



wwPDB EM Validation Summary Report ⓘ

Mar 5, 2026 – 07:44 AM UTC

PDB ID : 6EDT / pdb_00006edt
EMDB ID : EMD-9037
Title : Mycobacterium tuberculosis RNAP open promoter complex with RbpA/CarD and AP3 promoter
Authors : Darst, S.A.; Campbell, E.A.; Boyaci Selcuk, H.; Chen, J.
Deposited on : 2018-08-10
Resolution : 3.60 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.dev132
MolProbity : 4-5-2 with Phenix2.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

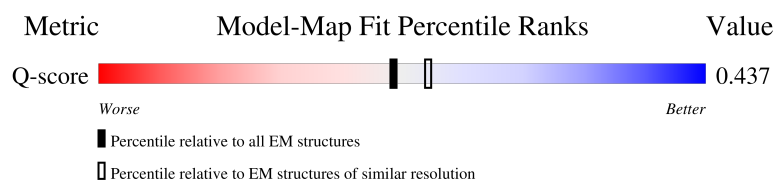
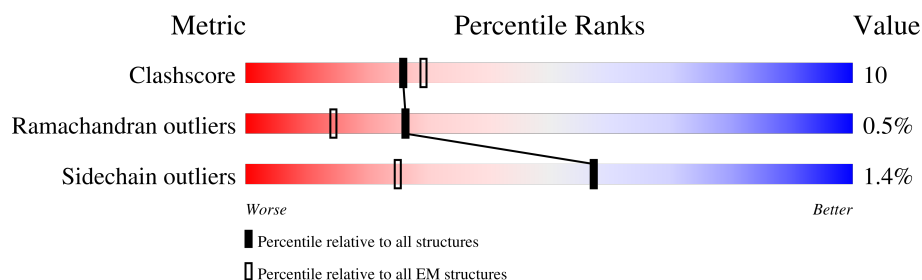
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.60 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.



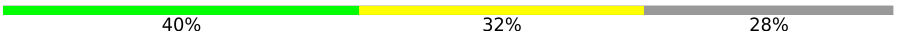
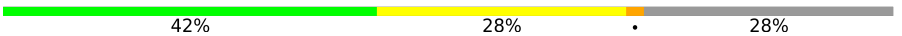
Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	229148	23984	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
Q-score	-	25397	12797 (3.10 - 4.10)

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	A	347	56% 8% 35%
1	B	347	56% 12% 32%
2	C	1134	79% 17% ..
3	D	1371	74% 17% • 7%

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Mol	Chain	Length	Quality of chain
4	E	110	
5	F	531	
6	J	111	
7	O	90	
8	P	90	
9	M	162	

2 Entry composition

There are 11 unique types of molecules in this entry. The entry contains 29979 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 DNA-directed RNA polymerase subunit alpha.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	225	Total	C	N	O	S	0	0
			1716	1080	296	338	2		
1	B	237	Total	C	N	O	S	0	0
			1765	1115	301	346	3		

- Molecule 2 is a protein called DNA-directed RNA polymerase subunit beta.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	C	1111	Total	C	N	O	S	0	0
			8606	5392	1511	1664	39		

- Molecule 3 is a protein called DNA-directed RNA polymerase subunit beta'.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	D	1270	Total	C	N	O	S	0	0
			9914	6208	1802	1862	42		

There are 55 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	-46	ASP	-	expression tag	UNP A5U053
D	-45	GLY	-	expression tag	UNP A5U053
D	-44	ALA	-	expression tag	UNP A5U053
D	-43	ALA	-	expression tag	UNP A5U053
D	-42	ILE	-	expression tag	UNP A5U053
D	-41	GLU	-	expression tag	UNP A5U053
D	-40	LEU	-	expression tag	UNP A5U053
D	-39	ARG	-	expression tag	UNP A5U053
D	-38	GLU	-	expression tag	UNP A5U053
D	-37	GLY	-	expression tag	UNP A5U053
D	-36	GLU	-	expression tag	UNP A5U053
D	-35	ASP	-	expression tag	UNP A5U053
D	-34	GLU	-	expression tag	UNP A5U053

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Chain	Residue	Modelled	Actual	Comment	Reference
D	-33	ASP	-	expression tag	UNP A5U053
D	-32	LEU	-	expression tag	UNP A5U053
D	-31	GLU	-	expression tag	UNP A5U053
D	-30	ARG	-	expression tag	UNP A5U053
D	-29	ALA	-	expression tag	UNP A5U053
D	-28	ALA	-	expression tag	UNP A5U053
D	-27	ALA	-	expression tag	UNP A5U053
D	-26	ASN	-	expression tag	UNP A5U053
D	-25	LEU	-	expression tag	UNP A5U053
D	-24	GLY	-	expression tag	UNP A5U053
D	-23	ILE	-	expression tag	UNP A5U053
D	-22	ASN	-	expression tag	UNP A5U053
D	-21	LEU	-	expression tag	UNP A5U053
D	-20	SER	-	expression tag	UNP A5U053
D	-19	ARG	-	expression tag	UNP A5U053
D	-18	ASN	-	expression tag	UNP A5U053
D	-17	GLU	-	expression tag	UNP A5U053
D	-16	SER	-	expression tag	UNP A5U053
D	-15	ALA	-	expression tag	UNP A5U053
D	-14	SER	-	expression tag	UNP A5U053
D	-13	VAL	-	expression tag	UNP A5U053
D	-12	GLU	-	expression tag	UNP A5U053
D	-11	ASP	-	expression tag	UNP A5U053
D	-10	LEU	-	expression tag	UNP A5U053
D	-9	ALA	-	expression tag	UNP A5U053
D	-8	LEU	-	expression tag	UNP A5U053
D	-7	ALA	-	expression tag	UNP A5U053
D	-6	ARG	-	expression tag	UNP A5U053
D	-5	HIS	-	expression tag	UNP A5U053
D	-4	GLY	-	expression tag	UNP A5U053
D	-3	GLY	-	expression tag	UNP A5U053
D	-2	SER	-	expression tag	UNP A5U053
D	-1	GLY	-	expression tag	UNP A5U053
D	0	ALA	-	expression tag	UNP A5U053
D	1317	HIS	-	expression tag	UNP A5U053
D	1318	HIS	-	expression tag	UNP A5U053
D	1319	HIS	-	expression tag	UNP A5U053
D	1320	HIS	-	expression tag	UNP A5U053
D	1321	HIS	-	expression tag	UNP A5U053
D	1322	HIS	-	expression tag	UNP A5U053
D	1323	HIS	-	expression tag	UNP A5U053
D	1324	HIS	-	expression tag	UNP A5U053

- Molecule 4 is a protein called DNA-directed RNA polymerase subunit omega.

Mol	Chain	Residues	Atoms				AltConf	Trace
4	E	83	Total	C	N	O	0	0
			649	414	108	127		

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
E	1	GLY	-	expression tag	UNP A0A0T9N9K3

- Molecule 5 is a protein called RNA polymerase sigma factor SigA.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	F	322	Total	C	N	O	S	0	0
			2540	1583	459	489	9		

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
F	-2	GLY	-	expression tag	UNP P9WGI0
F	-1	PRO	-	expression tag	UNP P9WGI0
F	0	HIS	-	expression tag	UNP P9WGI0

- Molecule 6 is a protein called RNA polymerase-binding protein RbpA.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	J	109	Total	C	N	O	S	0	0
			880	543	166	168	3		

- Molecule 7 is a DNA chain called DNA (65-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
7	O	65	Total	C	N	O	P	0	0
			1336	633	243	395	65		

- Molecule 8 is a DNA chain called DNA (65-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
8	P	65	Total	C	N	O	P	0	0
			1329	629	250	385	65		

- Molecule 9 is a protein called RNA polymerase-binding transcription factor CarD.

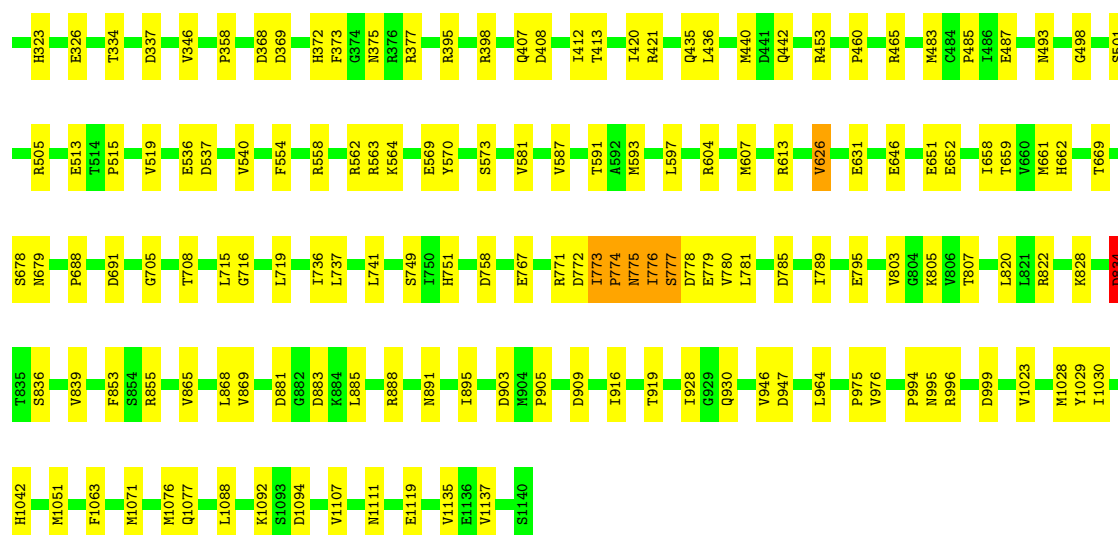
Mol	Chain	Residues	Atoms					AltConf	Trace
9	M	159	Total	C	N	O	S	0	0
			1241	777	224	239	1		

- Molecule 10 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		AltConf
10	D	2	Total	Zn	0
			2	2	

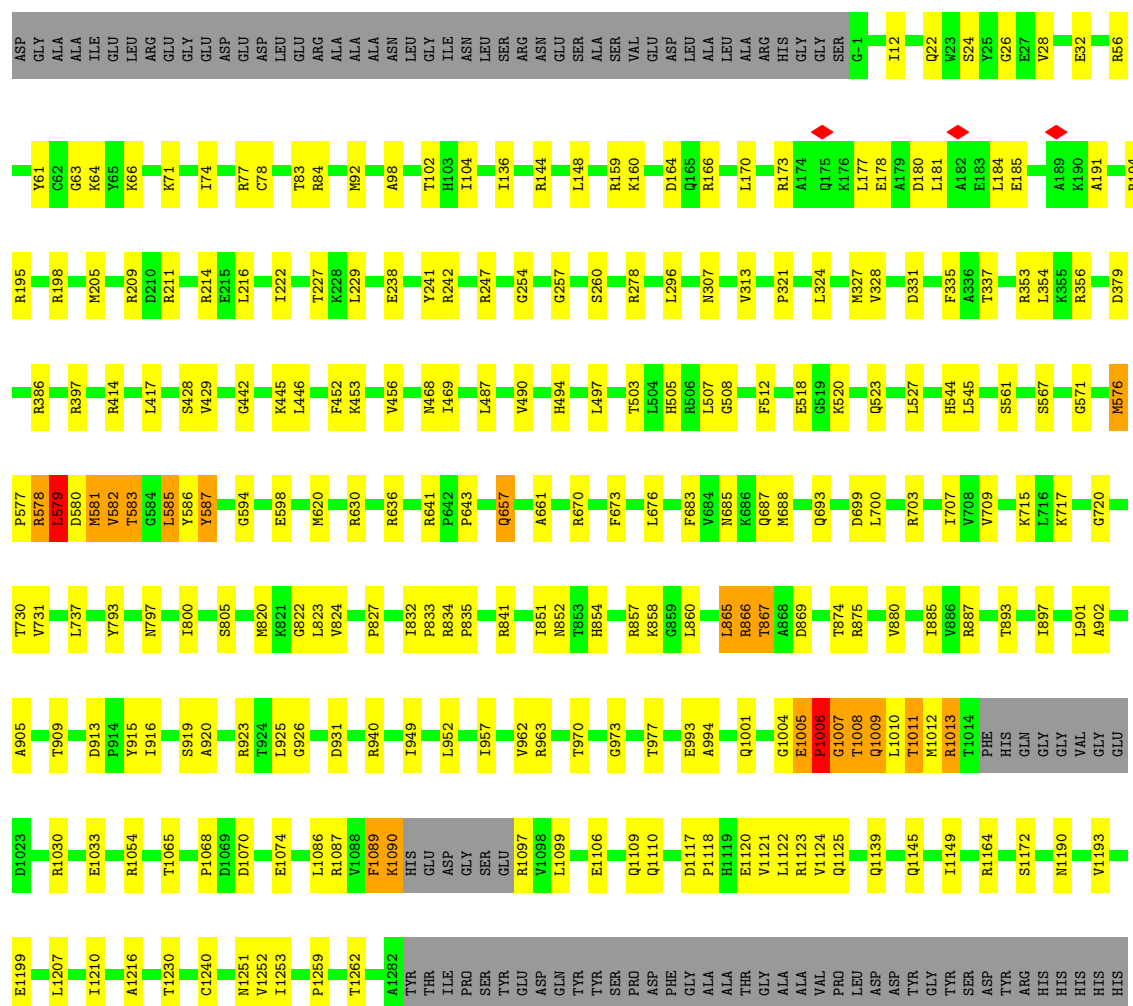
- Molecule 11 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		AltConf
11	D	1	Total	Mg	0
			1	1	



• Molecule 3: DNA-directed RNA polymerase subunit beta'

Chain D: 74% 17% 7%



DA

DT

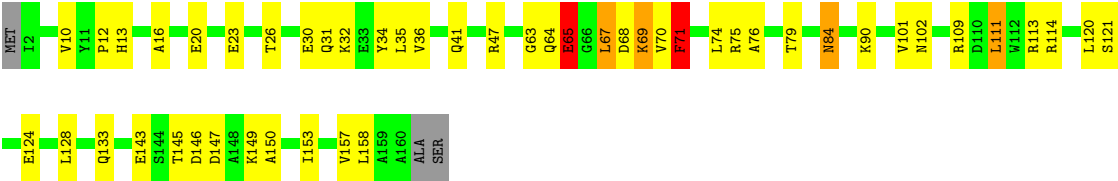
DA

DG

DC

DC

● Molecule 9: RNA polymerase-binding transcription factor CarD



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	211381	Depositor
Resolution determination method	Not provided	
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	69.9	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	1.931	Depositor
Minimum map value	-0.730	Depositor
Average map value	0.007	Depositor
Map value standard deviation	0.075	Depositor
Recommended contour level	0.25	Depositor
Map size (Å)	325.0, 325.0, 325.0	wwPDB
Map dimensions	250, 250, 250	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.3, 1.3, 1.3	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: MG, ZN

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	0.39	0/1742	0.55	0/2370
1	B	0.49	0/1792	0.62	2/2442 (0.1%)
2	C	0.49	2/8765 (0.0%)	0.67	7/11885 (0.1%)
3	D	0.53	8/10078 (0.1%)	0.68	11/13624 (0.1%)
4	E	0.35	0/662	0.59	0/901
5	F	0.32	0/2571	0.56	0/3468
6	J	0.32	0/896	0.65	0/1210
7	O	0.38	0/1497	0.49	0/2310
8	P	0.39	0/1491	0.58	4/2297 (0.2%)
9	M	0.42	1/1257 (0.1%)	0.77	3/1700 (0.2%)
All	All	0.47	11/30751 (0.0%)	0.64	27/42207 (0.1%)

The worst 5 of 11 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	182	SER	CA-C	-7.40	1.45	1.53
3	D	1005	GLU	CA-C	-7.40	1.43	1.52
3	D	581	MET	CA-C	-6.20	1.45	1.52
3	D	1006	PRO	CA-C	-5.54	1.44	1.52
3	D	867	THR	CA-C	-5.47	1.45	1.52

The worst 5 of 27 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	583	THR	CB-CA-C	-11.24	93.24	110.88
2	C	231	ARG	N-CA-C	8.69	129.30	110.80
2	C	834	ASP	N-CA-C	8.33	121.81	108.41
9	M	65	GLU	N-CA-C	-7.99	101.53	111.11
2	C	276	ASP	N-CA-C	-7.79	101.52	111.02

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

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	1716	0	1756	19	0
1	B	1765	0	1794	29	0
2	C	8606	0	8544	229	0
3	D	9914	0	9987	218	0
4	E	649	0	645	10	0
5	F	2540	0	2552	34	0
6	J	880	0	852	12	0
7	O	1336	0	732	37	0
8	P	1329	0	727	38	0
9	M	1241	0	1259	39	0
10	D	2	0	0	0	0
11	D	1	0	0	0	0
All	All	29979	0	28848	598	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 10.

The worst 5 of 598 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:C:776:ILE:CD1	2:C:780:VAL:HG21	1.23	1.59
2:C:231:ARG:CD	2:C:232:GLN:H	0.90	1.53
2:C:278:TYR:CE2	2:C:282:ARG:HG3	1.55	1.41
2:C:231:ARG:HD2	2:C:232:GLN:N	1.06	1.39
3:D:1010:LEU:CD1	3:D:1145:GLN:HG3	1.52	1.37

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

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	223/347 (64%)	207 (93%)	16 (7%)	0	100	100
1	B	235/347 (68%)	210 (89%)	24 (10%)	1 (0%)	30	61
2	C	1109/1134 (98%)	991 (89%)	107 (10%)	11 (1%)	12	45
3	D	1264/1371 (92%)	1183 (94%)	77 (6%)	4 (0%)	36	65
4	E	81/110 (74%)	73 (90%)	8 (10%)	0	100	100
5	F	320/531 (60%)	303 (95%)	17 (5%)	0	100	100
6	J	107/111 (96%)	95 (89%)	11 (10%)	1 (1%)	14	46
9	M	157/162 (97%)	147 (94%)	9 (6%)	1 (1%)	21	54
All	All	3496/4113 (85%)	3209 (92%)	269 (8%)	18 (0%)	26	57

5 of 18 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	C	231	ARG
3	D	1008	THR
3	D	1011	THR
2	C	230	ARG
2	C	775	ASN

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	A	194/297 (65%)	192 (99%)	2 (1%)	68	75

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	B	195/297 (66%)	195 (100%)	0	100	100
2	C	937/965 (97%)	920 (98%)	17 (2%)	51	68
3	D	1048/1135 (92%)	1036 (99%)	12 (1%)	65	74
4	E	69/89 (78%)	67 (97%)	2 (3%)	37	60
5	F	266/429 (62%)	265 (100%)	1 (0%)	84	81
6	J	92/97 (95%)	92 (100%)	0	100	100
9	M	129/131 (98%)	122 (95%)	7 (5%)	20	47
All	All	2930/3440 (85%)	2889 (99%)	41 (1%)	57	71

5 of 41 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	D	1013	ARG
9	M	65	GLU
3	D	1089	PHE
4	E	82	LEU
9	M	69	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 41 such sidechains are listed below:

Mol	Chain	Res	Type
3	D	1104	HIS
5	F	322	GLN
3	D	1139	GLN
4	E	65	ASN
5	F	353	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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](#)

Of 3 ligands modelled in this entry, 3 are monoatomic - leaving 0 for Mogul analysis.

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.

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.

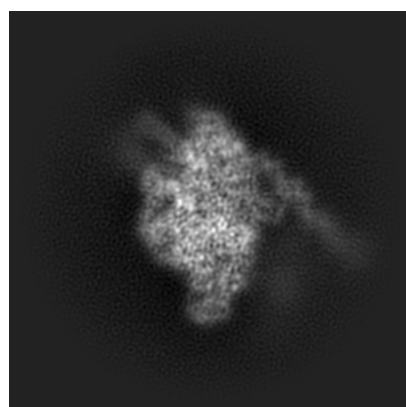
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-9037. These allow visual inspection of the internal detail of the map and identification of artifacts.

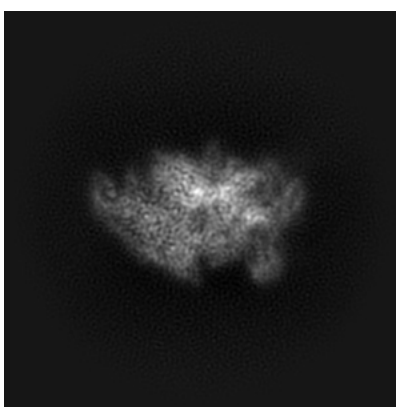
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections [i](#)

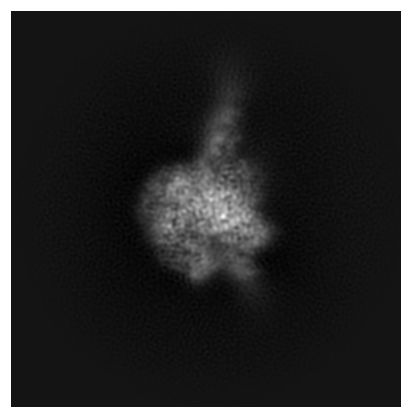
6.1.1 Primary map



X



Y

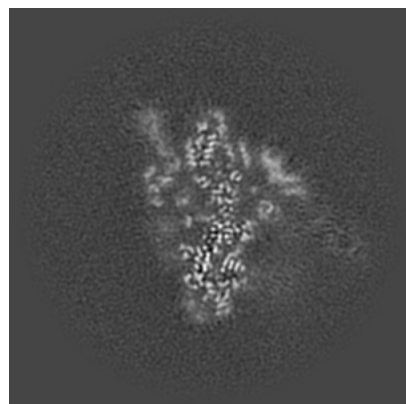


Z

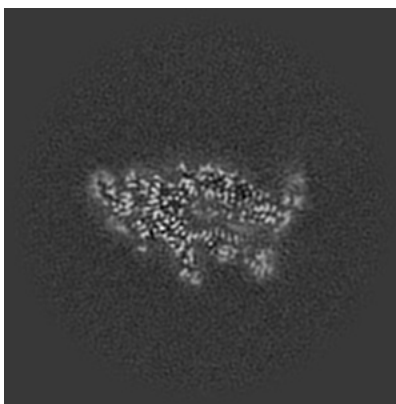
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

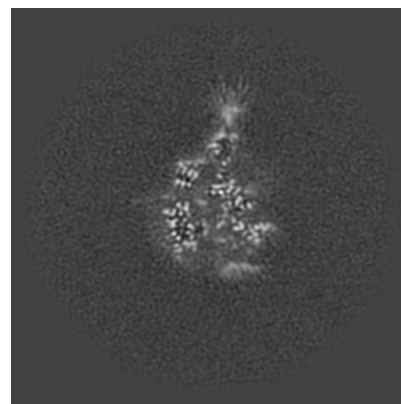
6.2.1 Primary map



X Index: 125



Y Index: 125

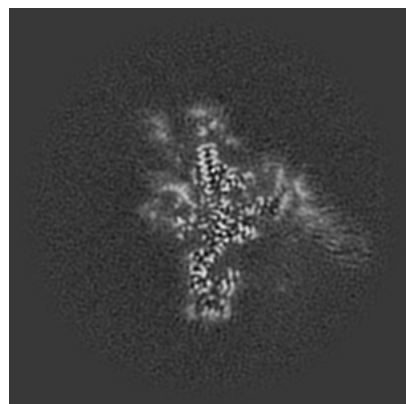


Z Index: 125

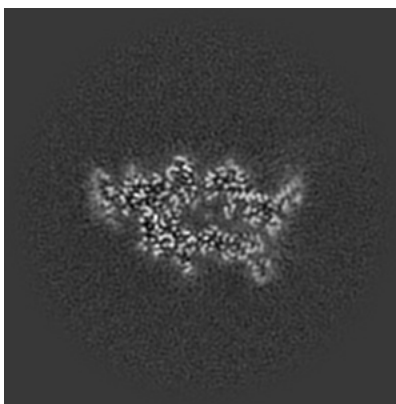
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

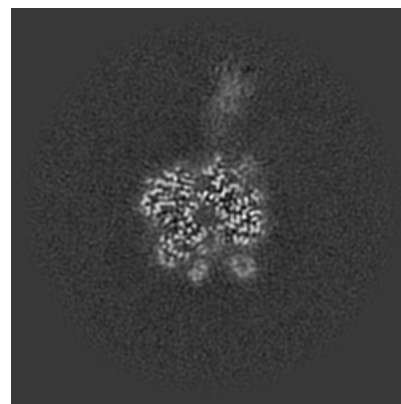
6.3.1 Primary map



X Index: 132



Y Index: 121

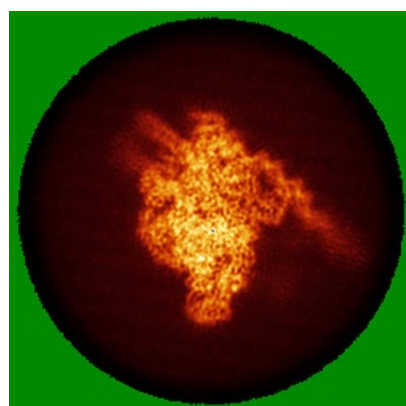


Z Index: 113

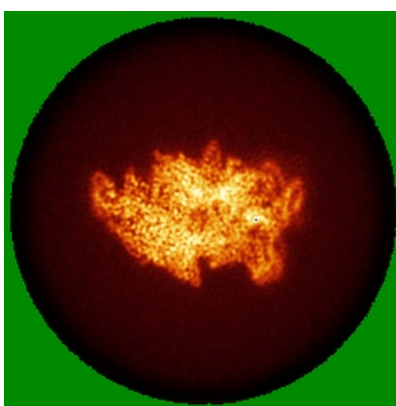
The images above show the largest variance slices of the map in three orthogonal directions.

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

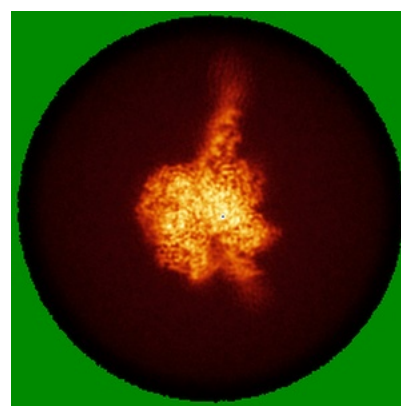
6.4.1 Primary map



X



Y



Z

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

6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.25. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

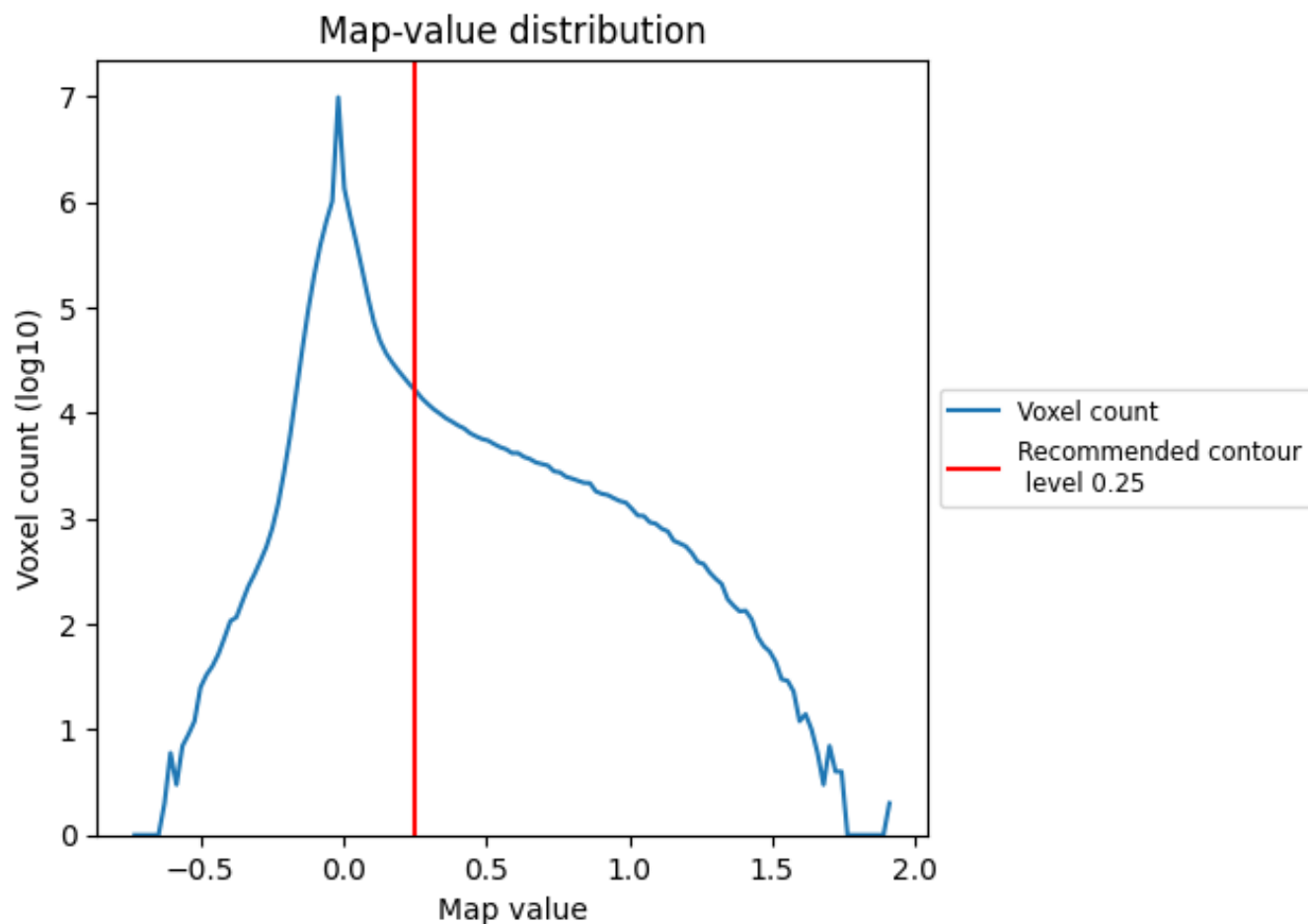
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

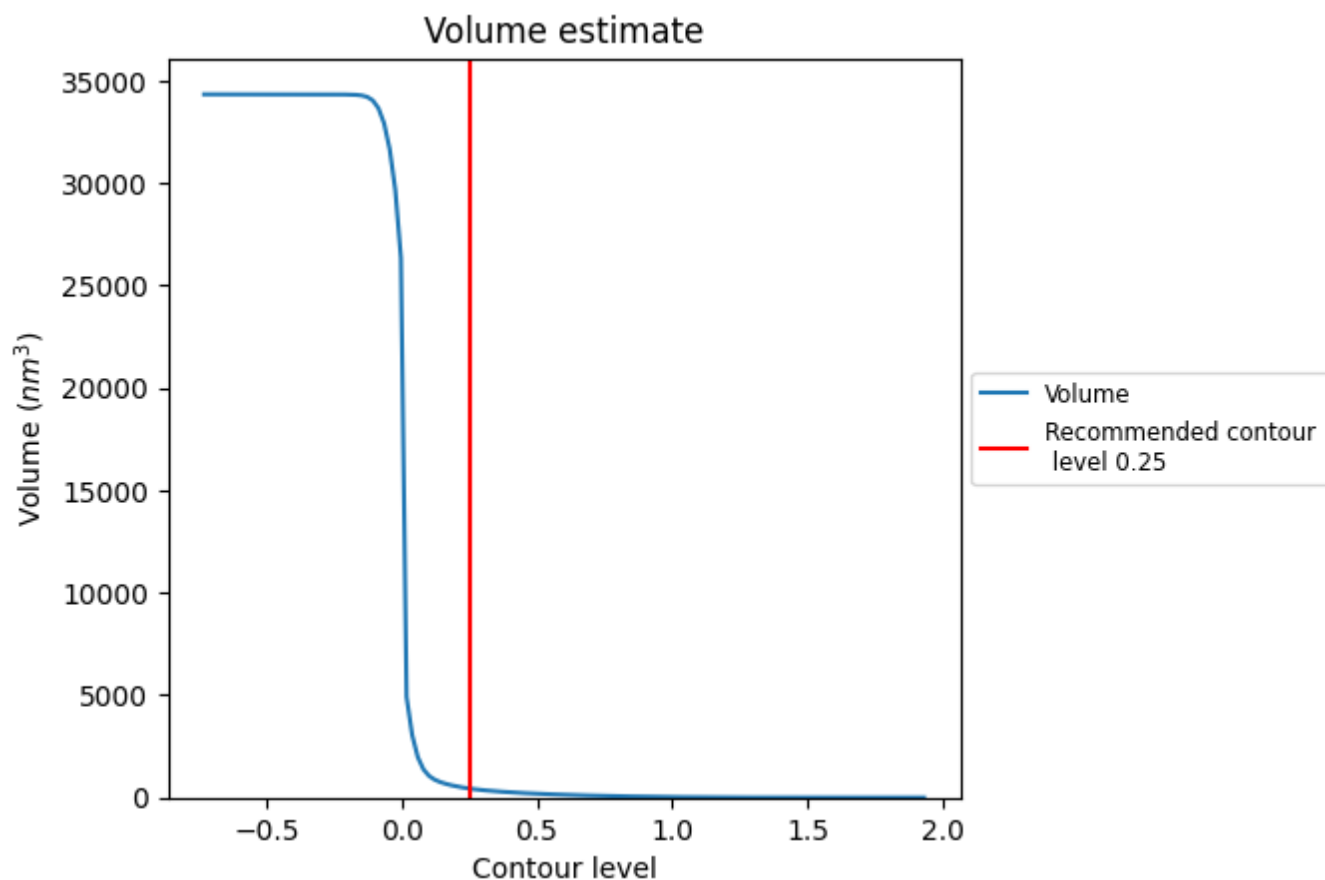
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution [i](#)



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

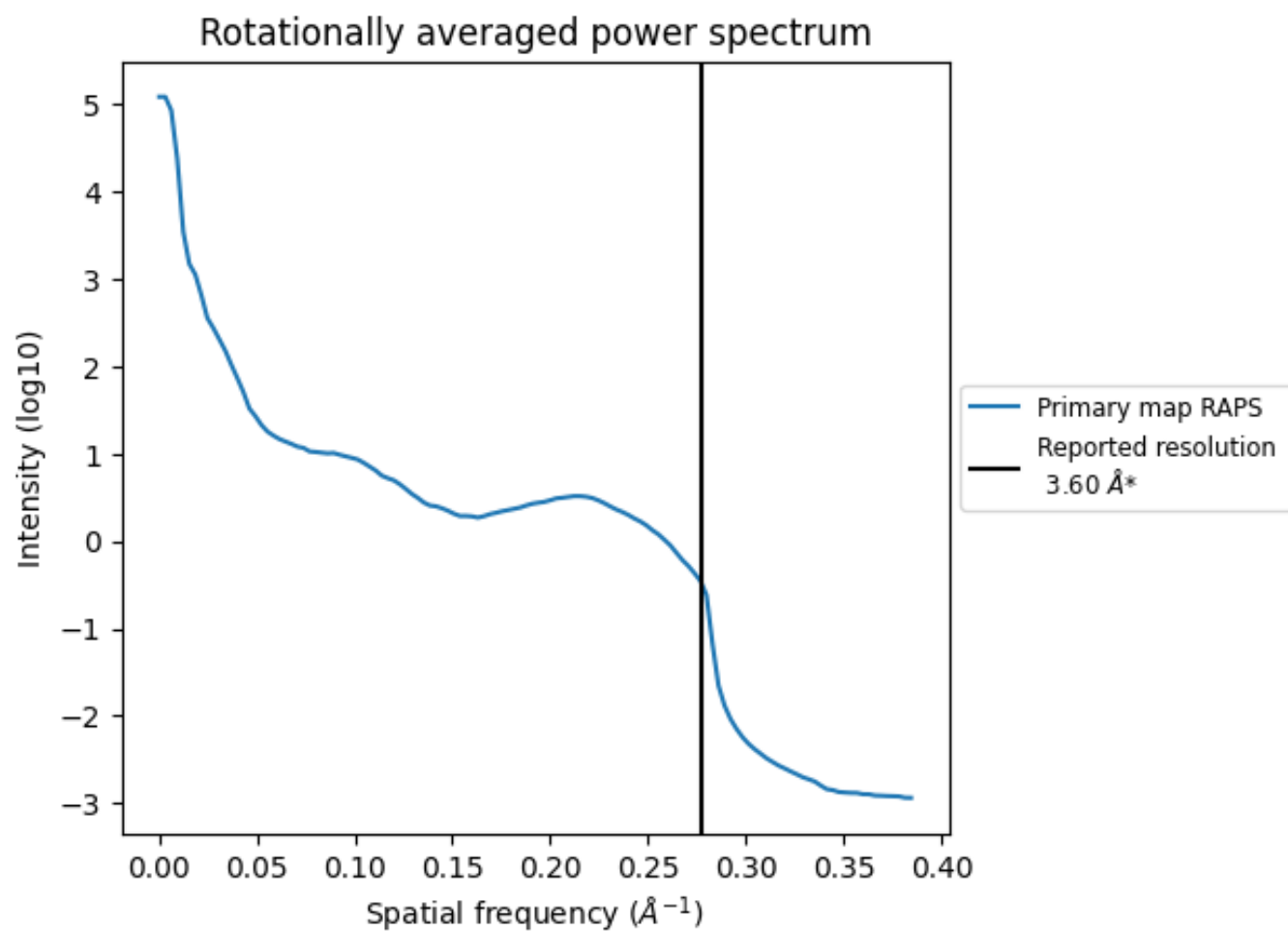
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 442 nm³; this corresponds to an approximate mass of 399 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 0.278 Å⁻¹

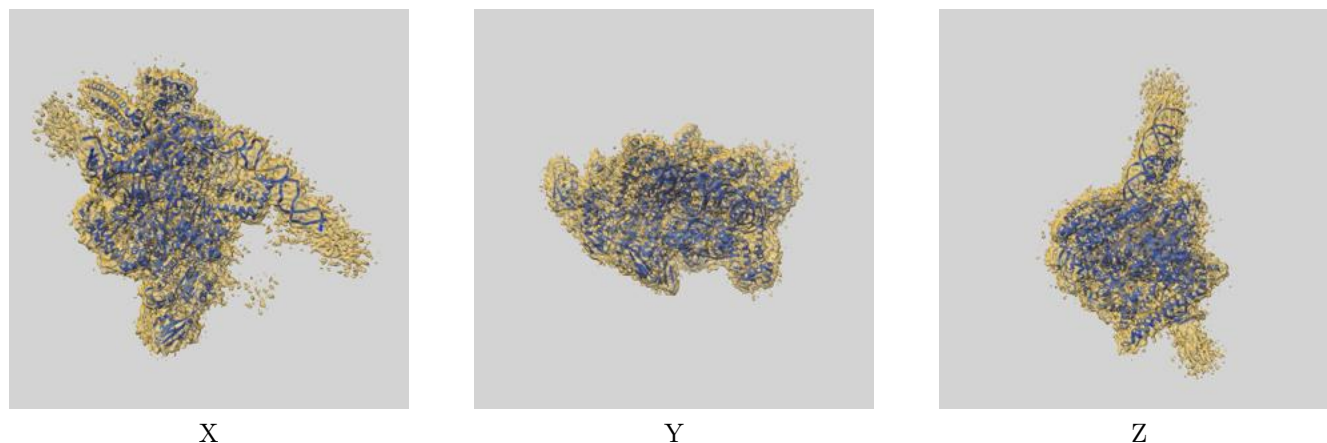
8 Fourier-Shell correlation

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

9 Map-model fit [i](#)

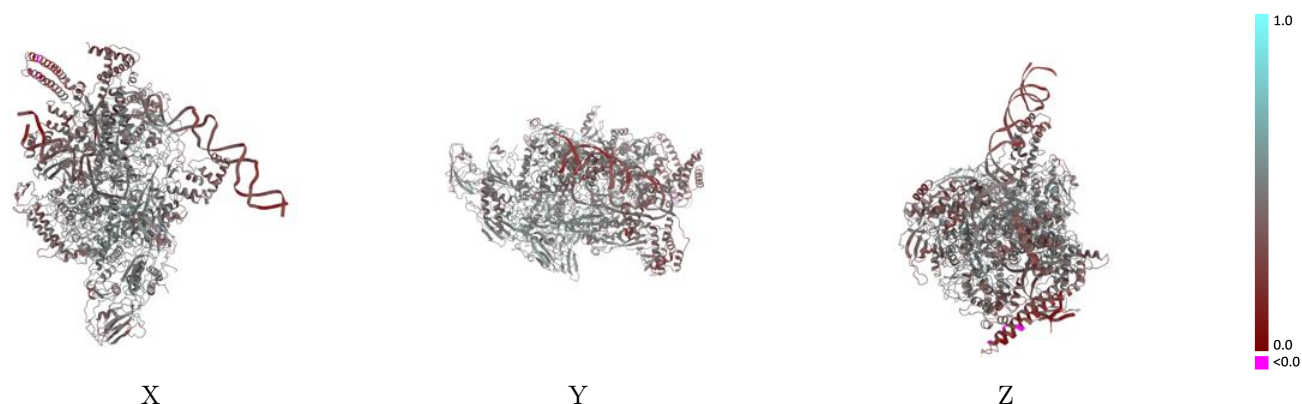
This section contains information regarding the fit between EMDB map EMD-9037 and PDB model 6EDT. Per-residue inclusion information can be found in section [3](#) on page [8](#).

9.1 Map-model overlay [i](#)



The images above show the 3D surface view of the map at the recommended contour level 0.25 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](#)

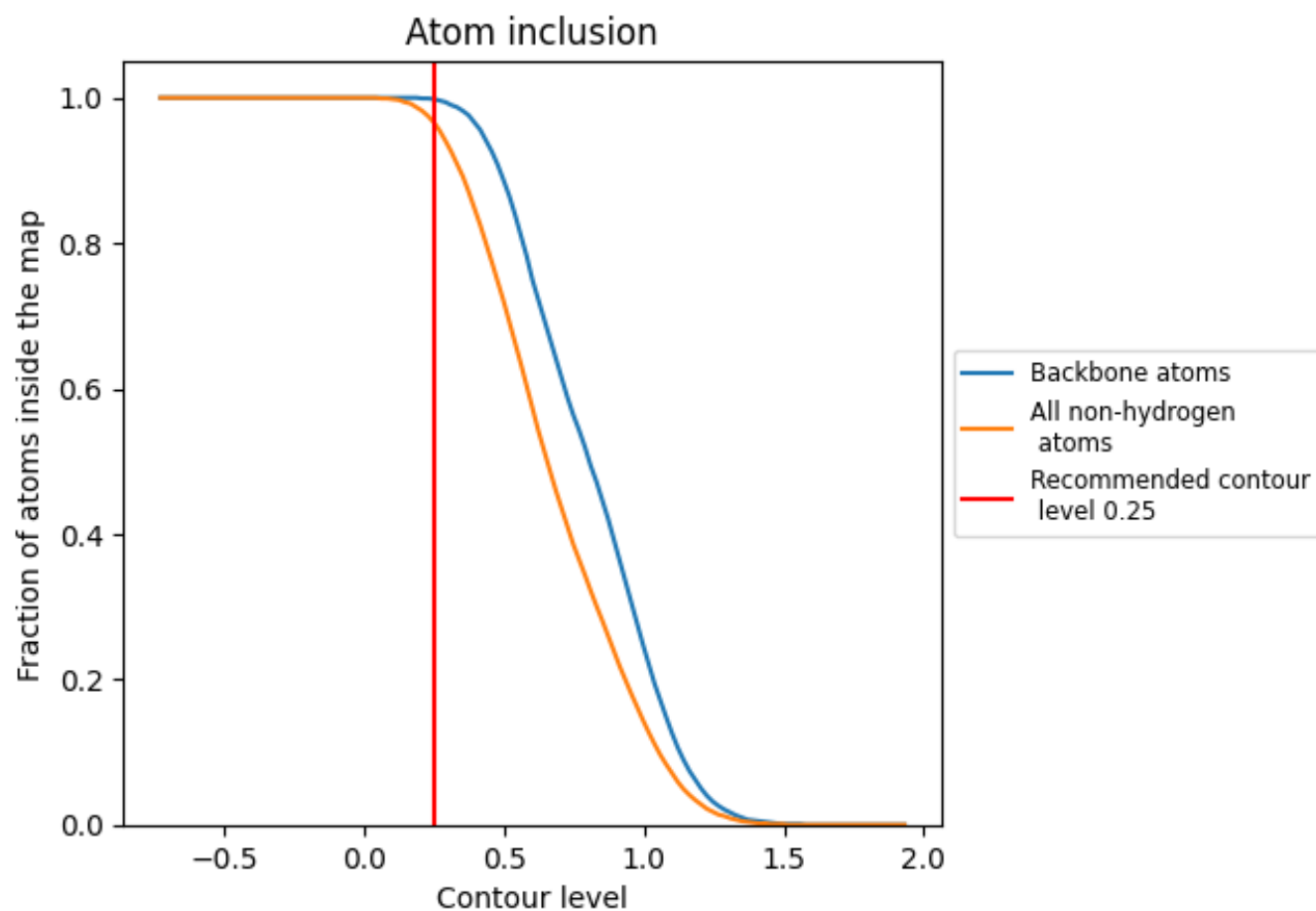


The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions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

This section was not generated.

9.4 Atom inclusion [i](#)



At the recommended contour level, 100% of all backbone atoms, 96% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary ⓘ

The table lists the average atom inclusion at the recommended contour level (0.25) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.9650	0.4370
A	0.9780	0.4790
B	0.9650	0.4440
C	0.9630	0.4690
D	0.9610	0.4490
E	0.9480	0.4570
F	0.9610	0.4020
J	0.9540	0.4070
M	0.9540	0.3620
O	0.9900	0.3260
P	0.9950	0.3320

1.0

0.0

<0.0