



Full wwPDB EM Validation Report ⓘ

Mar 8, 2026 – 04:44 PM UTC

PDB ID : 8EHQ / pdb_00008ehq
EMDB ID : EMD-28149
Title : Mycobacterium tuberculosis paused transcription complex with Bacillus subtilis NusG
Authors : Vishwakarma, R.K.; Murakami, K.S.
Deposited on : 2022-09-14
Resolution : 3.00 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:

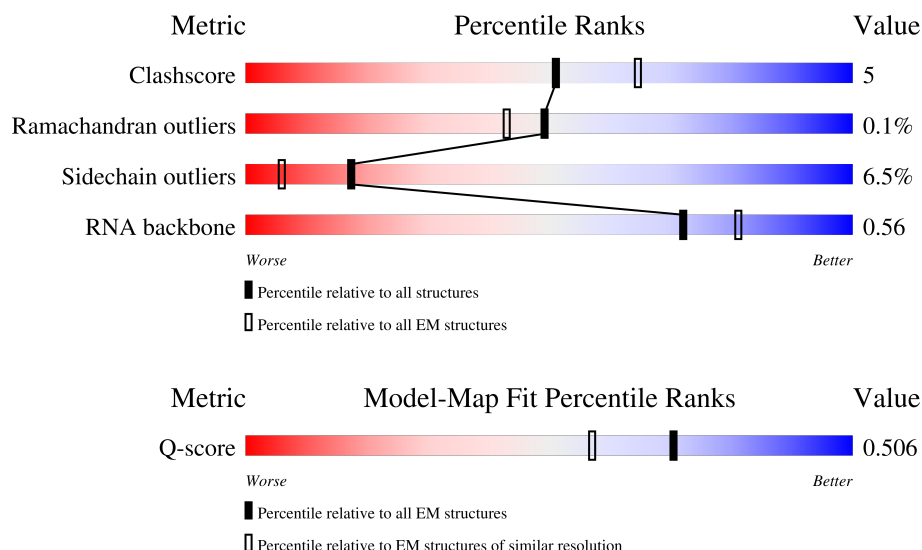
EMDB validation analysis : 0.0.1.dev132
MolProbity : 4-5-2 with Phenix2.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & 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 3.00 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	-
RNA backbone	8273	3508	-
Q-score	-	25397	14081 (2.50 - 3.50)

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	
1	B	347	
2	C	1178	

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
3	D	1316	80%15%••
4	E	110	65%10%25%
5	G	177	47%14%•38%
6	T	40	5%55%40%5%
7	N	40	58%38%5%
8	R	30	10%43%50%••

2 Entry composition [i](#)

There are 10 unique types of molecules in this entry. The entry contains 25828 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	226	Total	C	N	O	S	0	0
			1724	1085	297	339	3		
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	1122	Total	C	N	O	S	0	0
			8689	5440	1526	1684	39		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
3	D	1273	Total	C	N	O	S	0	0
			9953	6229	1811	1872	41		

- 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		

- Molecule 5 is a protein called Transcription termination/antitermination protein NusG.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	G	110	Total	C	N	O	S	1	0
			878	563	147	165	3		

- Molecule 6 is a DNA chain called DNA (38-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
6	T	38	Total	C	N	O	P	0	0
			772	365	142	227	38		

- Molecule 7 is a DNA chain called DNA (38-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
7	N	38	Total	C	N	O	P	0	0
			770	366	132	234	38		

- Molecule 8 is a RNA chain called RNA (29-MER).

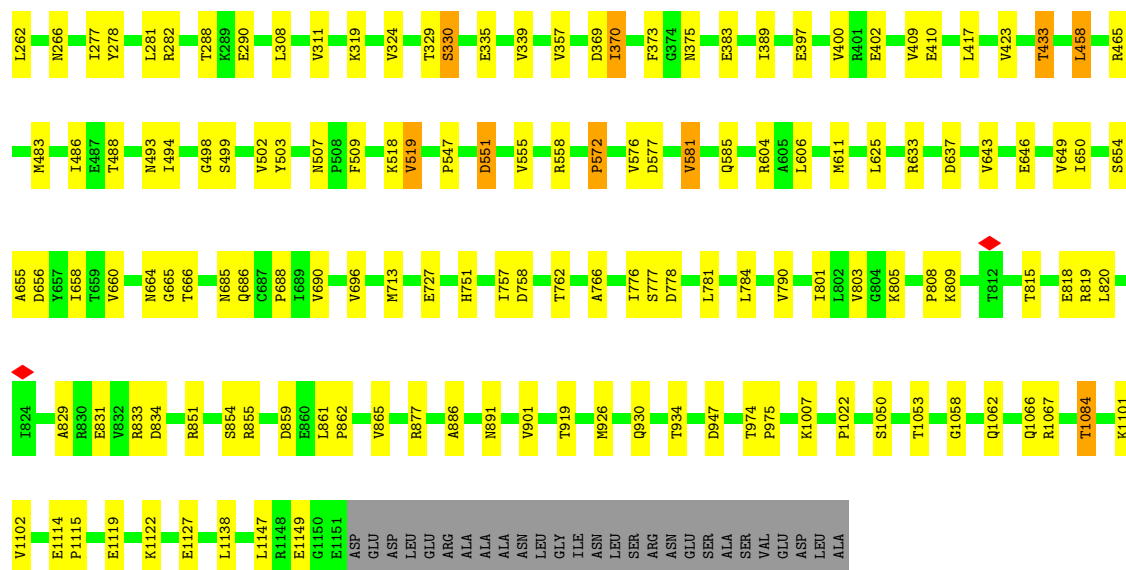
Mol	Chain	Residues	Atoms					AltConf	Trace
8	R	29	Total	C	N	O	P	0	0
			625	278	116	202	29		

- Molecule 9 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

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

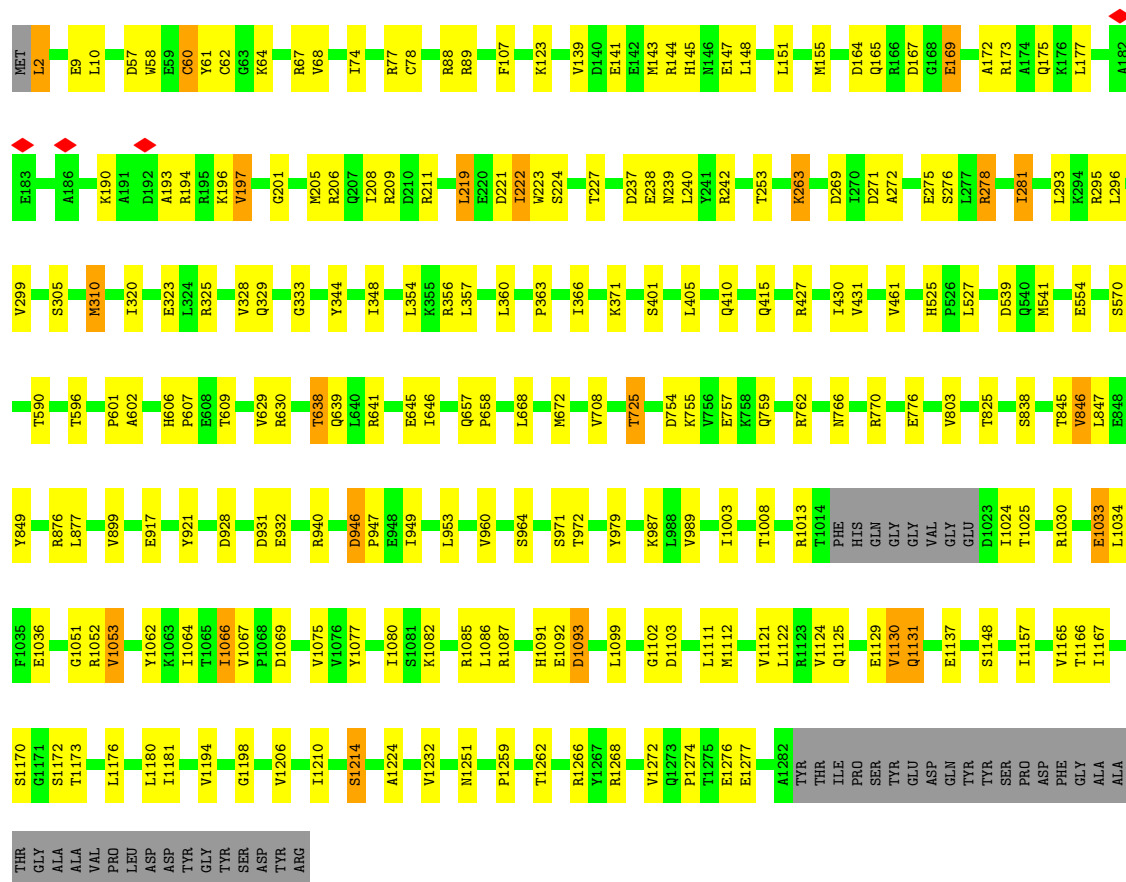
- Molecule 10 is ZINC ION (CCD ID: ZN) (formula: Zn).

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



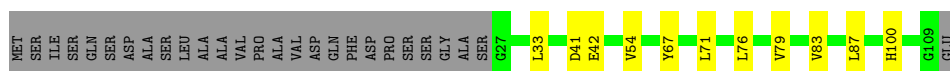
• Molecule 3: DNA-directed RNA polymerase subunit beta'

Chain D: 80% 15%

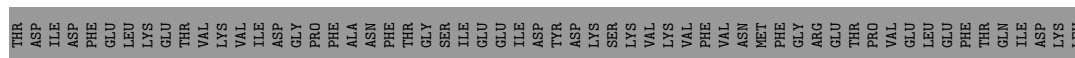


• Molecule 4: DNA-directed RNA polymerase subunit omega

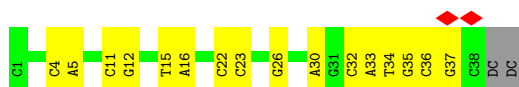
Chain E: 65% 10% 25%



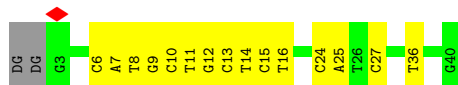
- Molecule 5: Transcription termination/antitermination protein NusG



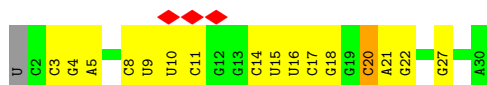
- Molecule 6: DNA (38-MER)



- Molecule 7: DNA (38-MER)



- Molecule 8: RNA (29-MER)



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	110849	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 ($e^-/\text{\AA}^2$)	45	Depositor
Minimum defocus (nm)	750	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	Not provided	
Image detector	FEI FALCON IV (4k x 4k)	Depositor
Maximum map value	2.101	Depositor
Minimum map value	-0.718	Depositor
Average map value	0.004	Depositor
Map value standard deviation	0.065	Depositor
Recommended contour level	0.238	Depositor
Map size (Å)	348.0, 348.0, 348.0	wwPDB
Map dimensions	400, 400, 400	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.87, 0.87, 0.87	Depositor

5 Model quality

5.1 Standard geometry

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	0.15	0/1750	0.31	0/2380
1	B	0.15	0/1792	0.32	0/2442
2	C	0.17	0/8848	0.33	1/11996 (0.0%)
3	D	0.16	0/10119	0.33	1/13679 (0.0%)
4	E	0.17	0/662	0.30	0/901
5	G	0.15	0/896	0.37	0/1209
6	T	0.19	0/864	0.34	0/1329
7	N	0.18	0/859	0.36	0/1322
8	R	0.12	0/699	0.20	0/1089
All	All	0.17	0/26489	0.33	2/36347 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	572	PRO	CA-N-CD	-10.18	97.75	112.00
3	D	601	PRO	CA-N-CD	-6.41	103.02	112.00

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	1724	0	1768	15	0
1	B	1765	0	1794	21	0
2	C	8689	0	8621	92	0
3	D	9953	0	10020	115	0
4	E	649	0	645	5	0
5	G	878	0	896	12	0
6	T	772	0	425	11	0
7	N	770	0	429	13	0
8	R	625	0	314	13	0
9	D	1	0	0	0	0
10	D	2	0	0	0	0
All	All	25828	0	24912	277	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 5.

All (277) 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)
3:D:194:ARG:HH21	3:D:197:VAL:HG21	1.45	0.81
1:A:82:SER:HB2	1:A:123:MET:HE1	1.68	0.76
3:D:1194:VAL:HA	3:D:1198:GLY:HA2	1.68	0.76
3:D:917:GLU:HA	3:D:921:TYR:HD2	1.49	0.75
6:T:30:DA:H61	7:N:11:DT:H3	1.34	0.75
1:B:3:ILE:HG22	1:B:5:GLN:H	1.55	0.71
8:R:20:C:O2	8:R:21:A:N6	2.25	0.70
3:D:238:GLU:OE2	3:D:242:ARG:NH1	2.25	0.69
3:D:1167:ILE:HD11	3:D:1181:ILE:HD11	1.75	0.69
3:D:1251:ASN:HD22	3:D:1259:PRO:HD3	1.56	0.69
3:D:1124:VAL:HG12	3:D:1125:GLN:HG3	1.75	0.68
2:C:465:ARG:NH2	8:R:27:G:OP2	2.26	0.68
2:C:1058:GLY:O	2:C:1062:GLN:NE2	2.26	0.68
7:N:15:DC:H2''	7:N:16:DT:H5'	1.77	0.67
2:C:658:ILE:HD11	2:C:688:PRO:HB3	1.76	0.67
3:D:123:LYS:NZ	7:N:36:DT:OP2	2.27	0.67
1:A:18:ARG:HG2	1:A:197:GLU:HG3	1.76	0.66
3:D:155:MET:HB3	3:D:219:LEU:HD11	1.78	0.66
3:D:62:CYS:HB3	3:D:78:CYS:SG	2.35	0.66
2:C:558:ARG:HA	2:C:572:PRO:HA	1.79	0.65
2:C:572:PRO:HD2	2:C:572:PRO:O	1.95	0.65
7:N:24:DC:H1'	7:N:25:DA:C8	2.32	0.65
3:D:64:LYS:HB2	3:D:77:ARG:HH21	1.62	0.64

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:D:641:ARG:HA	3:D:657:GLN:HG3	1.79	0.64
3:D:877:LEU:HD22	3:D:1157:ILE:HD13	1.78	0.64
2:C:369:ASP:O	2:C:375:ASN:ND2	2.31	0.64
2:C:86:LEU:HD21	2:C:389:ILE:HD13	1.80	0.63
2:C:278:TYR:OH	2:C:282:ARG:NH1	2.32	0.63
2:C:1122:LYS:NZ	2:C:1149:GLU:OE2	2.33	0.61
5:G:72:THR:HG23	5:G:75:SER:H	1.65	0.61
3:D:1093:ASP:N	3:D:1093:ASP:OD1	2.32	0.61
2:C:1119:GLU:OE2	3:D:89:ARG:NH2	2.26	0.61
3:D:1003:ILE:HD12	3:D:1157:ILE:HD12	1.82	0.60
2:C:178:GLN:NE2	2:C:458:LEU:O	2.35	0.59
6:T:26:DG:H1	7:N:16:DT:H3	1.51	0.59
3:D:757:GLU:OE2	3:D:770:ARG:NH1	2.34	0.59
2:C:400:VAL:HG23	2:C:417:LEU:HB3	1.85	0.58
3:D:165:GLN:O	3:D:169:GLU:HG2	2.03	0.58
3:D:946:ASP:OD2	3:D:947:PRO:HD3	2.04	0.58
1:A:69:VAL:HG22	1:A:128:LEU:HD23	1.85	0.58
3:D:638:THR:HG22	3:D:639:GLN:HG2	1.85	0.58
3:D:190:LYS:HD2	3:D:193:ALA:H	1.69	0.57
2:C:551:ASP:OD1	2:C:551:ASP:N	2.29	0.57
6:T:4:DC:H2"	6:T:5:DA:C8	2.40	0.57
3:D:143:MET:O	3:D:147:GLU:HB3	2.05	0.57
1:A:23:ILE:HD12	1:A:192:LEU:HD23	1.87	0.57
3:D:876:ARG:NH1	3:D:1036:GLU:OE2	2.38	0.57
4:E:67:TYR:HD1	4:E:76:LEU:HD11	1.70	0.56
3:D:979:TYR:HD2	3:D:989:VAL:HG21	1.71	0.56
3:D:430:ILE:HG21	3:D:541:MET:HG3	1.88	0.56
1:B:5:GLN:HE21	1:B:183:VAL:HG13	1.70	0.56
2:C:433:THR:O	2:C:433:THR:OG1	2.23	0.56
5:G:3:LYS:HG3	5:G:70:VAL:HG23	1.88	0.55
2:C:758:ASP:O	2:C:805:LYS:NZ	2.29	0.55
2:C:235:THR:HG21	2:C:262:LEU:HA	1.88	0.55
2:C:483:MET:HE2	2:C:498:GLY:HA3	1.89	0.55
1:B:104:GLU:OE1	1:B:124:HIS:ND1	2.32	0.55
3:D:141:GLU:OE2	3:D:144:ARG:NH1	2.40	0.55
3:D:1274:PRO:HG3	4:E:79:VAL:HG21	1.89	0.55
1:A:172:LEU:HG	1:A:199:LYS:HG2	1.88	0.55
2:C:654:SER:OG	2:C:655:ALA:N	2.40	0.54
5:G:48:ILE:HG13	5:G:53:LYS:HD2	1.89	0.54
2:C:855:ARG:NH2	2:C:865:VAL:O	2.40	0.54
1:B:187:THR:HG22	1:B:188:ASP:H	1.72	0.54

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:56:ILE:HD11	1:B:66:VAL:HG21	1.90	0.53
2:C:518:LYS:NZ	2:C:577:ASP:OD1	2.42	0.53
3:D:1052:ARG:O	3:D:1067:VAL:N	2.42	0.53
2:C:809:LYS:HE2	8:R:18:G:H5''	1.90	0.53
3:D:1030:ARG:NH1	3:D:1033:GLU:OE2	2.41	0.53
3:D:1166:THR:HG22	3:D:1180:LEU:HD23	1.90	0.52
6:T:15:DT:H2'	6:T:16:DA:C8	2.45	0.52
3:D:1052:ARG:HH21	3:D:1102:GLY:HA2	1.74	0.52
2:C:90:LEU:HD12	2:C:110:PRO:HG3	1.92	0.52
8:R:4:G:H2'	8:R:5:A:H8	1.73	0.52
3:D:144:ARG:NH2	3:D:227:THR:O	2.42	0.52
3:D:275:GLU:OE2	3:D:278:ARG:NH2	2.40	0.52
8:R:17:C:H2'	8:R:18:G:H8	1.74	0.51
3:D:155:MET:HE1	3:D:223:TRP:CE3	2.45	0.51
6:T:32:DC:H2''	6:T:33:DA:C8	2.45	0.51
3:D:1053:VAL:HA	3:D:1066:ILE:HA	1.93	0.51
2:C:229:LYS:HD2	2:C:281:LEU:HD23	1.91	0.51
3:D:525:HIS:HD2	3:D:527:LEU:HB2	1.75	0.51
2:C:633:ARG:NH2	2:C:637:ASP:OD2	2.33	0.51
2:C:757:ILE:HG21	2:C:803:VAL:HG21	1.92	0.51
2:C:829:ALA:HB1	2:C:831:GLU:OE1	2.11	0.51
3:D:845:THR:HG22	3:D:846:VAL:H	1.76	0.50
1:A:72:ASP:OD1	1:A:72:ASP:N	2.30	0.50
5:G:72:THR:OG1	5:G:73:ASP:N	2.44	0.50
1:A:153:ARG:NH2	1:A:157:ALA:O	2.44	0.50
8:R:17:C:H2'	8:R:18:G:C8	2.47	0.50
2:C:42:ALA:HB2	2:C:975:PRO:HG2	1.93	0.50
2:C:1084:THR:OG1	3:D:554:GLU:OE1	2.30	0.50
6:T:26:DG:H22	7:N:16:DT:H3	1.60	0.50
8:R:4:G:H2'	8:R:5:A:C8	2.47	0.50
2:C:519:VAL:HG21	2:C:576:VAL:HG23	1.93	0.49
3:D:208:ILE:O	3:D:211:ARG:HG2	2.11	0.49
3:D:144:ARG:O	3:D:148:LEU:HG	2.11	0.49
3:D:363:PRO:HG2	3:D:366:ILE:HD12	1.93	0.49
1:B:154:ALA:HB1	1:B:157:ALA:HB3	1.95	0.49
2:C:465:ARG:HE	2:C:493:ASN:HD21	1.60	0.49
2:C:751:HIS:HD2	2:C:877:ARG:HG3	1.78	0.49
3:D:776:GLU:HA	3:D:776:GLU:OE2	2.13	0.49
3:D:602:ALA:HB1	3:D:606:HIS:CD2	2.48	0.49
2:C:1007:LYS:HB3	2:C:1022:PRO:HB2	1.94	0.48
1:A:2:LEU:HD23	1:A:2:LEU:H	1.78	0.48

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:9:LEU:HD12	1:A:23:ILE:HG12	1.94	0.48
2:C:185:VAL:HG23	2:C:204:VAL:HG22	1.95	0.48
2:C:121:GLU:O	2:C:125:LYS:HG2	2.14	0.48
2:C:288:THR:HG22	2:C:290:GLU:OE2	2.13	0.48
3:D:1131:GLN:H	3:D:1131:GLN:HG2	1.47	0.48
6:T:34:DT:H2''	6:T:35:DG:C8	2.48	0.48
1:B:72:ASP:OD1	1:B:72:ASP:N	2.43	0.48
3:D:754:ASP:OD1	3:D:755:LYS:N	2.46	0.48
2:C:206:PRO:HA	2:C:308:LEU:HD23	1.96	0.48
3:D:657:GLN:N	3:D:658:PRO:HD2	2.29	0.48
6:T:36:DC:H2''	6:T:37:DG:C8	2.49	0.48
2:C:1127:GLU:OE1	3:D:405:LEU:HD12	2.14	0.48
3:D:979:TYR:CD2	3:D:989:VAL:HG21	2.48	0.48
7:N:13:DC:H2''	7:N:14:DT:H71	1.96	0.47
3:D:354:LEU:HD21	3:D:371:LYS:HG2	1.96	0.47
2:C:502:VAL:HG23	2:C:503:TYR:CD2	2.50	0.47
1:B:86:SER:HB3	1:B:119:HIS:HE1	1.80	0.47
3:D:645:GLU:HG2	3:D:646:ILE:N	2.28	0.47
3:D:1034:LEU:HD11	3:D:1137:GLU:HB3	1.97	0.47
6:T:22:DC:H2''	6:T:23:DC:H5'	1.96	0.47
2:C:861:LEU:HD22	2:C:862:PRO:HD2	1.96	0.47
3:D:668:LEU:O	3:D:672:MET:HG3	2.14	0.47
3:D:190:LYS:HD2	3:D:193:ALA:N	2.30	0.47
3:D:237:ASP:HB3	3:D:240:LEU:HD13	1.96	0.47
3:D:1210:ILE:O	3:D:1214:SER:OG	2.31	0.47
3:D:554:GLU:HG3	4:E:54:VAL:HG11	1.96	0.46
3:D:151:LEU:O	3:D:155:MET:HG3	2.14	0.46
7:N:6:DC:H2''	7:N:7:DA:C8	2.50	0.46
2:C:650:ILE:HD13	2:C:660:VAL:HG22	1.95	0.46
5:G:69:ILE:HG12	5:G:70:VAL:N	2.30	0.46
2:C:664:ASN:OD1	2:C:665:GLY:N	2.48	0.46
2:C:851:ARG:HA	2:C:851:ARG:HD2	1.72	0.46
3:D:1125:GLN:HB3	3:D:1129:GLU:HG3	1.96	0.46
2:C:1101:LYS:HB2	2:C:1101:LYS:HE2	1.74	0.46
7:N:9:DG:H2''	7:N:10:DC:C5	2.51	0.46
2:C:189:GLU:OE1	2:C:200:HIS:NE2	2.49	0.46
3:D:295:ARG:O	3:D:299:VAL:HG23	2.16	0.46
2:C:581:VAL:HB	2:C:585:GLN:HE21	1.81	0.46
6:T:11:DC:H2'	6:T:12:DG:C8	2.50	0.46
3:D:224:SER:O	3:D:227:THR:OG1	2.32	0.46
7:N:15:DC:C6	7:N:16:DT:H72	2.51	0.46

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:C:861:LEU:HD13	2:C:865:VAL:HG23	1.97	0.46
7:N:8:DT:H2''	7:N:9:DG:C8	2.50	0.45
2:C:547:PRO:HB2	2:C:555:VAL:HB	1.99	0.45
2:C:815:THR:O	2:C:819:ARG:HG2	2.17	0.45
5:G:91:SER:HB2	5:G:95:GLY:HA2	1.97	0.45
1:B:2:LEU:HD23	1:B:2:LEU:HA	1.83	0.45
2:C:1050:SER:HB3	2:C:1053:THR:O	2.17	0.45
3:D:1077:TYR:HB2	3:D:1080:ILE:HD11	1.99	0.45
1:A:182:ARG:HA	1:A:182:ARG:HD3	1.82	0.45
1:B:165:ASP:OD1	1:B:165:ASP:N	2.50	0.45
2:C:187:PHE:CD1	2:C:319:LYS:HE2	2.52	0.45
3:D:155:MET:HE1	3:D:223:TRP:CD2	2.51	0.45
2:C:335:GLU:O	2:C:339:VAL:HG23	2.17	0.45
2:C:1147:LEU:HD12	3:D:2:LEU:HD13	1.97	0.45
3:D:1051:GLY:HA2	3:D:1069:ASP:CG	2.42	0.45
3:D:1086:LEU:HD23	3:D:1099:LEU:HB3	1.99	0.45
5:G:75:SER:HA	5:G:78:VAL:HG12	1.99	0.45
3:D:173:ARG:HH11	3:D:177:LEU:HD12	1.81	0.44
2:C:776:ILE:HD11	2:C:781:LEU:HD21	1.98	0.44
2:C:69:ARG:HH12	2:C:73:SER:HB2	1.82	0.44
2:C:244:THR:HG23	2:C:247:GLN:HB2	1.99	0.44
2:C:815:THR:HG23	2:C:818:GLU:H	1.82	0.44
2:C:1066:GLN:HE22	3:D:427:ARG:HD2	1.82	0.44
1:A:225:LEU:HD13	1:B:205:ARG:HG2	1.99	0.44
2:C:216:VAL:HG22	2:C:222:VAL:HG12	1.99	0.44
1:B:186:ARG:HG3	1:B:187:THR:O	2.16	0.44
2:C:257:ILE:H	2:C:257:ILE:HG13	1.40	0.44
5:G:22:LEU:HD23	5:G:38:VAL:HG11	2.00	0.44
1:A:1:MET:N	1:B:142:ARG:O	2.43	0.44
2:C:930:GLN:O	2:C:934:THR:HG23	2.18	0.44
3:D:356:ARG:HD2	3:D:357:LEU:HD12	1.99	0.43
3:D:1087:ARG:HB2	3:D:1111:LEU:O	2.17	0.43
3:D:1122:LEU:HG	3:D:1130:VAL:HG21	1.99	0.43
8:R:8:C:H2'	8:R:9:U:O4'	2.18	0.43
2:C:820:LEU:HD23	2:C:820:LEU:HA	1.81	0.43
3:D:57:ASP:HB3	3:D:58:TRP:CD1	2.53	0.43
3:D:239:ASN:HA	3:D:242:ARG:HG3	2.00	0.43
3:D:953:LEU:HD23	3:D:953:LEU:HA	1.79	0.43
1:A:187:THR:O	1:A:187:THR:HG23	2.18	0.43
3:D:931:ASP:C	3:D:932:GLU:HG3	2.44	0.43
3:D:1091:HIS:CG	3:D:1092:GLU:H	2.37	0.43

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:82:SER:HB2	1:B:123:MET:HE1	2.00	0.43
2:C:140:ILE:HD12	2:C:147:ILE:HG12	2.00	0.43
2:C:187:PHE:HD1	2:C:319:LYS:HE2	1.83	0.43
2:C:397:GLU:HA	2:C:400:VAL:HG12	2.01	0.43
2:C:926:MET:HE2	2:C:926:MET:HB2	1.94	0.43
3:D:1224:ALA:HA	3:D:1232:VAL:HG21	2.00	0.43
2:C:685:ASN:HD22	2:C:686:GLN:N	2.17	0.43
2:C:784:LEU:HD11	2:C:801:ILE:HG21	2.01	0.43
5:G:34:LYS:HA	5:G:34:LYS:HD3	1.80	0.43
2:C:369:ASP:OD2	2:C:370:ILE:N	2.52	0.42
2:C:409:VAL:O	2:C:410:GLU:HB2	2.19	0.42
3:D:278:ARG:HA	3:D:281:ILE:HG22	2.00	0.42
5:G:97:LYS:HA	5:G:97:LYS:HD3	1.78	0.42
2:C:232:GLN:HE22	2:C:277:ILE:HD13	1.85	0.42
2:C:833:ARG:HG2	2:C:834:ASP:H	1.84	0.42
3:D:60:CYS:SG	3:D:61:TYR:N	2.92	0.42
3:D:344:TYR:O	3:D:348:ILE:HG13	2.20	0.42
3:D:193:ALA:O	3:D:196:LYS:HG3	2.19	0.42
3:D:590:THR:O	3:D:630:ARG:HB3	2.19	0.42
5:G:105:GLU:O	5:G:109:ILE:HG12	2.20	0.42
3:D:164:ASP:HA	3:D:167:ASP:OD2	2.20	0.42
3:D:754:ASP:OD1	3:D:754:ASP:C	2.62	0.42
6:T:15:DT:H2'	6:T:16:DA:H8	1.84	0.42
2:C:192:ASP:HB3	2:C:197:LYS:H	1.83	0.42
2:C:604:ARG:HA	2:C:604:ARG:HD2	1.68	0.42
2:C:777:SER:OG	2:C:778:ASP:N	2.53	0.42
3:D:296:LEU:HD12	3:D:296:LEU:HA	1.92	0.42
3:D:1170:SER:O	3:D:1173:THR:OG1	2.28	0.42
4:E:67:TYR:HA	4:E:76:LEU:HD13	2.02	0.42
1:A:1:MET:C	1:A:1:MET:HE3	2.44	0.42
2:C:766:ALA:H	2:C:808:PRO:HG3	1.85	0.42
3:D:194:ARG:HA	3:D:197:VAL:HB	2.01	0.42
3:D:949:ILE:HD13	3:D:949:ILE:HA	1.84	0.42
1:B:11:GLU:HG3	1:B:21:PHE:CE2	2.55	0.42
3:D:1013:ARG:HH22	3:D:1024:ILE:HD11	1.85	0.42
8:R:14:C:H2'	8:R:15:U:H6	1.85	0.42
1:B:15:THR:HG22	1:B:16:ASP:N	2.35	0.41
3:D:221:ASP:OD2	3:D:222:ILE:N	2.53	0.41
2:C:713:MET:HE2	2:C:713:MET:HB2	1.84	0.41
2:C:1138:LEU:HB2	3:D:9:GLU:HB2	2.02	0.41
3:D:67:ARG:NH1	8:R:16:U:OP1	2.53	0.41

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:D:293:LEU:HA	3:D:293:LEU:HD23	1.73	0.41
3:D:928:ASP:OD1	3:D:940:ARG:N	2.53	0.41
2:C:685:ASN:HD22	2:C:686:GLN:H	1.68	0.41
2:C:751:HIS:CD2	2:C:877:ARG:HG3	2.55	0.41
3:D:759:GLN:HG2	3:D:762:ARG:HH21	1.85	0.41
2:C:611:MET:HE3	2:C:886:ALA:HB1	2.02	0.41
3:D:208:ILE:HA	3:D:211:ARG:HE	1.85	0.41
2:C:486:ILE:HD11	3:D:849:TYR:HE2	1.85	0.41
2:C:854:SER:O	2:C:859:ASP:HB2	2.19	0.41
3:D:320:ILE:HG22	3:D:325:ARG:HE	1.85	0.41
1:B:90:ASP:OD1	1:B:90:ASP:N	2.53	0.41
3:D:310:MET:HB2	3:D:310:MET:HE2	1.77	0.41
3:D:539:ASP:OD1	3:D:539:ASP:N	2.54	0.41
2:C:154:MET:HE3	2:C:154:MET:HB3	1.99	0.41
2:C:244:THR:OG1	2:C:245:SER:N	2.53	0.41
3:D:88:ARG:HB3	3:D:323:GLU:HG3	2.02	0.41
3:D:1266:ARG:H	3:D:1266:ARG:HG3	1.61	0.41
8:R:3:C:H2'	8:R:4:G:H8	1.86	0.41
2:C:290:GLU:H	2:C:290:GLU:CD	2.29	0.41
3:D:172:ALA:O	3:D:175:GLN:HG3	2.20	0.41
3:D:607:PRO:O	3:D:609:THR:HG23	2.20	0.41
1:B:40:ARG:HE	1:B:40:ARG:HB2	1.62	0.41
1:B:131:LYS:HZ3	1:B:131:LYS:HG2	1.80	0.41
3:D:263:LYS:HE3	3:D:263:LYS:HB2	1.86	0.41
3:D:410:GLN:HA	3:D:415:GLN:HG3	2.03	0.41
5:G:47:ASP:HB3	5:G:55:VAL:HA	2.02	0.41
1:A:55:ARG:HH22	1:A:158:GLU:HB3	1.85	0.41
2:C:329:THR:O	2:C:330:SER:HB2	2.21	0.41
2:C:727:GLU:H	3:D:725:THR:HG21	1.86	0.41
3:D:329:GLN:NE2	3:D:333:GLY:O	2.43	0.41
1:B:92:PRO:HB3	1:B:141:GLU:HG3	2.03	0.40
2:C:656:ASP:OD1	2:C:656:ASP:N	2.54	0.40
3:D:1112:MET:HE2	3:D:1112:MET:HB3	1.94	0.40
2:C:228:ARG:NH2	7:N:27:DC:OP2	2.54	0.40
3:D:206:ARG:HA	3:D:209:ARG:NE	2.37	0.40
3:D:1062:TYR:CZ	3:D:1082:LYS:HE2	2.57	0.40
7:N:12:DG:H1'	7:N:13:DC:H5'	2.03	0.40
2:C:488:THR:HG22	2:C:606:LEU:HD11	2.02	0.40
2:C:1114:GLU:HA	2:C:1115:PRO:HD3	1.95	0.40
3:D:190:LYS:NZ	3:D:193:ALA:HB2	2.37	0.40
3:D:1277:GLU:H	3:D:1277:GLU:HG3	1.69	0.40

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:C:507:ASN:HB3	2:C:509:PHE:H	1.87	0.40
3:D:525:HIS:CD2	3:D:527:LEU:HB2	2.54	0.40
8:R:16:U:H2'	8:R:17:C:C6	2.57	0.40
1:B:61:HIS:CD2	1:B:61:HIS:H	2.39	0.40
3:D:201:GLY:O	3:D:205:MET:SD	2.80	0.40
3:D:269:ASP:OD2	3:D:272:ALA:HB3	2.21	0.40
4:E:42:GLU:OE1	4:E:100:HIS:NE2	2.54	0.40
8:R:16:U:H2'	8:R:17:C:H6	1.86	0.40

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	224/347 (65%)	211 (94%)	13 (6%)	0	100	100
1	B	235/347 (68%)	220 (94%)	15 (6%)	0	100	100
2	C	1120/1178 (95%)	1073 (96%)	46 (4%)	1 (0%)	48	80
3	D	1269/1316 (96%)	1211 (95%)	57 (4%)	1 (0%)	48	80
4	E	81/110 (74%)	81 (100%)	0	0	100	100
5	G	109/177 (62%)	101 (93%)	8 (7%)	0	100	100
All	All	3038/3475 (87%)	2897 (95%)	139 (5%)	2 (0%)	49	80

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	D	1066	ILE
2	C	330	SER

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	195/297 (66%)	183 (94%)	12 (6%)	16	49
1	B	195/297 (66%)	175 (90%)	20 (10%)	7	28
2	C	945/998 (95%)	892 (94%)	53 (6%)	19	52
3	D	1054/1095 (96%)	988 (94%)	66 (6%)	16	48
4	E	69/90 (77%)	64 (93%)	5 (7%)	13	43
5	G	98/159 (62%)	89 (91%)	9 (9%)	8	33
All	All	2556/2936 (87%)	2391 (94%)	165 (6%)	17	47

All (165) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	6	ARG
1	A	10	SER
1	A	16	ASP
1	A	19	SER
1	A	56	ILE
1	A	72	ASP
1	A	86	SER
1	A	128	LEU
1	A	147	VAL
1	A	166	SER
1	A	201	SER
1	A	218	LEU
1	B	1	MET
1	B	2	LEU
1	B	9	LEU
1	B	16	ASP
1	B	24	GLU
1	B	45	SER
1	B	56	ILE
1	B	65	THR
1	B	66	VAL
1	B	78	LEU

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	B	105	VAL
1	B	116	VAL
1	B	140	VAL
1	B	142	ARG
1	B	165	ASP
1	B	175	THR
1	B	196	VAL
1	B	198	THR
1	B	214	THR
1	B	216	VAL
2	C	48	LEU
2	C	65	ILE
2	C	92	GLU
2	C	99	PHE
2	C	100	SER
2	C	106	SER
2	C	108	SER
2	C	113	ASP
2	C	116	LYS
2	C	149	SER
2	C	152	VAL
2	C	162	GLU
2	C	176	VAL
2	C	177	SER
2	C	180	VAL
2	C	236	VAL
2	C	238	LEU
2	C	244	THR
2	C	257	ILE
2	C	261	THR
2	C	266	ASN
2	C	311	VAL
2	C	324	VAL
2	C	357	VAL
2	C	370	ILE
2	C	373	PHE
2	C	383	GLU
2	C	402	GLU
2	C	423	VAL
2	C	433	THR
2	C	458	LEU
2	C	494	ILE

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
2	C	499	SER
2	C	519	VAL
2	C	551	ASP
2	C	581	VAL
2	C	625	LEU
2	C	643	VAL
2	C	646	GLU
2	C	649	VAL
2	C	666	THR
2	C	690	VAL
2	C	696	VAL
2	C	762	THR
2	C	790	VAL
2	C	891	ASN
2	C	901	VAL
2	C	919	THR
2	C	947	ASP
2	C	974	THR
2	C	1067	ARG
2	C	1084	THR
2	C	1102	VAL
3	D	2	LEU
3	D	10	LEU
3	D	60	CYS
3	D	68	VAL
3	D	74	ILE
3	D	107	PHE
3	D	139	VAL
3	D	145	HIS
3	D	169	GLU
3	D	197	VAL
3	D	219	LEU
3	D	222	ILE
3	D	253	THR
3	D	263	LYS
3	D	271	ASP
3	D	276	SER
3	D	278	ARG
3	D	281	ILE
3	D	305	SER
3	D	310	MET
3	D	328	VAL

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
3	D	360	LEU
3	D	401	SER
3	D	431	VAL
3	D	461	VAL
3	D	570	SER
3	D	596	THR
3	D	629	VAL
3	D	638	THR
3	D	708	VAL
3	D	725	THR
3	D	766	ASN
3	D	803	VAL
3	D	825	THR
3	D	838	SER
3	D	846	VAL
3	D	847	LEU
3	D	899	VAL
3	D	946	ASP
3	D	960	VAL
3	D	964	SER
3	D	971	SER
3	D	972	THR
3	D	987	LYS
3	D	1008	THR
3	D	1025	THR
3	D	1033	GLU
3	D	1053	VAL
3	D	1064	ILE
3	D	1075	VAL
3	D	1085	ARG
3	D	1093	ASP
3	D	1103	ASP
3	D	1121	VAL
3	D	1130	VAL
3	D	1131	GLN
3	D	1148	SER
3	D	1165	VAL
3	D	1172	SER
3	D	1176	LEU
3	D	1206	VAL
3	D	1214	SER
3	D	1262	THR

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
3	D	1268	ARG
3	D	1272	VAL
3	D	1276	GLU
4	E	33	LEU
4	E	41	ASP
4	E	71	LEU
4	E	83	VAL
4	E	87	LEU
5	G	4	ASN
5	G	10	THR
5	G	24	LYS
5	G	48	ILE
5	G	67	VAL
5	G	69	ILE
5	G	85	VAL
5	G	86	THR
5	G	102	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (58) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	17	ASN
1	A	79	ASN
1	A	120	ASN
1	A	124	HIS
1	A	226	ASN
1	B	5	GLN
1	B	61	HIS
1	B	79	ASN
1	B	119	HIS
1	B	185	GLN
1	B	226	ASN
2	C	232	GLN
2	C	323	HIS
2	C	415	GLN
2	C	435	GLN
2	C	476	HIS
2	C	545	ASN
2	C	585	GLN
2	C	599	HIS
2	C	610	ASN
2	C	685	ASN

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
2	C	700	GLN
2	C	718	ASN
2	C	751	HIS
2	C	755	HIS
2	C	775	ASN
2	C	1062	GLN
2	C	1066	GLN
2	C	1111	ASN
2	C	1129	GLN
3	D	5	ASN
3	D	262	GLN
3	D	352	ASN
3	D	368	ASN
3	D	396	ASN
3	D	410	GLN
3	D	416	ASN
3	D	499	ASN
3	D	525	HIS
3	D	533	ASN
3	D	564	ASN
3	D	600	GLN
3	D	693	GLN
3	D	698	ASN
3	D	792	HIS
3	D	852	ASN
3	D	882	GLN
3	D	935	ASN
3	D	1001	GLN
3	D	1133	HIS
3	D	1153	HIS
3	D	1239	ASN
3	D	1246	ASN
3	D	1251	ASN
3	D	1265	ASN
3	D	1273	GLN
4	E	63	GLN
5	G	21	ASN

5.3.3 RNA ⓘ

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
8	R	28/30 (93%)	4 (14%)	0

All (4) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
8	R	10	U
8	R	11	C
8	R	20	C
8	R	22	G

There are no RNA pucker outliers to report.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

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 ⓘ

There are no chain breaks in this entry.

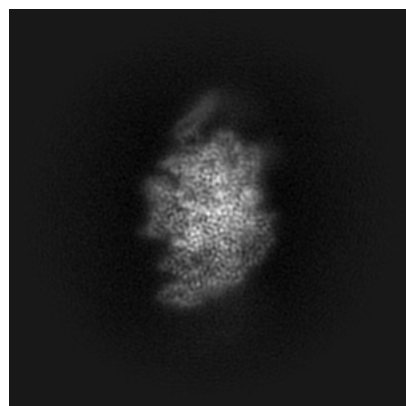
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-28149. These allow visual inspection of the internal detail of the map and identification of artifacts.

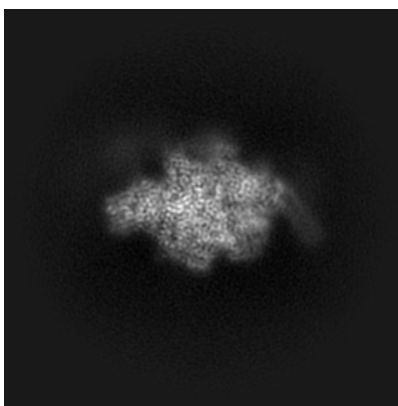
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

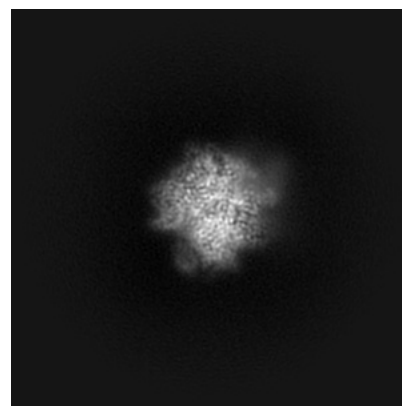
6.1.1 Primary map



X

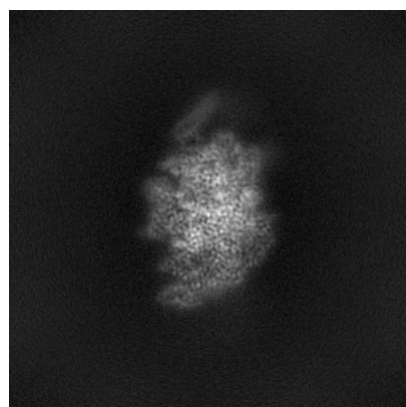


Y

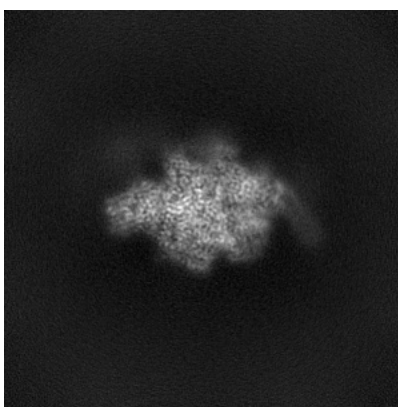


Z

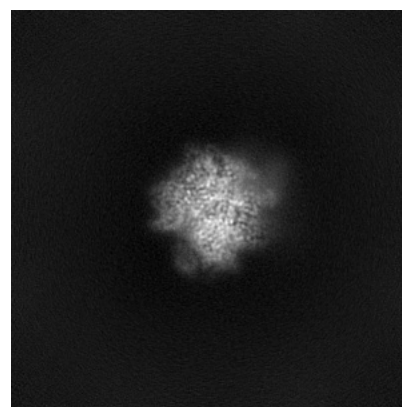
6.1.2 Raw map



X



Y

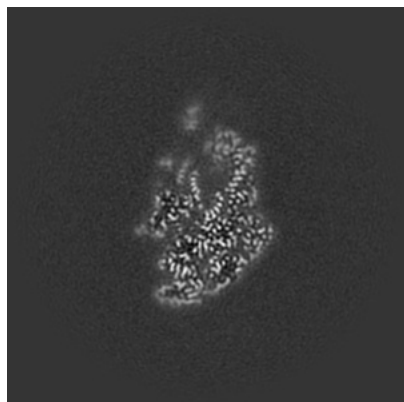


Z

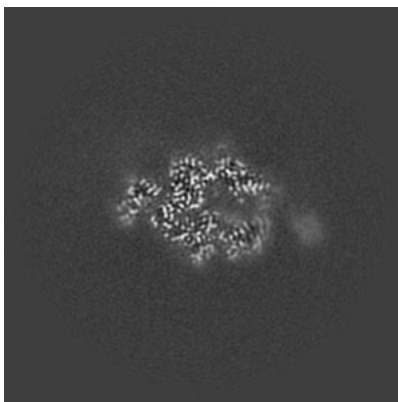
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

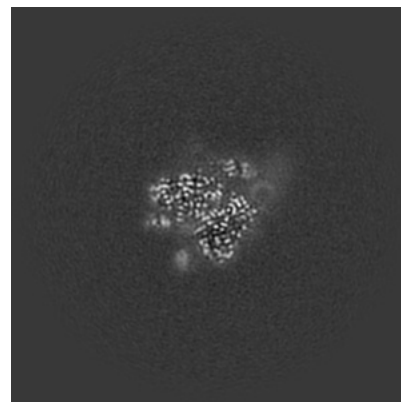
6.2.1 Primary map



X Index: 200

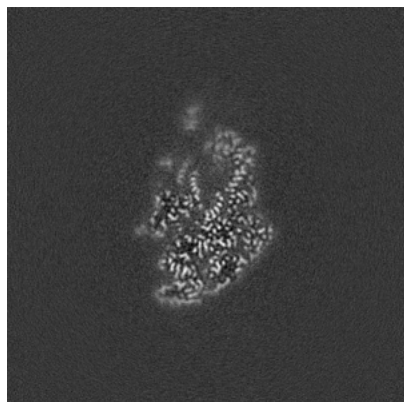


Y Index: 200

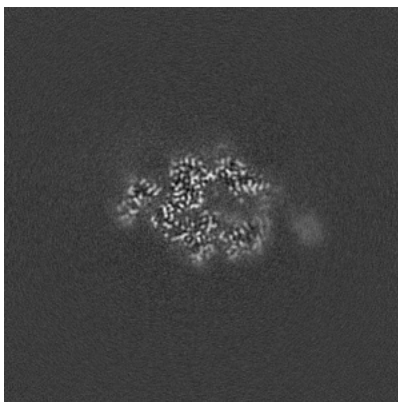


Z Index: 200

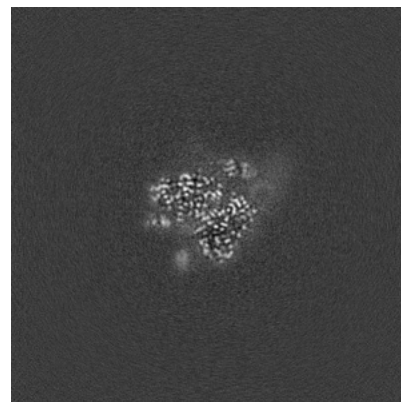
6.2.2 Raw map



X Index: 200



Y Index: 200

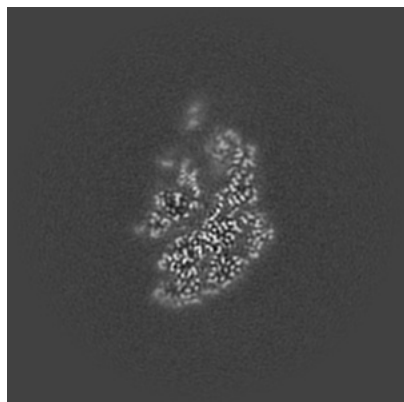


Z Index: 200

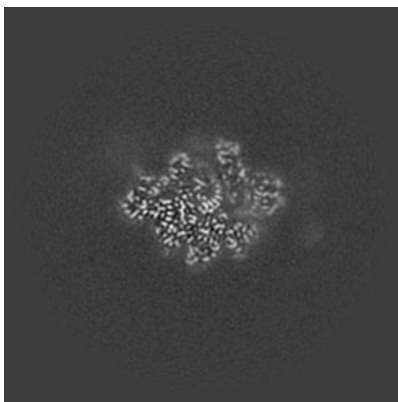
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

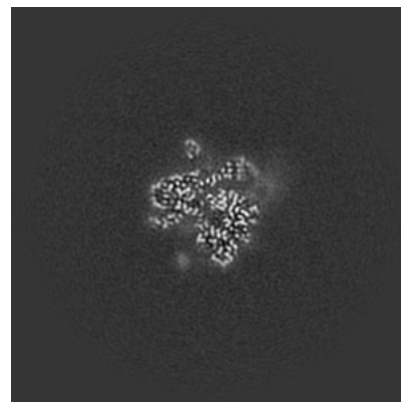
6.3.1 Primary map



X Index: 198

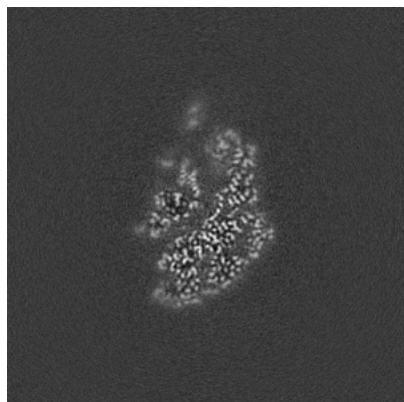


Y Index: 212

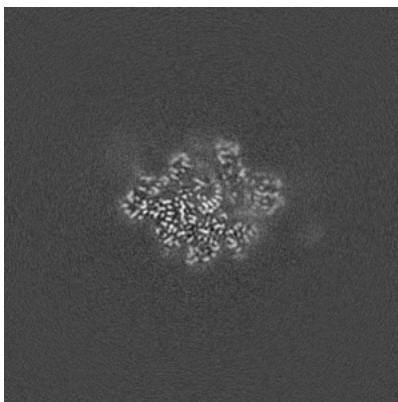


Z Index: 195

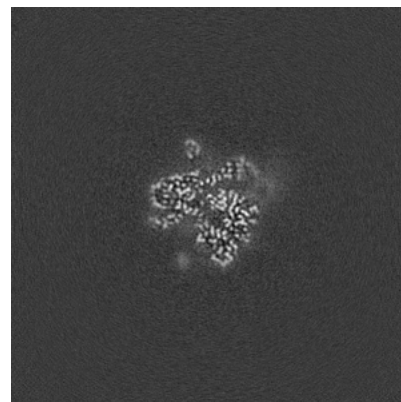
6.3.2 Raw map



X Index: 198



Y Index: 212

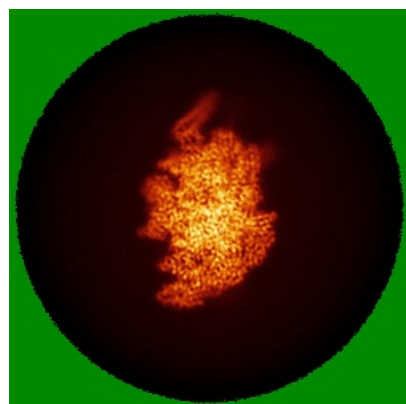


Z Index: 195

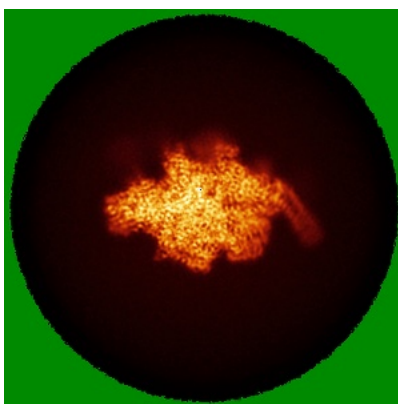
The images above show the largest variance slices of the map in three orthogonal directions.

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

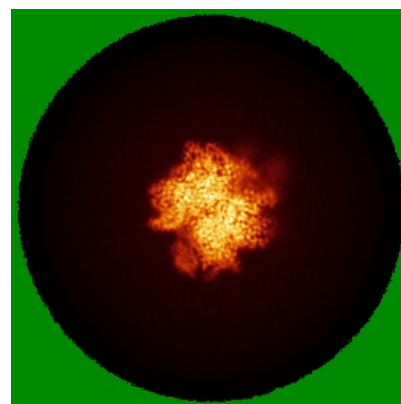
6.4.1 Primary map



X

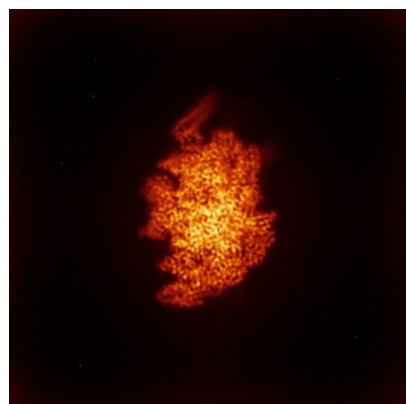


Y

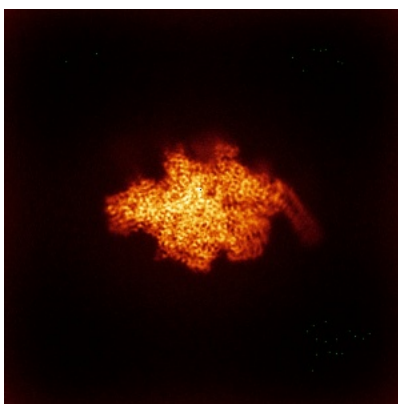


Z

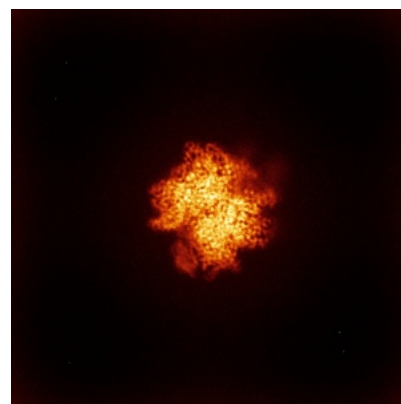
6.4.2 Raw map



X



Y

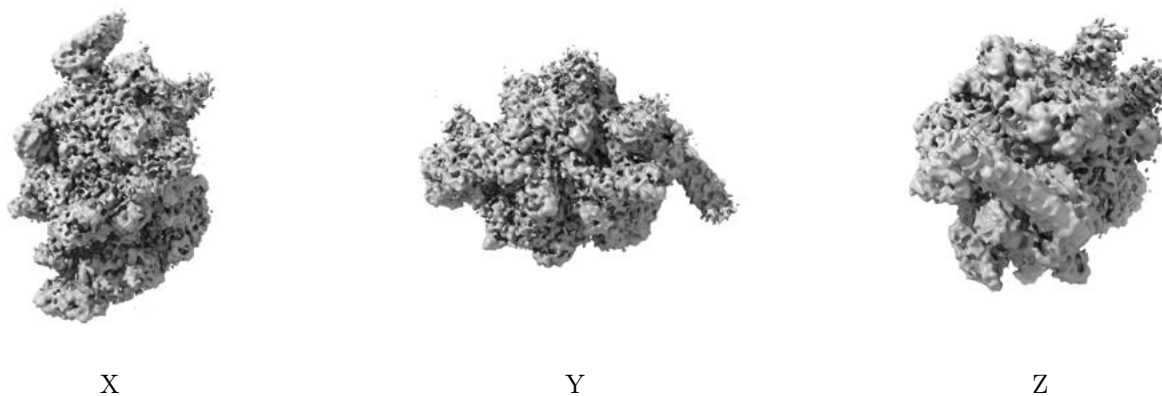


Z

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.

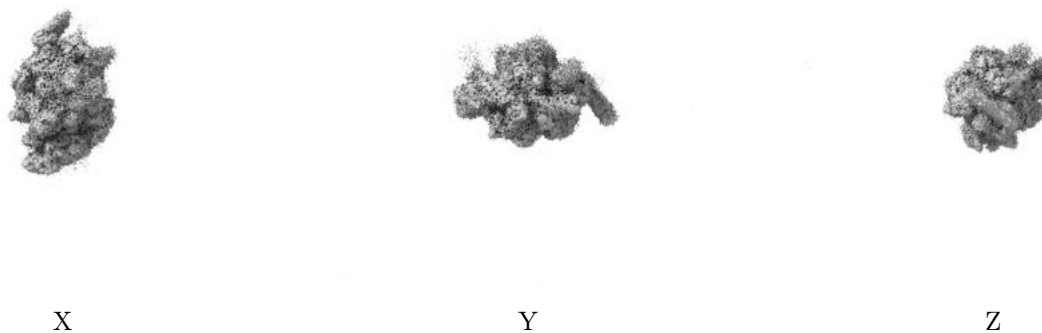
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.238. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 Raw map



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

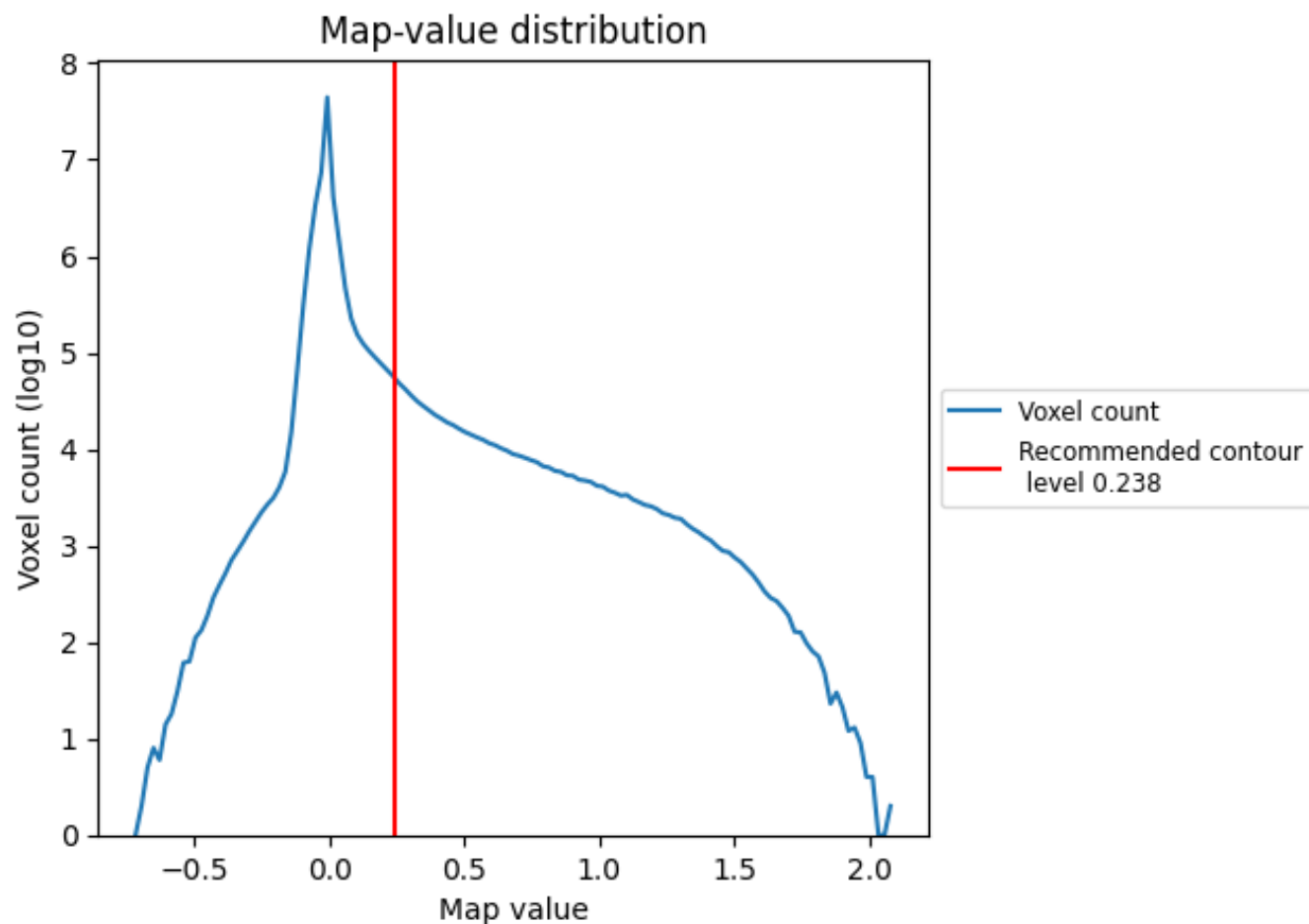
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

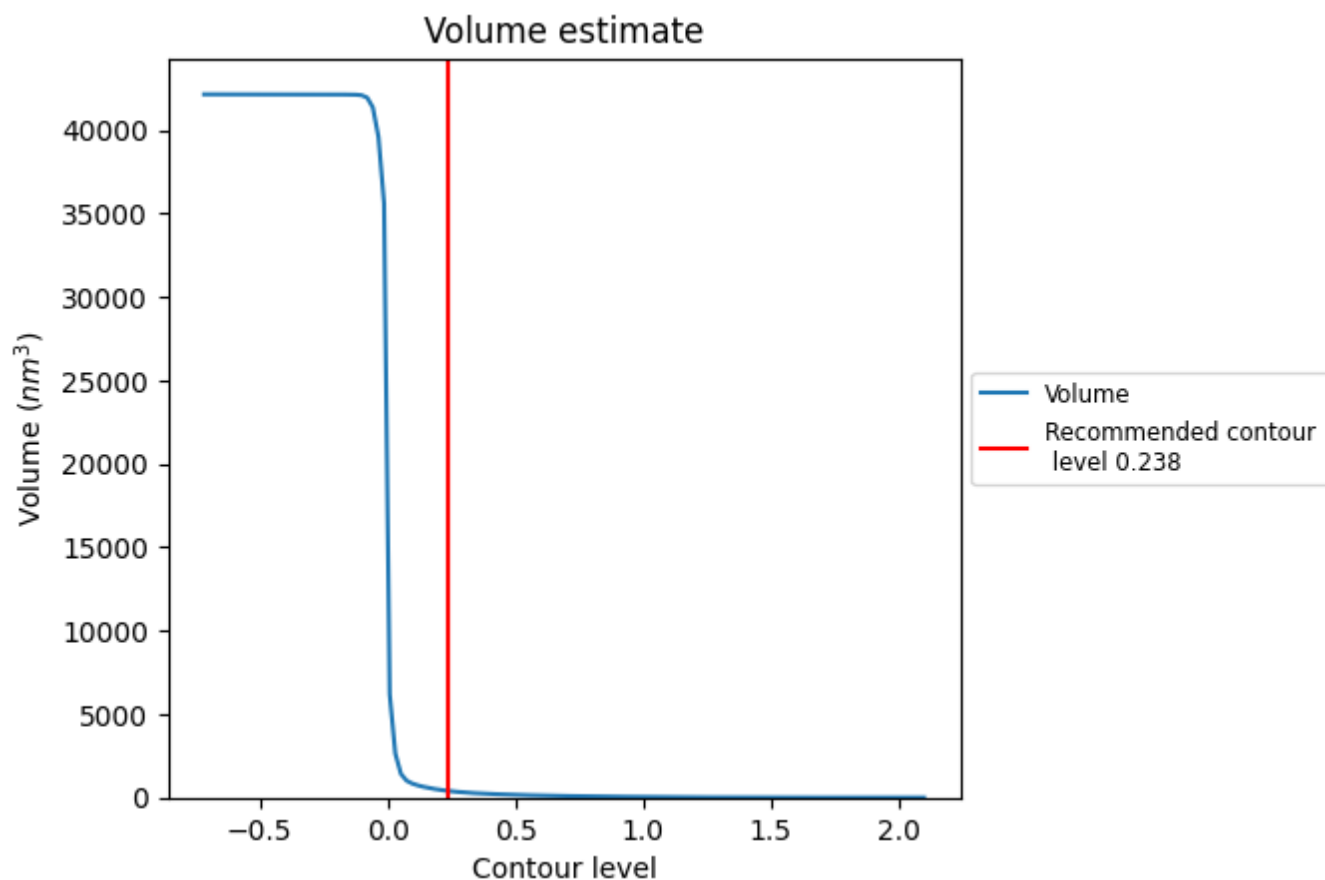
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution [i](#)



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

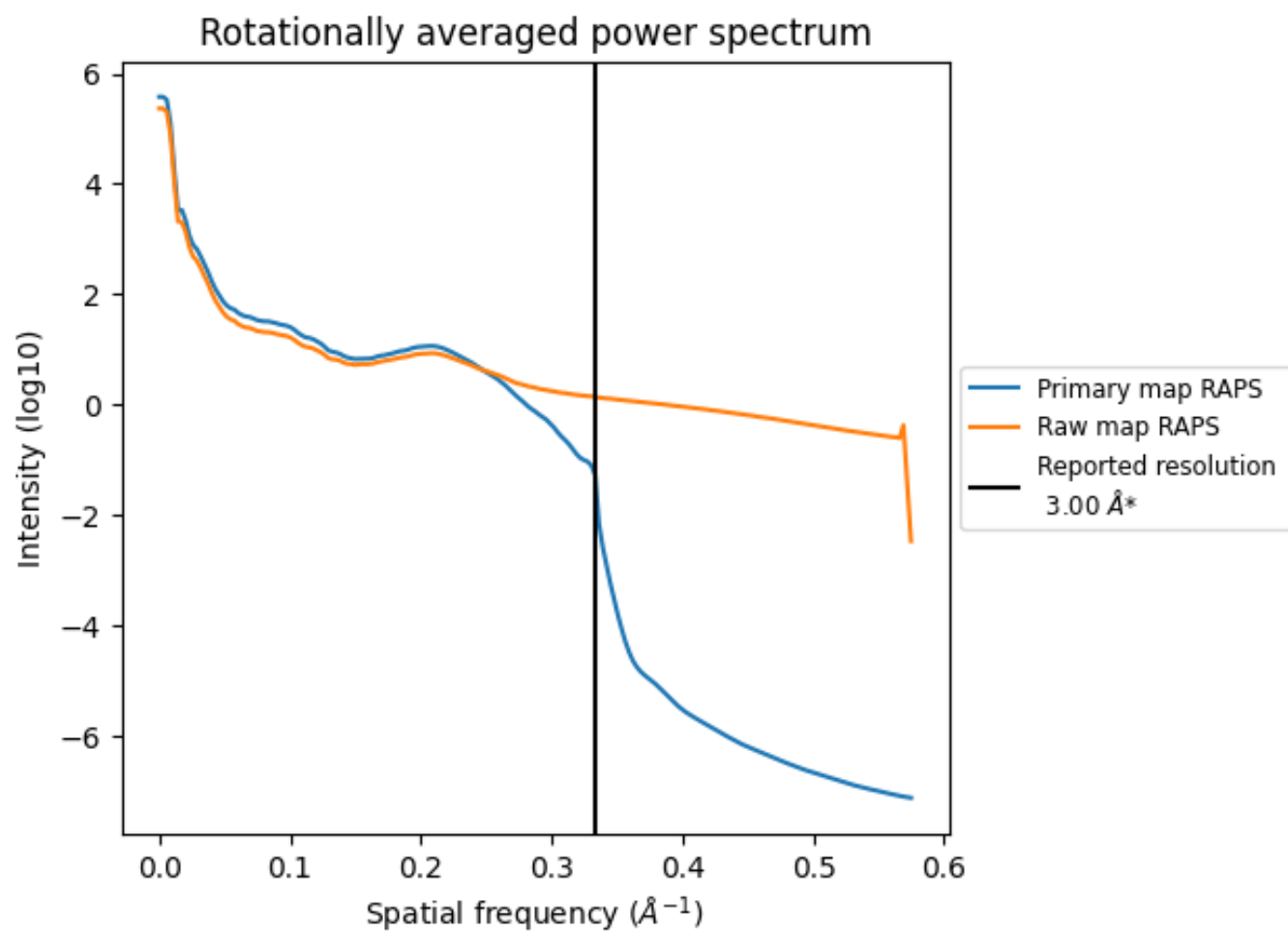
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 399 nm^3 ; this corresponds to an approximate mass of 360 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 ⓘ

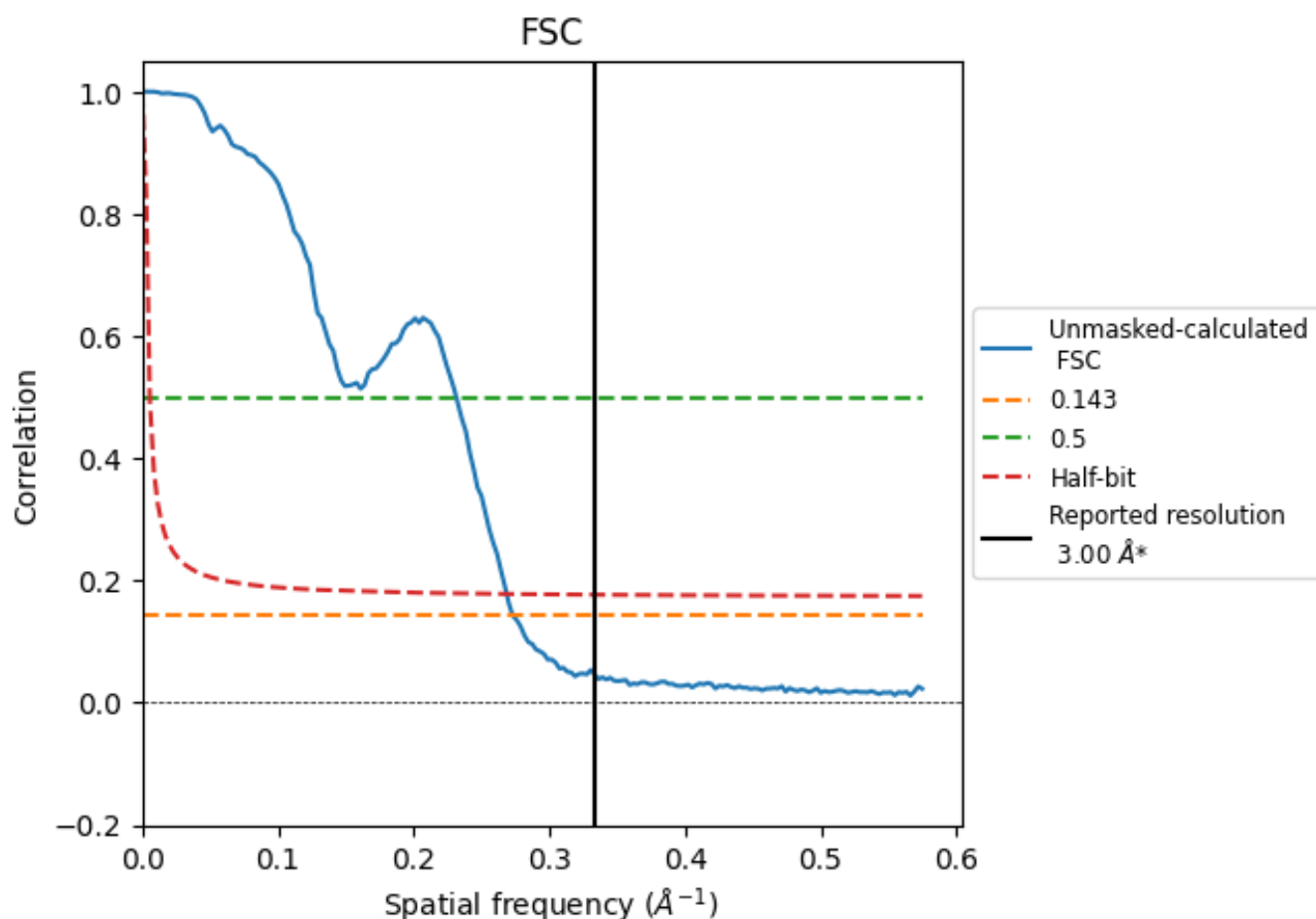


*Reported resolution corresponds to spatial frequency of 0.333 Å⁻¹

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 0.333 Å⁻¹

8.2 Resolution estimates [i](#)

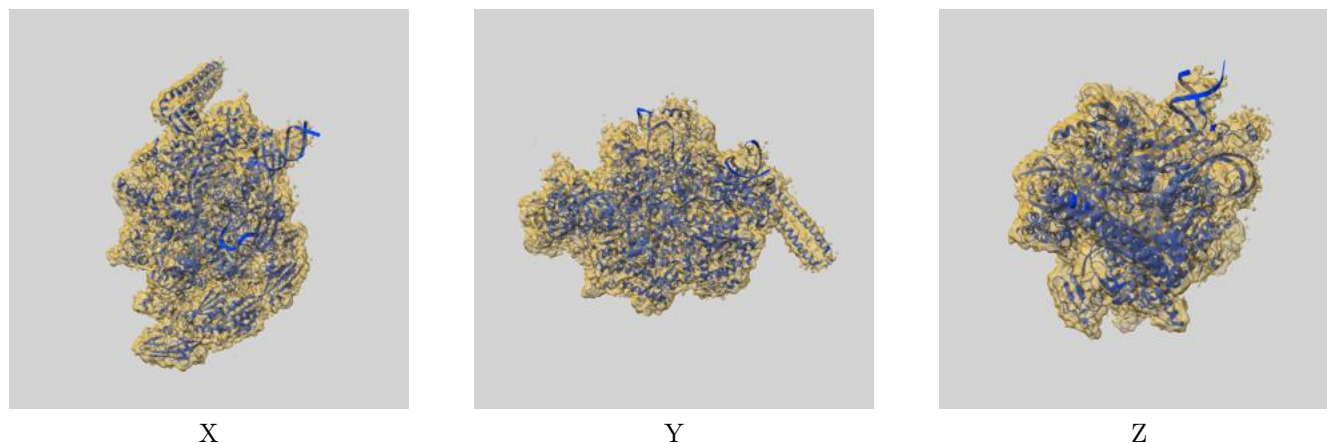
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.00	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	3.66	4.32	3.72

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 3.66 differs from the reported value 3.0 by more than 10 %

9 Map-model fit [i](#)

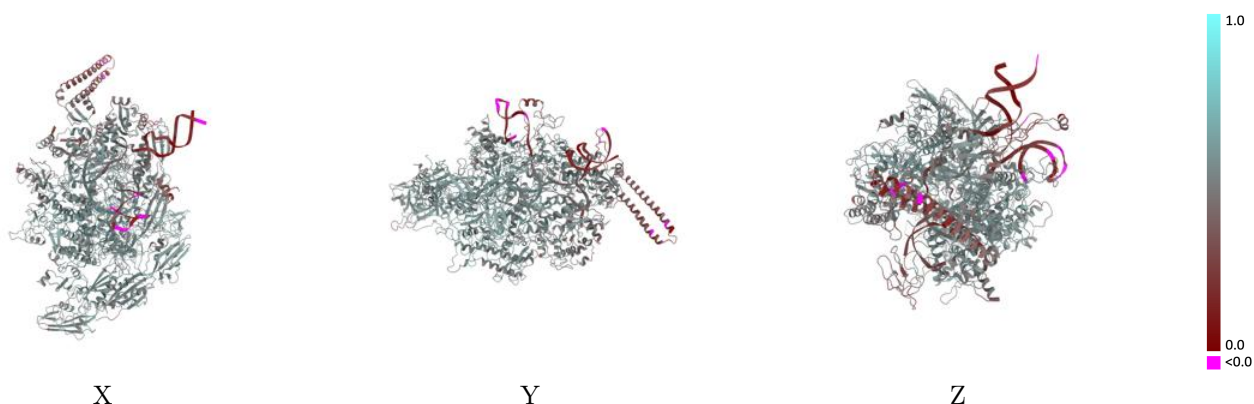
This section contains information regarding the fit between EMDB map EMD-28149 and PDB model 8EHQ. Per-residue inclusion information can be found in section [3](#) on page [6](#).

9.1 Map-model overlay [i](#)



The images above show the 3D surface view of the map at the recommended contour level 0.238 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](#)

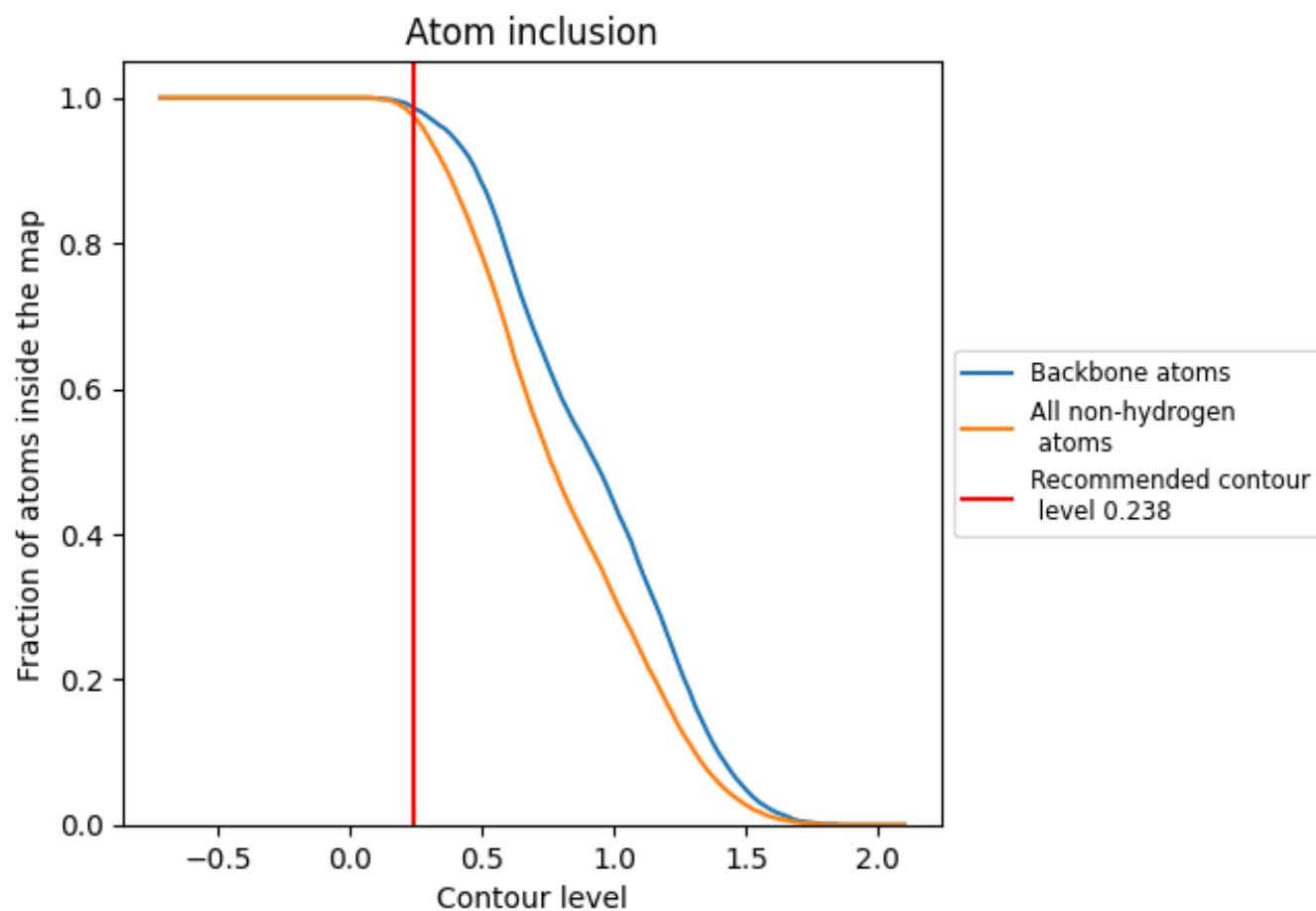


The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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, 99% of all backbone atoms, 98% 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 (0.238) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.9760	0.5060
A	0.9900	0.5380
B	0.9900	0.5220
C	0.9870	0.5370
D	0.9860	0.5120
E	0.9910	0.5400
G	0.9330	0.4470
N	0.9180	0.3210
R	0.7820	0.2650
T	0.9040	0.3700

1.0

0.0

<0.0