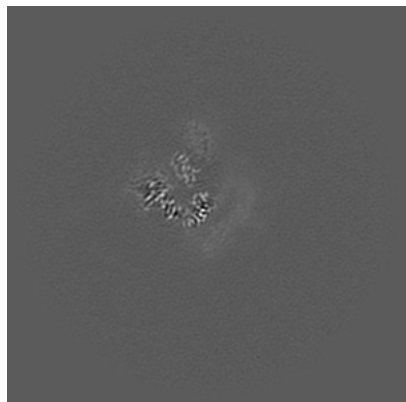
6.2.1 Primary map



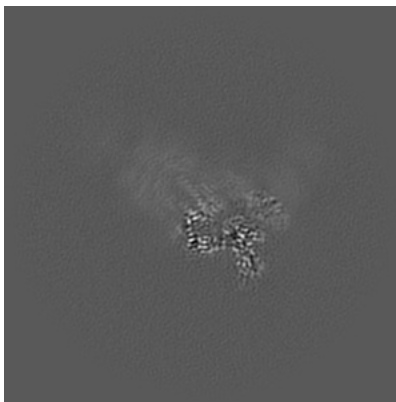
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

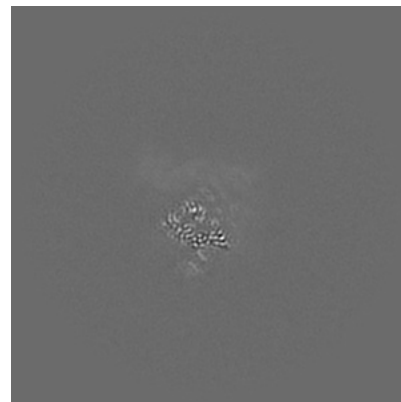
6.3.1 Primary map



X Index: 164



Y Index: 166

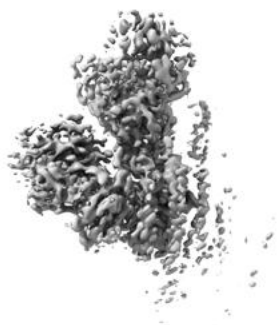


Z Index: 176

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

6.4 Orthogonal surface views [i](#)

6.4.1 Primary map



X



Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.246. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

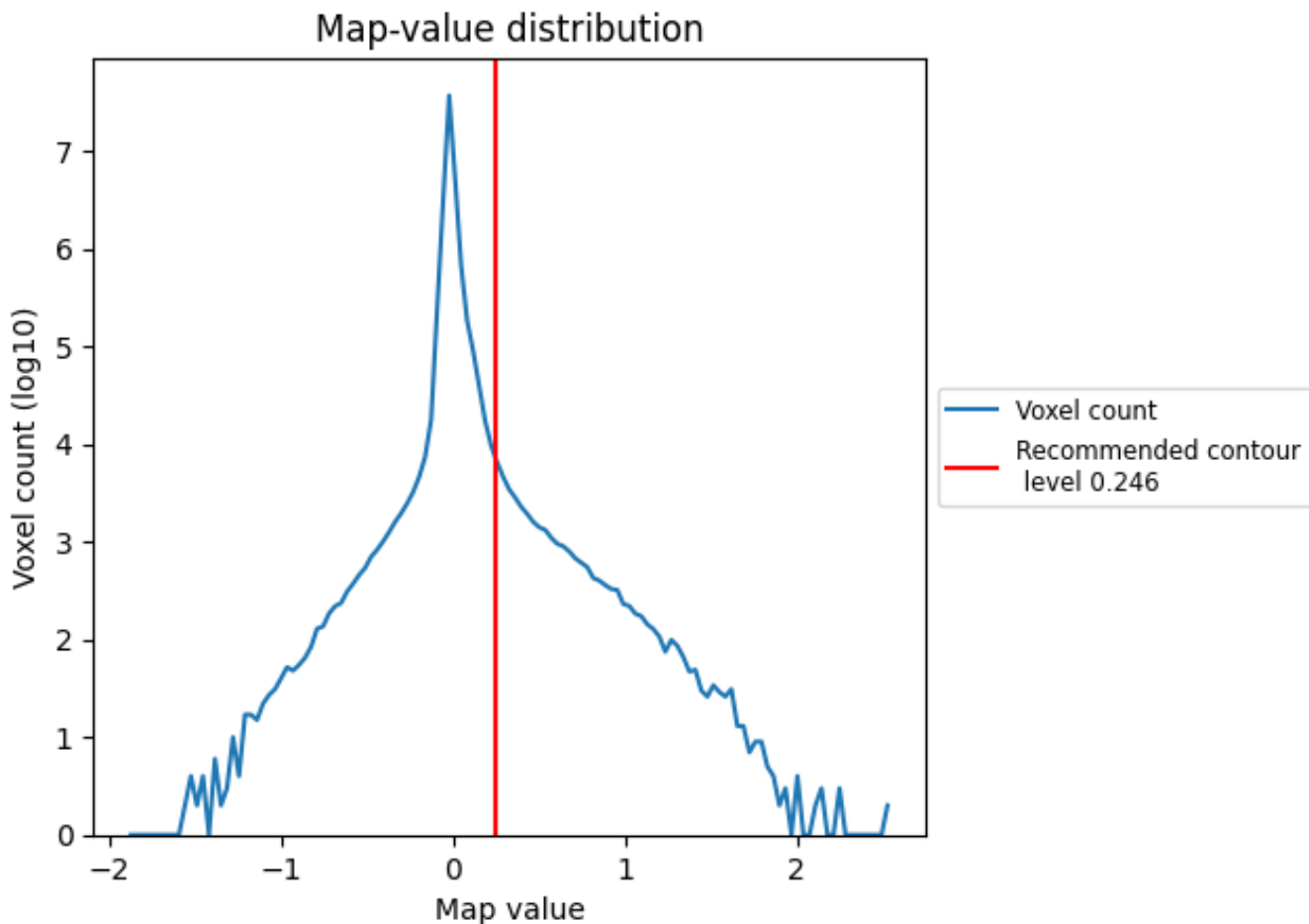
6.5 Mask visualisation

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

7 Map analysis [i](#)

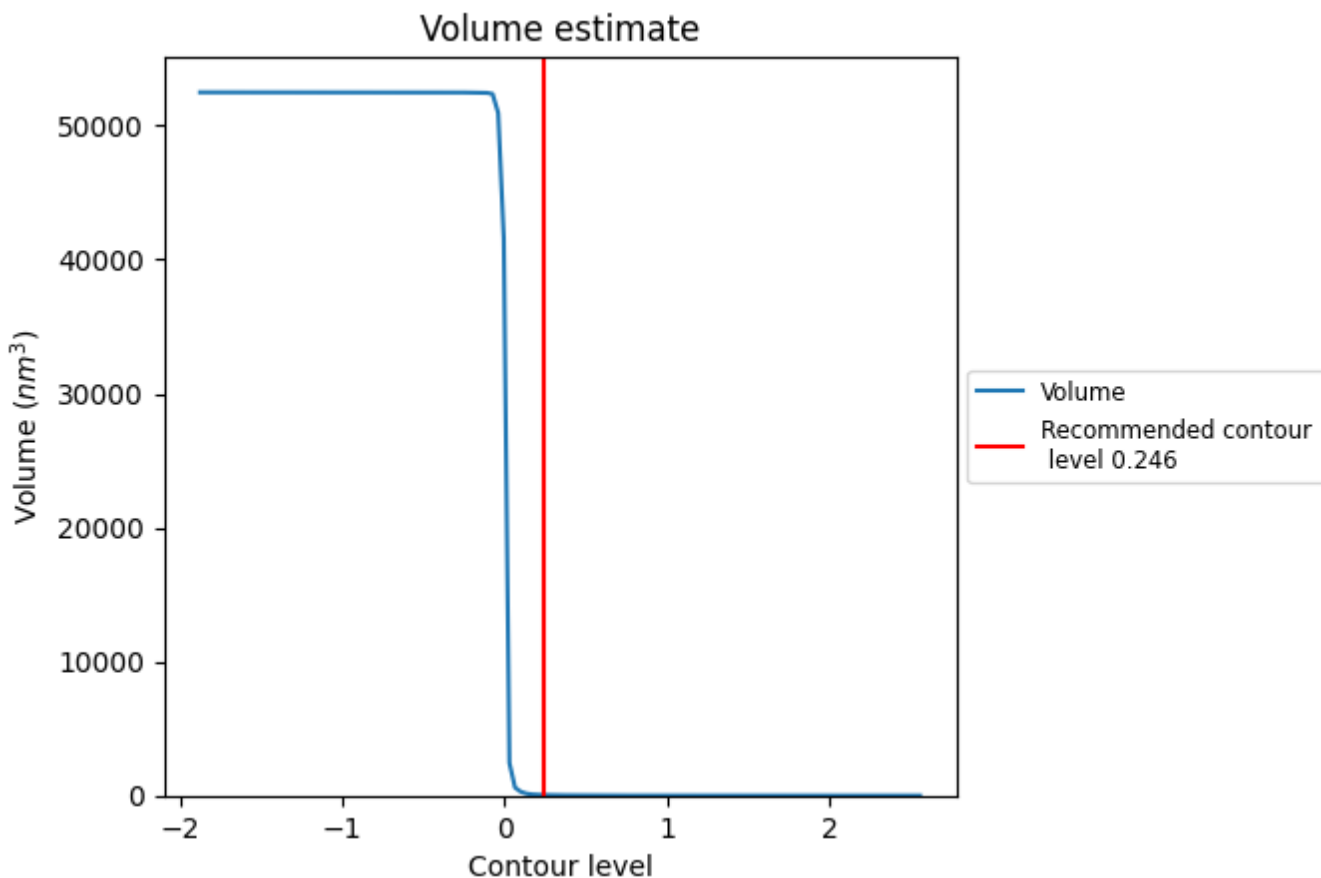
This section contains the results of statistical analysis of the map.

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.

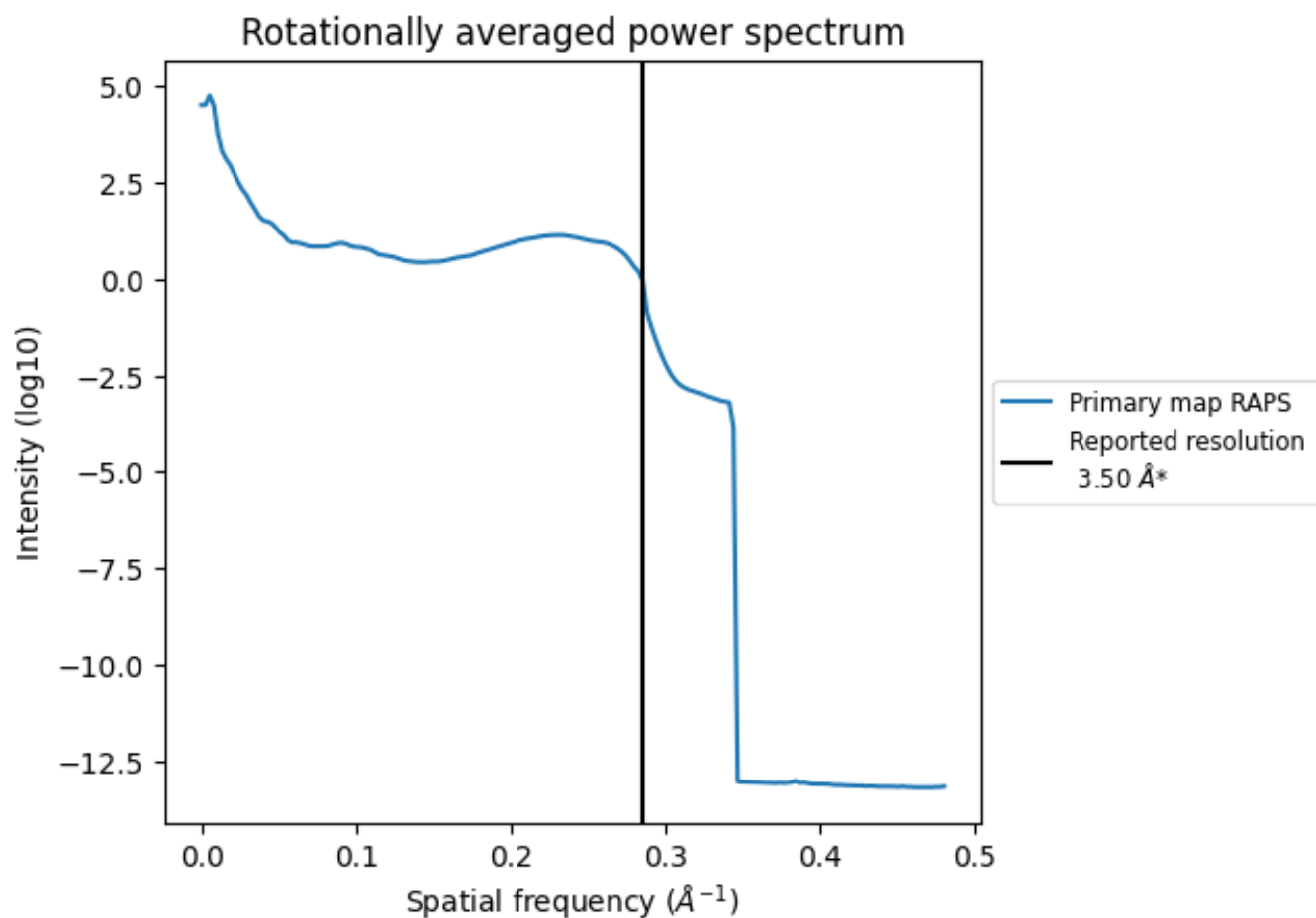
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 42 nm³; this corresponds to an approximate mass of 38 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 0.286 Å⁻¹

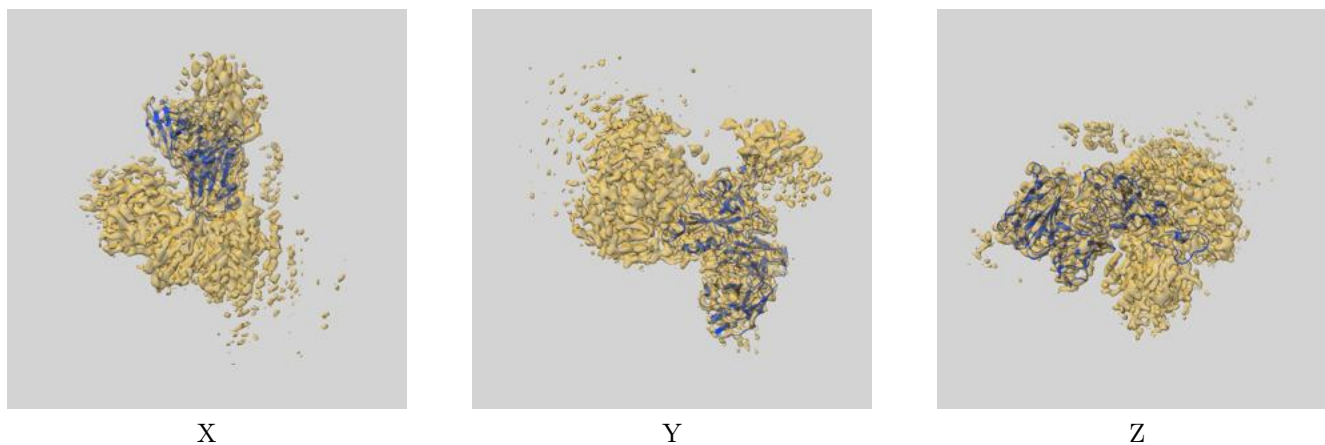
8 Fourier-Shell correlation

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

9 Map-model fit [i](#)

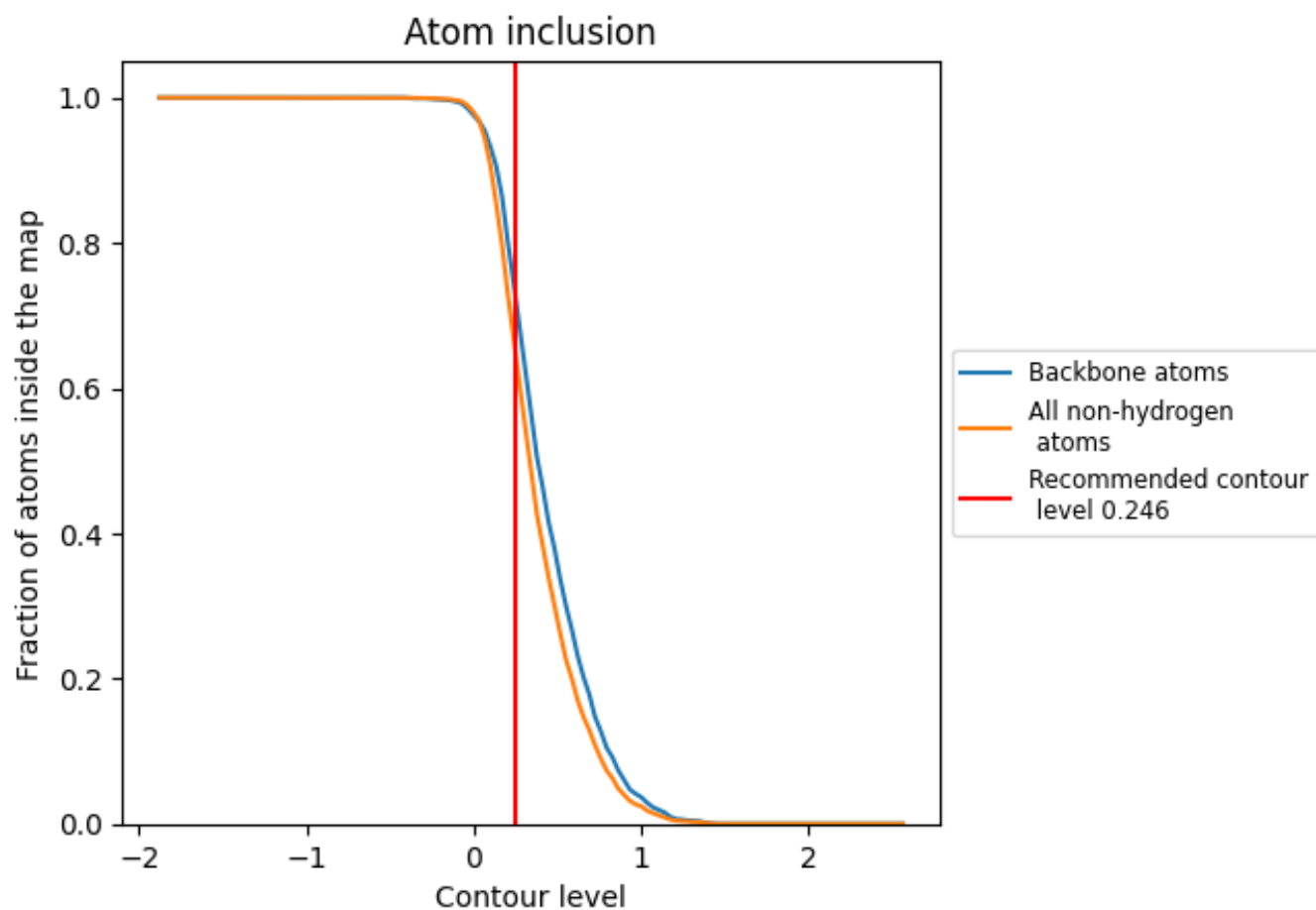
This section contains information regarding the fit between EMDB map EMD-32718 and PDB model 7WR8. Per-residue inclusion information can be found in section [3](#) on page [5](#).

9.1 Map-model overlay [i](#)



The images above show the 3D surface view of the map at the recommended contour level 0.246 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 Atom inclusion [i](#)



At the recommended contour level, 73% of all backbone atoms, 65% of all non-hydrogen atoms, are inside the map.