WORLDWIDE PDB

PROTEIN DATA BANK

Full wwPDB EM Validation Report (i)

Jun 4, 2025 – 04:57 PM JST

PDB ID	:	9JQ5 / pdb_00009jq5
EMDB ID	:	EMD-61723
Title	:	Structure of human IVD in complex with FAD and isovaleryl-CoA
Authors	:	Ju, K.; Xu, Y.; Bai, F.; Luan, X.
Deposited on	:	2024-09-27
Resolution	:	3.35 Å(reported)

The following versions of software and data (see references (i)) were used in the production of this report:

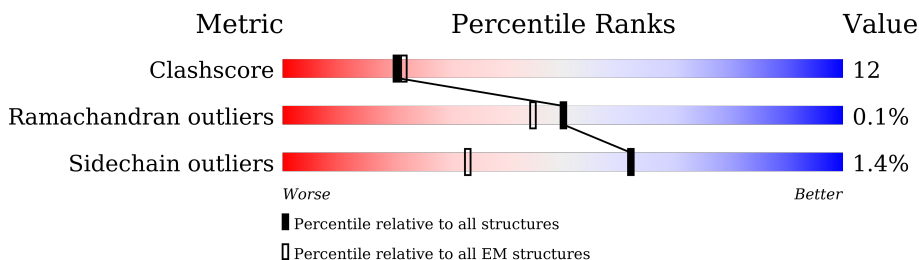|		
EMDB validation analysis	:	0.0.1.dev118
Mogul	:	1.8.5 (274361), CSD as541be (2020)
MolProbity	:	4-5-2 with Phenix2.0rc1
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ	:	1.9.13
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.43.1

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 3.35 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	Percentile Ranks	Value
Clashscore		12
Ramachandran outliers		0.1%
Sidechain outliers		1.4%

Worse   *Better*

∎ Percentile relative to all structures
▯ Percentile relative to all EM structures

Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415

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	426	6% / 73% / 18% / 9%
1	B	426	13% / 69% / 22% / 9%
1	C	426	14% / 68% / 23% / 9%
1	D	426	29% / 68% / 21% / · / 9%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	IVC	D	401	-	-	X	-

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 12536 atoms, of which 284 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 Isovaleryl-CoA dehydrogenase, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	387	Total	C	N	O	S	0	0
			2956	1866	518	550	22		
1	B	387	Total	C	N	O	S	0	0
			2956	1866	518	550	22		
1	C	387	Total	C	N	O	S	0	0
			2956	1866	518	550	22		
1	D	387	Total	C	N	O	S	0	0
			2956	1866	518	550	22		

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	254	ALA	GLU	engineered mutation	UNP P26440
B	254	ALA	GLU	engineered mutation	UNP P26440
C	254	ALA	GLU	engineered mutation	UNP P26440
D	254	ALA	GLU	engineered mutation	UNP P26440

- Molecule 2 is Isovaleryl-coenzyme A (CCD ID: IVC) (formula: $C_{26}H_{44}N_7O_{17}P_3S$).
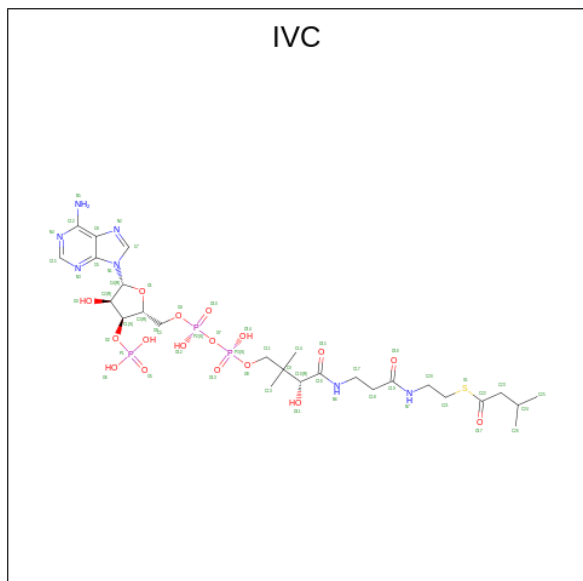
Mol	Chain	Residues	Atoms							AltConf
2	A	1	Total	C	H	N	O	P	S	0
			94	26	40	7	17	3	1	
2	B	1	Total	C	H	N	O	P	S	0
			94	26	40	7	17	3	1	
2	C	1	Total	C	H	N	O	P	S	0
			94	26	40	7	17	3	1	
2	D	1	Total	C	H	N	O	P	S	0
			94	26	40	7	17	3	1	

- Molecule 3 is FLAVIN-ADENINE DINUCLEOTIDE (CCD ID: FAD) (formula: $C_{27}H_{33}N_9O_{15}P_2$).
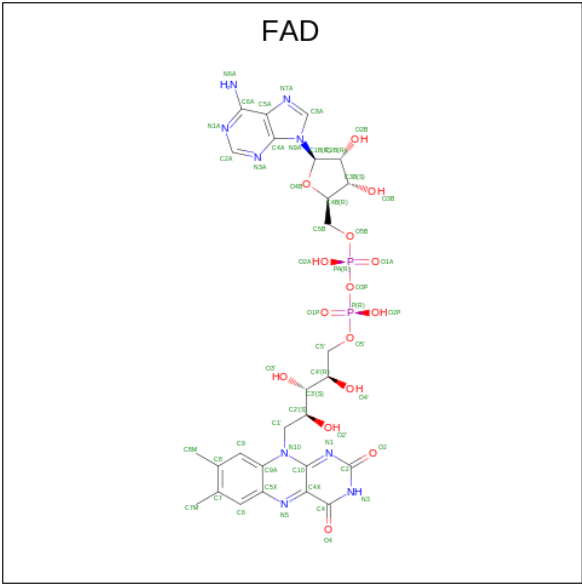
| Mol	Chain	Residues	Atoms						AltConf
3	A	1	Total	C	H	N	O	P	0
			84	27	31	9	15	2	
3	B	1	Total	C	H	N	O	P	0
			84	27	31	9	15	2	
3	C	1	Total	C	H	N	O	P	0
			84	27	31	9	15	2	
3	D	1	Total	C	H	N	O	P	0
			84	27	31	9	15	2	

3 Residue-property plots ⓘ

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: Isovaleryl-CoA dehydrogenase, mitochondrial
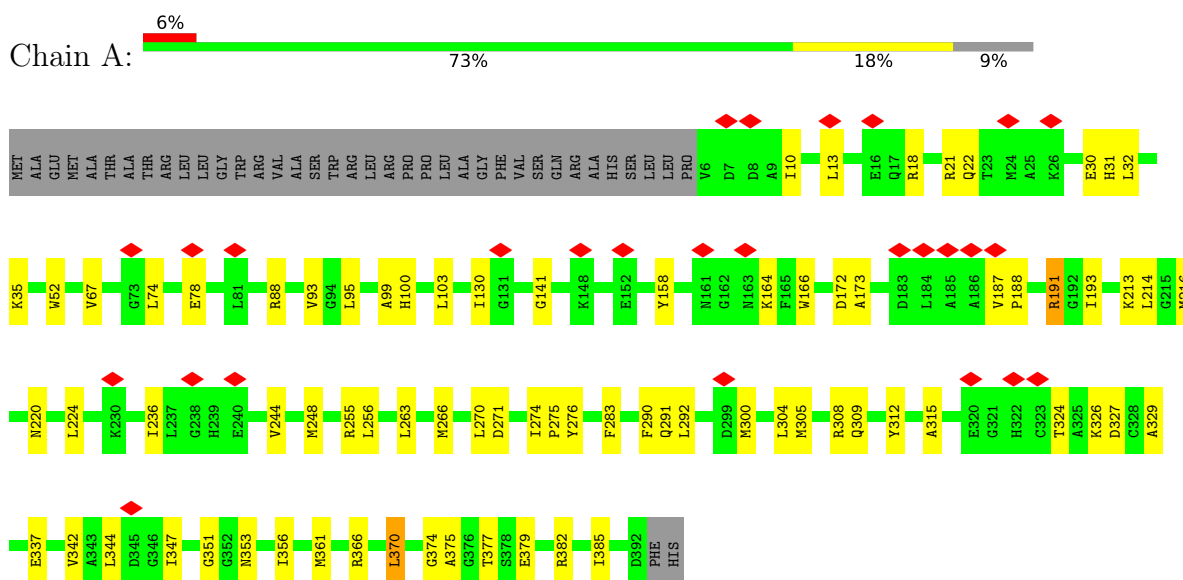
Chain A:

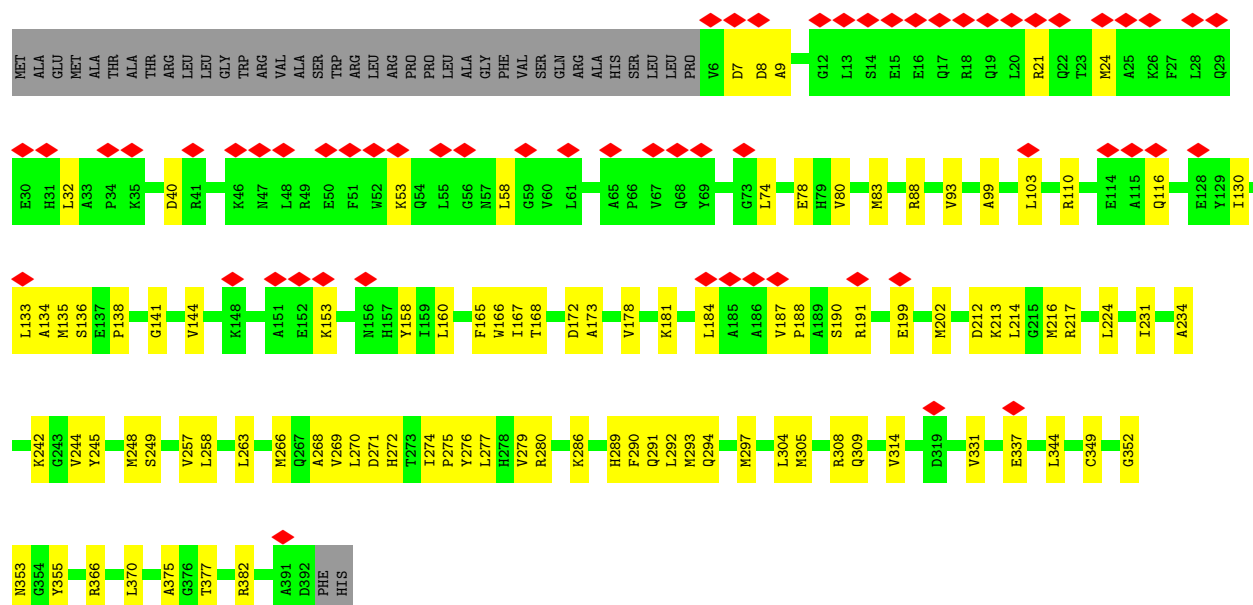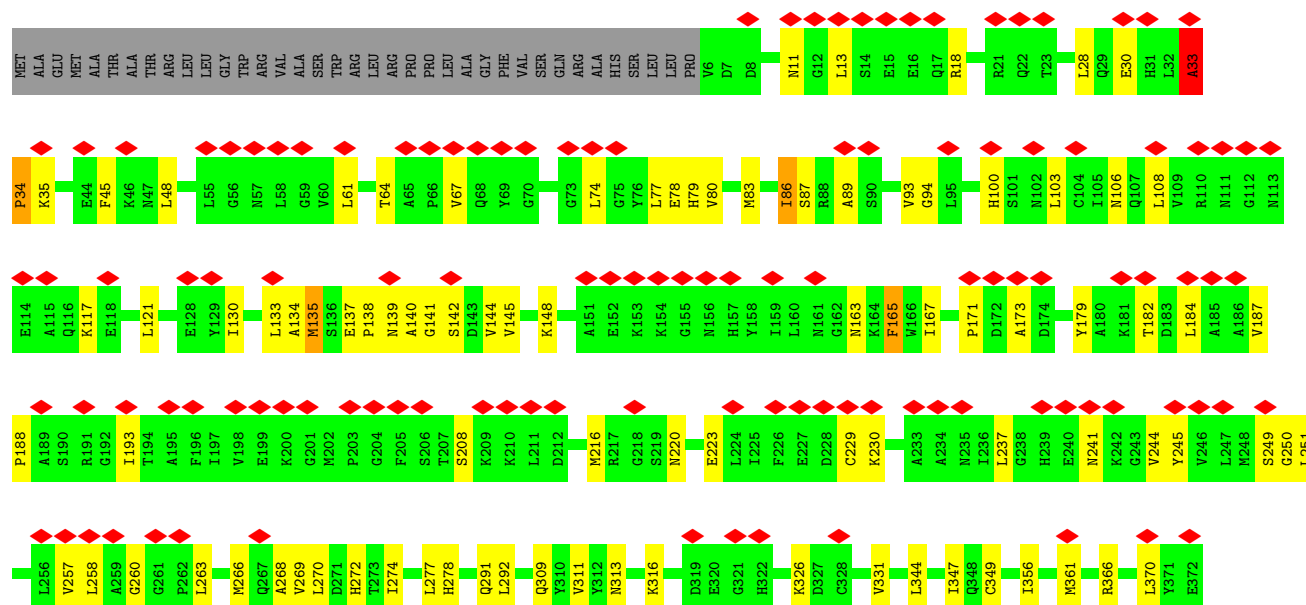• Molecule 1: Isovaleryl-CoA dehydrogenase, mitochondrial

Chain B:

• Molecule 1: Isovaleryl-CoA dehydrogenase, mitochondrial

Chain C:

• Molecule 1: Isovaleryl-CoA dehydrogenase, mitochondrial

Chain D:

I373 G374 A375 G376 V380 I385 A391 D392 PHE HIS
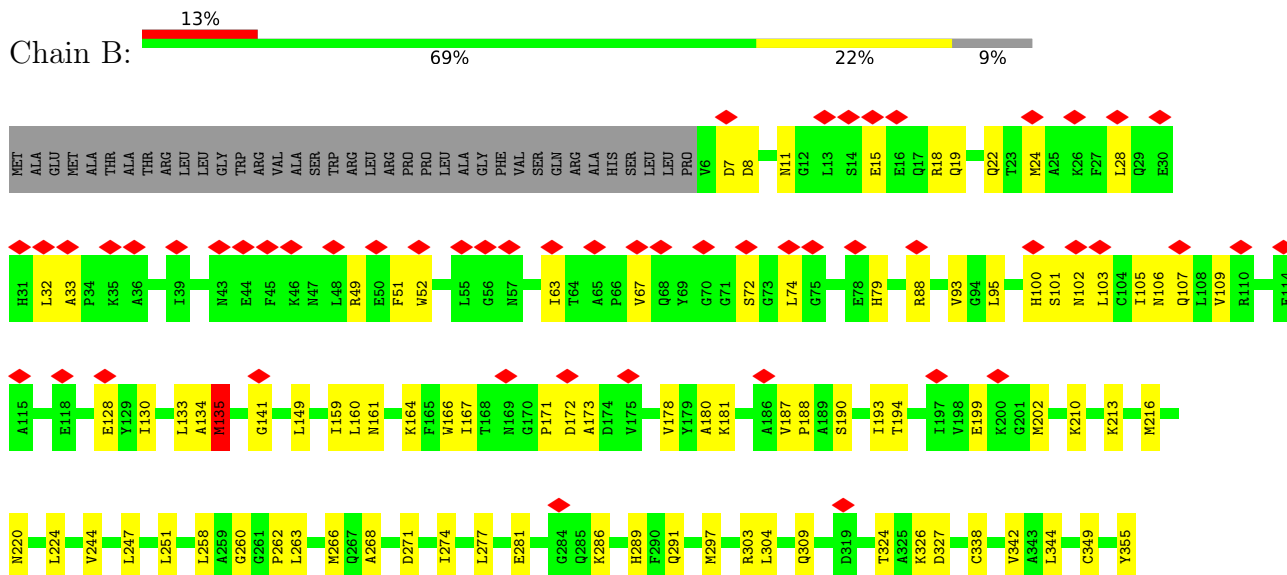
4 Experimental information ⓘ

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	102113	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose $(e^-/Å^2)$	50	Depositor
Minimum defocus (nm)	1200	Depositor
Maximum defocus (nm)	5000	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	2.061	Depositor
Minimum map value	-1.421	Depositor
Average map value	0.005	Depositor
Map value standard deviation	0.069	Depositor
Recommended contour level	0.3	Depositor
Map size (Å)	210.944, 210.944, 210.944	wwPDB
Map dimensions	256, 256, 256	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.824, 0.824, 0.824	Depositor

5 Model quality ⓘ

5.1 Standard geometry ⓘ

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

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	0.12	0/3007	0.31	0/4051
1	B	0.17	1/3007 (0.0%)	0.33	0/4051
1	C	0.17	0/3007	0.32	0/4051
1	D	0.22	0/3007	0.38	1/4051 (0.0%)
All	All	0.17	1/12028 (0.0%)	0.34	1/16204 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	135	MET	CA-C	-5.04	1.46	1.52

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	D	33	ALA	N-CA-C	7.03	125.34	109.81

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	2956	0	2963	60	0
1	B	2956	0	2963	72	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	C	2956	0	2963	79	0
1	D	2956	0	2963	81	0
2	A	54	40	40	13	0
2	B	54	40	40	12	0
2	C	54	40	41	12	0
2	D	54	40	41	29	0
3	A	53	31	31	8	0
3	B	53	31	31	11	0
3	C	53	31	31	10	0
3	D	53	31	31	12	0
All	All	12252	284	12138	293	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 12.

All (293) 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:D:401:IVC:C3	2:D:401:IVC:O1	1.64	1.30
2:A:401:IVC:O1	2:A:401:IVC:C3	1.63	1.28
2:C:401:IVC:C3	2:C:401:IVC:O1	1.63	1.25
2:B:401:IVC:C3	2:B:401:IVC:O1	1.64	1.23
1:D:251:LEU:HD13	2:D:401:IVC:S1	1.79	1.22
1:D:33:ALA:HB2	1:D:89:ALA:HB1	1.25	1.12
1:B:258:LEU:HD21	2:B:401:IVC:H44	1.49	0.93
1:D:135:MET:HE1	2:D:401:IVC:H43	1.54	0.88
1:A:95:LEU:HD11	2:A:401:IVC:H42	1.58	0.86
1:D:103:LEU:HD22	2:D:401:IVC:H41	1.55	0.85
1:D:251:LEU:CD1	2:D:401:IVC:S1	2.66	0.82
1:D:135:MET:SD	2:D:401:IVC:S1	2.79	0.79
1:B:135:MET:SD	1:B:247:LEU:HD11	2.23	0.79
1:C:99:ALA:HB2	2:C:401:IVC:H41	1.64	0.77
1:B:141:GLY:HA3	3:B:402:FAD:P	2.26	0.75
1:B:135:MET:HE1	2:B:401:IVC:S1	2.27	0.74
1:D:103:LEU:CD2	2:D:401:IVC:H41	2.17	0.74
1:B:95:LEU:HD11	2:B:401:IVC:C25	2.18	0.74
1:A:95:LEU:HD11	2:A:401:IVC:H39	1.73	0.70
1:D:251:LEU:HA	2:D:401:IVC:H36	1.73	0.70
1:D:347:ILE:HG12	1:D:361:MET:HB3	1.73	0.70
1:A:375:ALA:HA	2:A:401:IVC:S1	2.33	0.69
1:C:99:ALA:HB2	2:C:401:IVC:C25	2.23	0.68

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:199:GLU:HG2	1:C:202:MET:HE3	1.76	0.68
1:B:130:ILE:HB	1:B:173:ALA:HA	1.74	0.67
1:D:179:TYR:HB3	1:D:193:ILE:HD11	1.75	0.67
1:C:242:LYS:HG2	1:C:245:TYR:CD1	2.30	0.66
1:D:80:VAL:HG12	1:D:257:VAL:HA	1.77	0.66
1:A:18:ARG:O	1:A:22:GLN:NE2	2.29	0.66
1:A:344:LEU:HD11	1:B:344:LEU:HD11	1.78	0.66
1:C:110:ARG:HH12	1:C:249:SER:HB2	1.62	0.65
1:B:286:LYS:HB2	1:B:289:HIS:HD2	1.62	0.64
1:B:95:LEU:HD11	2:B:401:IVC:H39	1.77	0.64
1:D:250:GLY:C	2:D:401:IVC:H40	2.22	0.64
1:C:248:MET:HG3	2:C:401:IVC:H6	1.79	0.64
1:B:18:ARG:O	1:B:22:GLN:NE2	2.31	0.63
1:D:135:MET:SD	1:D:144:VAL:HG21	2.38	0.63
1:C:181:LYS:HE3	1:C:184:LEU:HA	1.79	0.63
1:C:141:GLY:HA3	3:C:402:FAD:P	2.39	0.62
1:D:251:LEU:HD13	2:D:401:IVC:C22	2.29	0.61
1:B:266:MET:HG3	1:B:304:LEU:HD13	1.83	0.61
1:C:160:LEU:HD13	1:C:231:ILE:HD13	1.81	0.61
1:A:103:LEU:HD21	2:A:401:IVC:O17	2.01	0.61
1:D:311:VAL:HG22	1:D:331:VAL:HB	1.83	0.61
1:C:88:ARG:NH2	1:C:271:ASP:OD2	2.34	0.61
1:A:32:LEU:HD11	1:A:93:VAL:HG21	1.83	0.61
1:D:251:LEU:CD1	2:D:401:IVC:C22	2.79	0.61
1:B:141:GLY:HA3	3:B:402:FAD:O2P	2.01	0.60
1:B:135:MET:H	3:B:402:FAD:HM82	1.65	0.60
1:B:172:ASP:OD2	1:B:220:ASN:ND2	2.33	0.59
1:D:216:MET:HG3	1:D:370:LEU:HD22	1.84	0.59
1:C:141:GLY:HA3	3:C:402:FAD:O2P	2.02	0.59
2:A:401:IVC:O1	2:A:401:IVC:C5	2.45	0.59
1:C:103:LEU:HD11	2:C:401:IVC:H43	1.84	0.59
1:A:164:LYS:HB2	1:A:224:LEU:HB2	1.85	0.59
1:D:326:LYS:HG3	1:D:385:ILE:HG12	1.85	0.58
1:B:166:TRP:HB3	3:B:402:FAD:C10	2.33	0.58
1:C:286:LYS:HB2	1:C:289:HIS:HD2	1.67	0.58
1:A:213:LYS:HA	1:B:356:ILE:HA	1.86	0.58
1:A:172:ASP:OD2	1:A:220:ASN:ND2	2.33	0.58
1:D:138:PRO:HD3	1:D:165:PHE:HB2	1.84	0.58
1:B:95:LEU:HD11	2:B:401:IVC:H40	1.86	0.57
1:C:213:LYS:HA	1:D:356:ILE:HA	1.86	0.57
1:A:356:ILE:HA	1:B:213:LYS:HA	1.84	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:375:ALA:HB2	2:C:401:IVC:S1	2.44	0.57
1:D:30:GLU:HA	1:D:34:PRO:HG2	1.85	0.57
1:A:291:GLN:HE22	1:C:290:PHE:HD1	1.51	0.57
1:D:144:VAL:HG12	2:D:401:IVC:C14	2.34	0.57
2:A:401:IVC:H44	3:A:402:FAD:N5	2.19	0.57
1:A:166:TRP:HB3	3:A:402:FAD:N10	2.18	0.57
1:C:212:ASP:OD1	1:C:217:ARG:NH1	2.38	0.57
1:C:242:LYS:HG2	1:C:245:TYR:CE1	2.40	0.57
1:D:251:LEU:HD11	2:D:401:IVC:H35	1.87	0.56
1:D:135:MET:CE	2:D:401:IVC:H43	2.33	0.56
2:D:401:IVC:H33	3:D:402:FAD:HM83	1.88	0.56
1:D:144:VAL:HG12	2:D:401:IVC:H21	1.88	0.56
1:A:377:THR:HG21	3:A:402:FAD:C2B	2.35	0.56
1:D:142:SER:HB2	3:D:402:FAD:O2A	2.05	0.56
1:D:45:PHE:HB3	1:D:48:LEU:HB2	1.87	0.55
1:A:351:GLY:HA3	3:B:402:FAD:O1P	2.06	0.55
1:C:167:ILE:HG13	1:C:224:LEU:HG	1.87	0.55
1:A:99:ALA:HA	1:A:103:LEU:HD13	1.89	0.55
1:C:116:GLN:NE2	1:C:234:ALA:O	2.39	0.55
1:C:352:GLY:HA3	3:D:402:FAD:H5'2	1.89	0.55
1:B:277:LEU:HD21	1:B:349:CYS:HB3	1.89	0.55
1:B:291:GLN:HB2	1:D:291:GLN:HB2	1.89	0.55
1:A:214:LEU:O	1:A:366:ARG:NH1	2.40	0.54
1:C:130:ILE:HB	1:C:173:ALA:HA	1.89	0.54
1:D:268:ALA:O	1:D:272:HIS:ND1	2.38	0.54
1:B:11:ASN:OD1	1:B:309:GLN:NE2	2.41	0.54
1:B:7:ASP:OD1	1:B:8:ASP:N	2.41	0.54
1:C:32:LEU:HD11	1:C:93:VAL:HG21	1.90	0.54
1:A:130:ILE:HB	1:A:173:ALA:HA	1.89	0.54
1:B:49:ARG:NH2	1:B:128:GLU:O	2.41	0.54
2:A:401:IVC:O1	2:A:401:IVC:O4	2.25	0.54
1:C:337:GLU:OE2	1:C:382:ARG:NH2	2.41	0.54
1:B:166:TRP:HB3	3:B:402:FAD:N10	2.22	0.54
1:D:74:LEU:HD13	1:D:78:GLU:HG2	1.89	0.54
1:B:79:HIS:HE1	1:B:102:ASN:HB2	1.73	0.53
1:D:133:LEU:HD13	2:D:401:IVC:C25	2.38	0.53
1:A:95:LEU:CD1	2:A:401:IVC:H39	2.37	0.53
2:B:401:IVC:O1	2:B:401:IVC:C5	2.51	0.53
1:B:291:GLN:HB3	1:D:292:LEU:HG	1.91	0.53
1:A:248:MET:HG3	2:A:401:IVC:C4	2.38	0.53
1:D:135:MET:HG3	1:D:144:VAL:HG23	1.90	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:277:LEU:HD11	1:D:349:CYS:HB3	1.90	0.53
1:A:216:MET:HG3	1:A:370:LEU:HD13	1.91	0.53
1:A:266:MET:HG2	1:A:304:LEU:HB2	1.91	0.53
1:C:242:LYS:CG	1:C:245:TYR:CE1	2.92	0.53
1:A:74:LEU:HD13	1:A:78:GLU:HG2	1.90	0.52
1:C:377:THR:HG21	3:C:402:FAD:O2B	2.10	0.52
2:D:401:IVC:S1	3:D:402:FAD:C8M	2.98	0.52
1:A:377:THR:HG21	3:A:402:FAD:O2B	2.10	0.52
1:D:163:ASN:ND2	1:D:223:GLU:OE2	2.43	0.52
1:B:88:ARG:NH2	1:B:271:ASP:OD2	2.43	0.52
1:A:290:PHE:HD1	1:C:291:GLN:HE22	1.57	0.51
1:B:103:LEU:O	1:B:107:GLN:NE2	2.43	0.51
1:B:187:VAL:HB	1:B:188:PRO:HD3	1.92	0.51
1:C:40:ASP:HA	1:C:217:ARG:HB2	1.92	0.51
1:A:347:ILE:HG12	1:A:361:MET:HB3	1.92	0.51
1:B:133:LEU:HD23	1:B:135:MET:HE2	1.91	0.51
1:D:145:VAL:HG21	2:D:401:IVC:O14	2.11	0.51
1:C:144:VAL:HG22	2:C:401:IVC:H18	1.91	0.51
1:C:344:LEU:HD11	1:D:344:LEU:HD11	1.92	0.51
1:A:276:TYR:OH	1:A:353:ASN:ND2	2.40	0.51
1:C:7:ASP:OD2	1:C:21:ARG:NH1	2.44	0.51
1:D:135:MET:CE	2:D:401:IVC:S1	2.99	0.50
1:B:181:LYS:HA	1:B:193:ILE:HA	1.93	0.50
1:C:213:LYS:NZ	1:C:216:MET:O	2.43	0.50
1:C:214:LEU:O	1:C:366:ARG:NH1	2.36	0.50
1:D:87:SER:HB3	1:D:94:GLY:HA3	1.93	0.50
1:D:260:GLY:HA2	1:D:263:LEU:HD12	1.94	0.50
1:A:31:HIS:O	1:A:35:LYS:NZ	2.38	0.49
1:D:251:LEU:CD1	2:D:401:IVC:C21	2.90	0.49
1:A:141:GLY:HA3	3:A:402:FAD:O2P	2.12	0.49
1:B:251:LEU:HD11	2:B:401:IVC:C21	2.42	0.49
1:C:168:THR:OG1	3:C:402:FAD:H6	2.12	0.49
1:B:135:MET:HE3	3:B:402:FAD:HM81	1.93	0.49
1:A:187:VAL:HB	1:A:188:PRO:HD3	1.95	0.49
2:A:401:IVC:H37	3:A:402:FAD:C6	2.43	0.49
1:B:326:LYS:HG3	1:B:385:ILE:HG23	1.93	0.49
1:D:274:ILE:O	1:D:278:HIS:ND1	2.44	0.49
1:B:135:MET:CE	2:B:401:IVC:S1	3.00	0.49
1:D:11:ASN:HA	1:D:309:GLN:HE22	1.78	0.49
1:B:266:MET:HB2	1:B:342:VAL:HG11	1.95	0.48
1:A:283:PHE:HE2	3:B:402:FAD:N7A	2.10	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:370:LEU:HD21	3:B:402:FAD:N3	2.29	0.48
1:C:216:MET:HG3	1:C:370:LEU:HD13	1.94	0.48
1:D:229:CYS:SG	1:D:230:LYS:N	2.86	0.48
1:B:303:ARG:HG2	1:B:338:CYS:HB3	1.96	0.48
1:C:8:ASP:OD1	1:C:9:ALA:N	2.47	0.48
1:A:270:LEU:HD11	1:A:300:MET:HB3	1.95	0.48
1:D:374:GLY:HA2	3:D:402:FAD:H1'1	1.95	0.48
1:B:52:TRP:HE1	1:B:100:HIS:CG	2.32	0.48
1:C:74:LEU:HD13	1:C:78:GLU:HG2	1.95	0.47
1:B:88:ARG:HG2	1:B:268:ALA:HB2	1.95	0.47
1:C:134:ALA:HB3	1:C:178:VAL:HA	1.96	0.47
1:B:258:LEU:HD21	2:B:401:IVC:C26	2.30	0.47
1:D:250:GLY:O	2:D:401:IVC:H40	2.12	0.47
1:A:256:LEU:HD21	1:A:315:ALA:HA	1.96	0.47
1:A:379:GLU:HB2	3:A:402:FAD:O2B	2.14	0.47
1:B:134:ALA:HB3	1:B:178:VAL:HA	1.95	0.47
1:B:260:GLY:HA2	1:B:263:LEU:HD12	1.97	0.47
1:D:108:LEU:HB2	1:D:121:LEU:HD21	1.96	0.47
1:A:141:GLY:HA3	3:A:402:FAD:P	2.55	0.47
1:B:377:THR:HG21	3:B:402:FAD:H3B	1.96	0.47
1:B:164:LYS:HB2	1:B:224:LEU:HB2	1.97	0.47
1:C:263:LEU:HD21	1:C:308:ARG:HA	1.96	0.46
1:D:144:VAL:HB	2:D:401:IVC:O16	2.15	0.46
1:C:80:VAL:HG22	1:C:257:VAL:HA	1.96	0.46
1:C:103:LEU:HB3	1:C:133:LEU:HB2	1.97	0.46
1:A:326:LYS:HG3	1:A:385:ILE:HG12	1.98	0.46
1:D:83:MET:HE1	1:D:258:LEU:HG	1.97	0.46
1:C:135:MET:HB2	3:C:402:FAD:C8M	2.45	0.46
1:D:251:LEU:HD13	2:D:401:IVC:C21	2.45	0.46
1:A:21:ARG:NH2	1:A:312:TYR:OH	2.48	0.46
1:A:88:ARG:NH1	1:A:271:ASP:OD2	2.49	0.46
1:B:167:ILE:HG13	1:B:224:LEU:HD13	1.97	0.46
1:D:64:THR:HB	1:D:106:ASN:HD21	1.81	0.46
1:D:103:LEU:HB3	1:D:133:LEU:HB2	1.97	0.46
1:D:187:VAL:HB	1:D:188:PRO:HD3	1.97	0.46
1:C:280:ARG:NH2	1:D:138:PRO:O	2.48	0.45
1:D:370:LEU:HD11	3:D:402:FAD:C2	2.46	0.45
1:B:180:ALA:O	1:B:194:THR:N	2.44	0.45
1:C:375:ALA:CB	2:C:401:IVC:S1	3.03	0.45
1:C:286:LYS:HB2	1:C:289:HIS:CD2	2.51	0.45
1:A:193:ILE:HB	1:A:244:VAL:HG13	1.99	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:305:MET:O	1:C:309:GLN:HG2	2.17	0.45
1:A:216:MET:HE3	1:A:370:LEU:HD22	1.98	0.45
1:B:149:LEU:HD21	1:B:160:LEU:HD23	1.98	0.45
1:B:190:SER:HB3	1:B:244:VAL:HG21	1.97	0.45
1:B:274:ILE:HD12	1:B:297:MET:HE3	1.99	0.45
1:C:190:SER:HB3	1:C:244:VAL:HG21	1.98	0.45
1:A:370:LEU:O	1:A:374:GLY:N	2.50	0.45
1:C:187:VAL:HB	1:C:188:PRO:HD3	1.98	0.45
1:C:166:TRP:HB3	3:C:402:FAD:N10	2.32	0.45
1:C:352:GLY:HA3	3:D:402:FAD:C5'	2.46	0.45
2:D:401:IVC:S1	3:D:402:FAD:HM81	2.58	0.44
2:C:401:IVC:O1	2:C:401:IVC:C5	2.53	0.44
1:D:251:LEU:HD12	2:D:401:IVC:H36	1.99	0.44
1:B:262:PRO:O	1:B:266:MET:HG2	2.18	0.44
1:C:138:PRO:HG3	1:C:165:PHE:HB2	1.99	0.44
1:C:314:VAL:HG21	1:C:331:VAL:HG11	2.00	0.44
1:C:375:ALA:HB2	2:C:401:IVC:C22	2.48	0.44
1:A:266:MET:HE3	1:A:304:LEU:HA	1.98	0.44
1:B:79:HIS:CE1	1:B:102:ASN:HB2	2.53	0.44
1:D:130:ILE:HB	1:D:173:ALA:HA	1.99	0.44
1:A:52:TRP:HE1	1:A:100:HIS:CD2	2.35	0.44
1:B:63:ILE:HD12	1:B:72:SER:HB2	2.00	0.44
1:D:137:GLU:HG2	1:D:140:ALA:HB3	1.99	0.44
1:D:184:LEU:HD23	1:D:184:LEU:H	1.83	0.44
1:A:309:GLN:OE1	1:D:313:ASN:ND2	2.30	0.44
1:B:216:MET:HG3	1:B:370:LEU:HG	1.99	0.44
1:A:188:PRO:HB2	1:A:191:ARG:HG2	1.99	0.43
1:A:30:GLU:HG3	1:A:31:HIS:CD2	2.53	0.43
1:B:281:GLU:HG2	1:B:286:LYS:HG3	2.00	0.43
1:D:117:LYS:HG3	1:D:121:LEU:HD12	1.99	0.43
1:D:139:ASN:HD22	1:D:148:LYS:HD2	1.84	0.43
1:A:292:LEU:HD23	1:C:292:LEU:HD23	1.99	0.43
1:A:324:THR:OG1	1:A:327:ASP:OD2	2.36	0.43
1:C:294:GLN:HA	1:C:297:MET:HE2	2.00	0.43
1:A:255:ARG:HH11	1:A:329:ALA:HB2	1.83	0.43
1:A:95:LEU:HD11	2:A:401:IVC:C26	2.39	0.43
1:B:106:ASN:HA	1:B:109:VAL:HG22	2.01	0.43
1:B:171:PRO:HG3	1:B:210:LYS:HE3	2.00	0.43
1:A:99:ALA:O	1:A:103:LEU:HB2	2.19	0.43
1:C:266:MET:HA	1:C:269:VAL:HG22	2.00	0.43
1:C:274:ILE:HB	1:C:275:PRO:HD3	2.01	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:276:TYR:OH	1:C:353:ASN:ND2	2.44	0.43
1:D:370:LEU:HD11	3:D:402:FAD:N3	2.34	0.43
1:D:77:LEU:HD22	1:D:316:LYS:HG2	2.01	0.43
1:C:172:ASP:OD1	1:C:172:ASP:N	2.50	0.43
1:D:79:HIS:CE1	1:D:257:VAL:HG11	2.54	0.43
1:D:141:GLY:HA3	3:D:402:FAD:O3P	2.19	0.43
1:B:159:ILE:HG22	1:B:161:ASN:HD21	1.84	0.42
1:C:277:LEU:HD21	1:C:349:CYS:HB3	2.01	0.42
1:D:61:LEU:HD22	1:D:100:HIS:HD2	1.82	0.42
1:D:251:LEU:HB2	2:D:401:IVC:H44	2.01	0.42
1:A:158:TYR:CE1	1:A:236:ILE:HD11	2.53	0.42
1:A:375:ALA:HA	2:A:401:IVC:H32	2.01	0.42
1:D:171:PRO:HD2	1:D:220:ASN:HB3	2.00	0.42
2:D:401:IVC:O1	2:D:401:IVC:C5	2.53	0.42
1:A:10:ILE:HD12	1:A:305:MET:HE2	2.01	0.42
1:B:103:LEU:HD21	2:B:401:IVC:H43	2.01	0.42
1:B:199:GLU:HB2	1:B:202:MET:HE3	2.02	0.42
1:C:244:VAL:CG1	1:C:245:TYR:CE1	3.03	0.42
1:C:355:TYR:OH	1:D:366:ARG:O	2.26	0.42
1:A:337:GLU:OE2	1:A:382:ARG:NH2	2.47	0.42
1:B:15:GLU:OE2	1:B:19:GLN:NE2	2.53	0.42
1:B:103:LEU:CD2	2:B:401:IVC:H43	2.50	0.42
1:C:293:MET:HE2	3:D:402:FAD:N3A	2.34	0.42
1:A:326:LYS:HG3	1:A:385:ILE:HG23	2.00	0.42
1:B:24:MET:HE2	1:B:24:MET:HA	2.02	0.42
1:C:270:LEU:HA	1:C:270:LEU:HD23	1.83	0.42
1:B:63:ILE:HD11	1:B:74:LEU:HB2	2.02	0.42
1:C:133:LEU:HD23	3:C:402:FAD:HM71	2.00	0.42
1:C:245:TYR:HA	2:C:401:IVC:H7	2.02	0.42
1:B:28:LEU:O	1:B:33:ALA:N	2.44	0.41
1:D:245:TYR:O	1:D:249:SER:OG	2.32	0.41
1:C:135:MET:H	3:C:402:FAD:HM82	1.85	0.41
1:C:245:TYR:CD1	1:C:245:TYR:N	2.87	0.41
1:C:377:THR:HG21	3:C:402:FAD:C2B	2.50	0.41
1:D:28:LEU:HD21	1:D:86:ILE:HD12	2.01	0.41
1:D:208:SER:HB3	1:D:223:GLU:HB3	2.02	0.41
1:B:32:LEU:HD11	1:B:93:VAL:HG21	2.01	0.41
1:D:86:ILE:O	1:D:87:SER:OG	2.32	0.41
1:A:263:LEU:HD21	1:A:308:ARG:HA	2.02	0.41
1:A:274:ILE:HB	1:A:275:PRO:HD3	2.02	0.41
1:A:370:LEU:HB2	1:B:355:TYR:CZ	2.55	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:133:LEU:CD2	1:B:135:MET:HE2	2.50	0.41
1:D:83:MET:SD	1:D:257:VAL:HG12	2.60	0.41
1:C:136:SER:OG	3:C:402:FAD:H9	2.20	0.41
1:D:13:LEU:O	1:D:18:ARG:NH1	2.53	0.41
1:C:266:MET:HB2	1:C:304:LEU:HD13	2.03	0.41
1:B:166:TRP:O	3:B:402:FAD:C5X	2.69	0.41
1:D:266:MET:HA	1:D:269:VAL:HG22	2.01	0.41
1:A:266:MET:HG3	1:A:342:VAL:HG11	2.03	0.41
1:C:153:LYS:HB3	1:C:158:TYR:CD2	2.56	0.41
1:D:182:THR:OG1	1:D:241:ASN:OD1	2.38	0.41
1:B:101:SER:HA	1:B:105:ILE:HD12	2.02	0.41
1:C:24:MET:HE1	1:C:58:LEU:HD13	2.02	0.41
1:D:134:ALA:HA	1:D:167:ILE:HD12	2.03	0.41
1:B:164:LYS:HB3	1:B:167:ILE:HD11	2.03	0.40
1:C:244:VAL:HG13	1:C:245:TYR:CD1	2.56	0.40
1:C:375:ALA:HA	2:C:401:IVC:H34	2.02	0.40
2:D:401:IVC:S1	3:D:402:FAD:HM83	2.61	0.40
1:C:83:MET:HE2	1:C:258:LEU:HD12	2.02	0.40
1:D:270:LEU:HD23	1:D:270:LEU:HA	1.89	0.40
1:B:324:THR:OG1	1:B:327:ASP:OD2	2.27	0.40
1:D:86:ILE:HG23	1:D:94:GLY:HA2	2.02	0.40
1:C:53:LYS:HE2	1:C:53:LYS:HB2	1.86	0.40
1:C:268:ALA:O	1:C:272:HIS:ND1	2.32	0.40
1:C:188:PRO:HB2	1:C:191:ARG:HB2	2.02	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	385/426 (90%)	380 (99%)	5 (1%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	385/426 (90%)	380 (99%)	5 (1%)	0	100	100
1	C	385/426 (90%)	383 (100%)	2 (0%)	0	100	100
1	D	385/426 (90%)	378 (98%)	6 (2%)	1 (0%)	37	65
All	All	1540/1704 (90%)	1521 (99%)	18 (1%)	1 (0%)	50	77

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	33	ALA

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	307/338 (91%)	303 (99%)	4 (1%)	65	79
1	B	307/338 (91%)	304 (99%)	3 (1%)	73	84
1	C	307/338 (91%)	306 (100%)	1 (0%)	91	95
1	D	307/338 (91%)	298 (97%)	9 (3%)	37	62
All	All	1228/1352 (91%)	1211 (99%)	17 (1%)	62	78

All (17) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	13	LEU
1	A	67	VAL
1	A	191	ARG
1	A	370	LEU
1	B	51	PHE
1	B	67	VAL
1	B	135	MET
1	C	279	VAL
1	D	34	PRO
1	D	35	LYS

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Mol	Chain	Res	Type
1	D	67	VAL
1	D	86	ILE
1	D	93	VAL
1	D	135	MET
1	D	165	PHE
1	D	237	LEU
1	D	244	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (38) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	19	GLN
1	A	22	GLN
1	A	29	GLN
1	A	31	HIS
1	A	68	GLN
1	A	157	HIS
1	A	161	ASN
1	A	291	GLN
1	A	341	GLN
1	A	353	ASN
1	B	17	GLN
1	B	19	GLN
1	B	22	GLN
1	B	31	HIS
1	B	68	GLN
1	B	278	HIS
1	B	289	HIS
1	B	341	GLN
1	B	390	ASN
1	C	19	GLN
1	C	54	GLN
1	C	57	ASN
1	C	102	ASN
1	C	107	GLN
1	C	111	ASN
1	C	278	HIS
1	C	289	HIS
1	C	294	GLN
1	C	341	GLN
1	C	348	GLN
1	C	357	ASN

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Mol	Chain	Res	Type
1	D	17	GLN
1	D	68	GLN
1	D	79	HIS
1	D	220	ASN
1	D	341	GLN
1	D	348	GLN
1	D	357	ASN

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 ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

8 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#|Z| > 2$	Counts	RMSZ	$\#|Z| > 2$
2	IVC	C	401	-	47,56,56	2.93	14 (29%)	59,83,83	1.36	7 (11%)
2	IVC	D	401	-	47,56,56	2.97	14 (29%)	59,83,83	2.00	11 (18%)
2	IVC	B	401	-	47,56,56	2.88	13 (27%)	59,83,83	1.75	12 (20%)
3	FAD	A	402	-	53,58,58	1.43	8 (15%)	68,89,89	2.17	25 (36%)
3	FAD	C	402	-	53,58,58	1.41	9 (16%)	68,89,89	2.14	26 (38%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	#|Z| > 2	Counts	RMSZ	#|Z| > 2
2	IVC	A	401	-	47,56,56	3.04	16 (34%)	59,83,83	2.06	13 (22%)
3	FAD	D	402	-	53,58,58	1.39	10 (18%)	68,89,89	2.17	28 (41%)
3	FAD	B	402	-	53,58,58	1.45	7 (13%)	68,89,89	1.95	18 (26%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	IVC	C	401	-	-	15/51/71/71	0/3/3/3
2	IVC	D	401	-	-	14/51/71/71	0/3/3/3
2	IVC	B	401	-	-	13/51/71/71	0/3/3/3
3	FAD	A	402	-	-	8/30/50/50	0/6/6/6
3	FAD	C	402	-	-	2/30/50/50	0/6/6/6
2	IVC	A	401	-	-	16/51/71/71	0/3/3/3
3	FAD	D	402	-	-	17/30/50/50	0/6/6/6
3	FAD	B	402	-	-	9/30/50/50	0/6/6/6

All (91) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	401	IVC	O1-C3	8.82	1.64	1.45
2	B	401	IVC	O1-C3	8.57	1.64	1.45
2	C	401	IVC	O1-C3	8.48	1.63	1.45
2	A	401	IVC	O1-C3	8.29	1.63	1.45
2	A	401	IVC	O1-C4	-8.28	1.29	1.41
2	B	401	IVC	O1-C4	-8.12	1.29	1.41
2	D	401	IVC	O1-C4	-7.61	1.30	1.41
2	C	401	IVC	O1-C4	-7.54	1.30	1.41
2	A	401	IVC	C1-C3	-7.46	1.32	1.52
2	C	401	IVC	C16-N6	7.38	1.49	1.33
2	D	401	IVC	C16-N6	7.29	1.49	1.33
2	C	401	IVC	C1-C3	-7.18	1.33	1.52
2	A	401	IVC	C16-N6	6.98	1.48	1.33
2	B	401	IVC	C1-C3	-6.97	1.34	1.52
2	D	401	IVC	C1-C3	-6.86	1.34	1.52
2	B	401	IVC	C16-N6	6.85	1.48	1.33
2	A	401	IVC	C19-N7	5.95	1.46	1.33
2	C	401	IVC	C19-N7	5.57	1.46	1.33

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	401	IVC	C19-N7	5.44	1.45	1.33
2	D	401	IVC	C22-S1	5.30	1.89	1.76
2	D	401	IVC	C19-N7	4.91	1.44	1.33
2	A	401	IVC	O15-C16	-4.90	1.13	1.23
2	B	401	IVC	O15-C16	-4.79	1.13	1.23
2	C	401	IVC	O15-C16	-4.64	1.14	1.23
3	C	402	FAD	C6-C7	-4.60	1.32	1.39
2	A	401	IVC	O17-C22	-4.44	1.13	1.21
2	D	401	IVC	O15-C16	-4.29	1.14	1.23
2	A	401	IVC	C22-S1	4.27	1.86	1.76
2	A	401	IVC	O3-C2	-4.01	1.33	1.43
2	C	401	IVC	O3-C2	-3.85	1.33	1.43
2	C	401	IVC	C18-C19	3.85	1.58	1.51
2	B	401	IVC	O3-C2	-3.84	1.33	1.43
3	A	402	FAD	C4-N3	-3.79	1.31	1.38
3	B	402	FAD	C9A-C5X	3.75	1.47	1.41
2	D	401	IVC	C18-C19	3.70	1.58	1.51
2	A	401	IVC	C18-C19	3.61	1.58	1.51
2	D	401	IVC	O3-C2	-3.59	1.34	1.43
3	D	402	FAD	C9A-C5X	3.57	1.47	1.41
2	C	401	IVC	C22-S1	3.53	1.84	1.76
3	B	402	FAD	C4-N3	-3.48	1.32	1.38
3	B	402	FAD	C6-C7	-3.37	1.34	1.39
3	A	402	FAD	C2B-C1B	-3.34	1.48	1.53
3	A	402	FAD	C9A-C5X	3.29	1.46	1.41
3	D	402	FAD	C4-N3	-3.27	1.32	1.38
2	C	401	IVC	C12-N5	3.19	1.45	1.34
3	D	402	FAD	C5X-N5	-3.16	1.33	1.39
2	D	401	IVC	C12-N5	3.15	1.45	1.34
2	D	401	IVC	C2-C4	3.14	1.58	1.53
3	A	402	FAD	C5X-N5	-3.13	1.33	1.39
2	B	401	IVC	C12-N5	3.12	1.45	1.34
2	B	401	IVC	C2-C4	3.08	1.58	1.53
2	A	401	IVC	C12-N5	3.04	1.45	1.34
2	B	401	IVC	O17-C22	-3.00	1.16	1.21
2	A	401	IVC	C17-N6	3.00	1.53	1.46
3	B	402	FAD	C5X-N5	-3.00	1.33	1.39
2	B	401	IVC	C22-S1	2.97	1.83	1.76
3	A	402	FAD	C6-C7	-2.95	1.35	1.39
2	C	401	IVC	C2-C4	2.84	1.58	1.53
3	D	402	FAD	O4B-C1B	2.83	1.45	1.41
3	C	402	FAD	C9-C8	-2.82	1.35	1.39

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	401	IVC	C17-N6	2.79	1.52	1.46
2	B	401	IVC	C18-C19	2.77	1.56	1.51
3	A	402	FAD	C2-N3	-2.76	1.32	1.39
2	C	401	IVC	C17-N6	2.75	1.52	1.46
3	C	402	FAD	C5X-N5	-2.73	1.34	1.39
3	B	402	FAD	C2-N3	-2.73	1.32	1.39
3	C	402	FAD	C9-C9A	-2.67	1.35	1.39
3	B	402	FAD	C2B-C1B	-2.66	1.49	1.53
2	C	401	IVC	C13-C9	2.64	1.59	1.53
2	C	401	IVC	O17-C22	-2.60	1.16	1.21
2	D	401	IVC	C21-S1	2.58	1.92	1.81
3	C	402	FAD	C9A-C5X	2.56	1.45	1.41
3	C	402	FAD	C4-N3	-2.52	1.34	1.38
2	A	401	IVC	C2-C4	2.40	1.57	1.53
3	A	402	FAD	C9-C9A	-2.40	1.35	1.39
3	D	402	FAD	C1'-C2'	-2.34	1.49	1.52
3	D	402	FAD	C6-C7	-2.33	1.36	1.39
2	A	401	IVC	O11-C10	-2.31	1.38	1.42
3	D	402	FAD	C2B-C1B	-2.29	1.50	1.53
3	D	402	FAD	C9-C8	-2.27	1.36	1.39
3	C	402	FAD	C2-N3	-2.25	1.33	1.39
3	D	402	FAD	C8-C7	2.23	1.46	1.40
2	A	401	IVC	C14-C9	2.22	1.58	1.53
3	C	402	FAD	C2B-C1B	-2.22	1.50	1.53
2	A	401	IVC	C13-C9	2.15	1.58	1.53
2	B	401	IVC	C17-N6	2.05	1.50	1.46
2	D	401	IVC	C13-C9	2.03	1.58	1.53
3	A	402	FAD	C9-C8	-2.02	1.36	1.39
3	D	402	FAD	C2-N3	-2.00	1.34	1.39
3	C	402	FAD	C2-N1	-2.00	1.32	1.36
3	B	402	FAD	C8-C7	2.00	1.45	1.40

All (140) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	401	IVC	C23-C22-S1	9.49	125.37	113.63
2	D	401	IVC	C23-C22-S1	7.11	122.42	113.63
2	D	401	IVC	C21-S1-C22	6.32	121.54	101.87
3	C	402	FAD	C9A-C9-C8	5.61	130.60	119.30
2	D	401	IVC	C18-C19-N7	5.55	125.76	116.42
3	A	402	FAD	C5X-C9A-N10	4.86	122.98	117.95
3	C	402	FAD	C5X-C9A-N10	4.75	122.86	117.95

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	A	402	FAD	C9A-N10-C10	-4.70	113.45	120.77
2	A	401	IVC	O17-C22-S1	-4.69	116.52	122.61
3	D	402	FAD	C3B-C2B-C1B	4.69	108.04	100.98
2	B	401	IVC	C18-C19-N7	4.63	124.22	116.42
3	B	402	FAD	N3A-C2A-N1A	-4.61	121.47	128.68
2	B	401	IVC	C21-S1-C22	4.57	116.09	101.87
2	A	401	IVC	P3-O7-P2	-4.54	117.24	132.83
3	B	402	FAD	P-O3P-PA	-4.46	117.52	132.83
3	A	402	FAD	C9A-C9-C8	4.44	128.23	119.30
3	D	402	FAD	N3A-C2A-N1A	-4.39	121.82	128.68
3	A	402	FAD	C6-C7-C8	-4.37	113.41	119.67
3	B	402	FAD	C7M-C7-C8	4.32	129.59	120.74
2	A	401	IVC	N3-C15-N4	-4.26	122.02	128.68
3	A	402	FAD	N3A-C2A-N1A	-4.19	122.13	128.68
2	C	401	IVC	N3-C15-N4	-4.09	122.28	128.68
2	B	401	IVC	N3-C15-N4	-4.07	122.32	128.68
3	A	402	FAD	C1'-N10-C9A	4.04	127.25	120.51
3	C	402	FAD	N3A-C2A-N1A	-4.04	122.36	128.68
3	C	402	FAD	C1'-N10-C9A	4.03	127.23	120.51
2	D	401	IVC	N3-C15-N4	-3.98	122.46	128.68
3	A	402	FAD	C5X-C6-C7	3.94	127.93	120.71
3	D	402	FAD	C8M-C8-C9	-3.92	112.24	119.49
3	D	402	FAD	O3B-C3B-C2B	-3.89	99.24	111.82
2	B	401	IVC	O16-C19-C18	-3.86	114.96	122.02
3	D	402	FAD	O4B-C1B-C2B	-3.86	101.29	106.93
3	B	402	FAD	C4X-C10-N1	-3.82	115.87	124.73
2	D	401	IVC	O16-C19-N7	-3.82	115.81	123.01
2	C	401	IVC	C23-C22-S1	3.80	118.33	113.63
2	D	401	IVC	C21-C20-N7	3.78	120.37	112.42
3	D	402	FAD	C9A-C5X-N5	-3.73	118.38	122.43
2	B	401	IVC	O17-C22-S1	-3.72	117.78	122.61
3	A	402	FAD	C9-C9A-C5X	-3.71	113.10	120.11
2	C	401	IVC	C13-C9-C10	3.71	115.25	108.82
3	D	402	FAD	O2-C2-N1	-3.64	115.79	121.83
3	C	402	FAD	C9A-N10-C10	-3.63	115.12	120.77
2	B	401	IVC	C23-C22-S1	3.63	118.11	113.63
3	C	402	FAD	C6-C5X-N5	3.62	124.84	118.51
3	C	402	FAD	C5X-C6-C7	3.60	127.31	120.71
3	C	402	FAD	O2-C2-N1	-3.58	115.90	121.83
3	D	402	FAD	O2B-C2B-C1B	3.57	124.03	110.85
3	A	402	FAD	C7M-C7-C8	3.55	128.01	120.74
3	D	402	FAD	C4X-C10-N1	-3.53	116.54	124.73

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	B	402	FAD	C7M-C7-C6	-3.53	112.97	119.49
3	D	402	FAD	C5X-N5-C4X	3.49	123.88	118.07
2	B	401	IVC	C13-C9-C10	3.48	114.86	108.82
3	C	402	FAD	C9-C8-C7	-3.42	114.77	119.67
2	B	401	IVC	P3-O7-P2	-3.39	121.18	132.83
3	A	402	FAD	C4X-C10-N10	3.39	121.43	116.48
2	A	401	IVC	C18-C19-N7	3.38	122.11	116.42
3	B	402	FAD	O4B-C1B-C2B	-3.34	102.05	106.93
3	B	402	FAD	C10-N1-C2	3.30	123.50	116.90
3	C	402	FAD	C9-C9A-C5X	-3.29	113.89	120.11
3	A	402	FAD	C4X-C10-N1	-3.26	117.17	124.73
3	D	402	FAD	O2B-C2B-C3B	3.16	122.04	111.82
3	D	402	FAD	C10-N1-C2	3.15	123.20	116.90
3	A	402	FAD	O2-C2-N1	-3.14	116.63	121.83
3	C	402	FAD	O4-C4-C4X	-3.10	118.36	126.60
2	D	401	IVC	C1-C2-C4	3.08	106.71	99.89
3	D	402	FAD	O2'-C2'-C3'	3.06	116.55	109.10
3	D	402	FAD	C4A-C5A-N7A	-3.06	106.21	109.40
3	C	402	FAD	C10-N1-C2	3.05	123.01	116.90
2	A	401	IVC	O16-C19-C18	-3.01	116.50	122.02
3	D	402	FAD	P-O3P-PA	-3.01	122.51	132.83
2	A	401	IVC	C24-C23-C22	2.97	125.99	114.55
3	D	402	FAD	C6-C7-C8	-2.95	115.44	119.67
3	C	402	FAD	C9A-C5X-N5	-2.93	119.25	122.43
3	B	402	FAD	C2A-N1A-C6A	2.92	123.75	118.75
2	C	401	IVC	C10-C16-N6	2.91	122.37	116.58
3	D	402	FAD	C9-C8-C7	2.89	123.81	119.67
3	B	402	FAD	C4-N3-C2	-2.87	120.34	125.64
3	D	402	FAD	C4-N3-C2	-2.87	120.35	125.64
3	A	402	FAD	C10-N1-C2	2.86	122.62	116.90
3	B	402	FAD	O4-C4-C4X	-2.83	119.09	126.60
3	C	402	FAD	C7M-C7-C8	2.82	126.52	120.74
3	B	402	FAD	C4A-C5A-N7A	-2.77	106.52	109.40
3	A	402	FAD	C4A-C5A-N7A	-2.77	106.52	109.40
3	C	402	FAD	P-O3P-PA	-2.74	123.42	132.83
3	B	402	FAD	C4X-C4-N3	2.67	119.97	113.19
3	C	402	FAD	C4X-C10-N1	-2.66	118.57	124.73
3	A	402	FAD	O4B-C1B-C2B	-2.62	103.10	106.93
3	D	402	FAD	C4X-C10-N10	2.57	120.24	116.48
3	B	402	FAD	C4X-C10-N10	2.57	120.24	116.48
3	C	402	FAD	C4-C4X-N5	2.56	121.87	118.23
3	C	402	FAD	C2A-N1A-C6A	2.54	123.10	118.75

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	401	IVC	C17-C18-C19	-2.53	108.14	112.36
3	B	402	FAD	O2A-PA-O1A	2.53	124.73	112.24
3	A	402	FAD	C4-N3-C2	-2.49	121.04	125.64
3	A	402	FAD	O4-C4-C4X	-2.49	120.00	126.60
2	A	401	IVC	C18-C17-N6	2.48	116.91	111.90
2	D	401	IVC	C26-C24-C23	2.48	121.22	111.22
2	B	401	IVC	C14-C9-C10	2.48	113.12	108.82
3	C	402	FAD	C4X-C10-N10	2.46	120.08	116.48
2	A	401	IVC	C1-C2-C4	2.46	105.35	99.89
3	A	402	FAD	O5'-C5'-C4'	2.45	115.90	109.36
3	A	402	FAD	P-O3P-PA	-2.43	124.47	132.83
3	D	402	FAD	C4-C4X-N5	2.43	121.69	118.23
2	B	401	IVC	C21-C20-N7	-2.43	107.32	112.42
3	C	402	FAD	C1B-N9A-C4A	-2.42	122.39	126.64
3	A	402	FAD	C4X-C4-N3	2.40	119.28	113.19
2	A	401	IVC	C25-C24-C23	2.39	120.85	111.22
3	A	402	FAD	O4'-C4'-C5'	-2.38	104.56	109.92
2	C	401	IVC	P3-O7-P2	-2.37	124.71	132.83
3	C	402	FAD	C4X-C4-N3	2.35	119.16	113.19
3	A	402	FAD	C8M-C8-C7	2.31	125.47	120.74
3	D	402	FAD	O3'-C3'-C4'	2.31	114.39	108.81
3	B	402	FAD	C9-C9A-N10	2.30	124.94	121.84
3	A	402	FAD	C8M-C8-C9	-2.30	115.25	119.49
3	D	402	FAD	C10-C4X-N5	-2.29	120.00	124.86
3	B	402	FAD	O2-C2-N1	-2.29	118.04	121.83
3	D	402	FAD	O4'-C4'-C5'	2.27	115.03	109.92
3	D	402	FAD	O4-C4-C4X	-2.27	120.58	126.60
2	D	401	IVC	C6-C8-N2	-2.25	107.05	109.40
3	C	402	FAD	O3B-C3B-C2B	-2.24	104.56	111.82
2	A	401	IVC	O4-C5-C3	-2.23	101.30	108.99
3	D	402	FAD	C9A-N10-C10	-2.20	117.34	120.77
2	C	401	IVC	C25-C24-C23	-2.19	102.38	111.22
2	A	401	IVC	C21-S1-C22	2.19	108.69	101.87
3	C	402	FAD	C4A-C5A-N7A	-2.17	107.14	109.40
3	B	402	FAD	C9A-N10-C10	-2.17	117.39	120.77
2	D	401	IVC	C13-C9-C10	2.16	112.56	108.82
2	D	401	IVC	C2-C1-C3	2.15	107.03	103.22
3	C	402	FAD	C6-C5X-C9A	-2.14	115.91	118.94
3	A	402	FAD	C2A-N1A-C6A	2.11	122.36	118.75
3	D	402	FAD	C5X-C9A-N10	2.11	120.13	117.95
2	B	401	IVC	C6-C8-N2	-2.10	107.21	109.40
3	C	402	FAD	C4-N3-C2	-2.09	121.78	125.64

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	402	FAD	C1'-N10-C9A	2.09	123.99	120.51
2	B	401	IVC	C20-N7-C19	-2.07	119.00	122.84
3	D	402	FAD	C4X-C4-N3	2.06	118.42	113.19
2	C	401	IVC	C1-C2-C4	2.06	104.44	99.89
3	C	402	FAD	O4B-C1B-C2B	-2.02	103.98	106.93
3	A	402	FAD	O3B-C3B-C2B	-2.01	105.33	111.82
3	D	402	FAD	C5'-C4'-C3'	-2.01	108.33	112.20

There are no chirality outliers.

All (94) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	401	IVC	O11-C10-C9-C11
2	A	401	IVC	C16-C10-C9-C11
2	A	401	IVC	O11-C10-C9-C13
2	A	401	IVC	C16-C10-C9-C13
2	A	401	IVC	O11-C10-C9-C14
2	A	401	IVC	C16-C10-C9-C14
2	A	401	IVC	N7-C20-C21-S1
2	A	401	IVC	O17-C22-S1-C21
2	A	401	IVC	C23-C22-S1-C21
2	B	401	IVC	C11-O8-P3-O7
2	B	401	IVC	C9-C10-C16-O15
2	B	401	IVC	C9-C10-C16-N6
2	B	401	IVC	O11-C10-C16-N6
2	B	401	IVC	C20-C21-S1-C22
2	B	401	IVC	O17-C22-S1-C21
2	B	401	IVC	C23-C22-S1-C21
2	C	401	IVC	O11-C10-C9-C11
2	C	401	IVC	C16-C10-C9-C11
2	C	401	IVC	O11-C10-C9-C13
2	C	401	IVC	C16-C10-C9-C13
2	C	401	IVC	N7-C20-C21-S1
2	C	401	IVC	O17-C22-S1-C21
2	C	401	IVC	C23-C22-S1-C21
2	C	401	IVC	S1-C22-C23-C24
2	D	401	IVC	C5-O4-P2-O7
2	D	401	IVC	O8-C11-C9-C13
2	D	401	IVC	O8-C11-C9-C10
2	D	401	IVC	N7-C20-C21-S1
2	D	401	IVC	O17-C22-S1-C21
2	D	401	IVC	C23-C22-S1-C21

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Mol	Chain	Res	Type	Atoms
2	D	401	IVC	O17-C22-C23-C24
3	A	402	FAD	C5B-O5B-PA-O3P
3	A	402	FAD	C3'-C4'-C5'-O5'
3	A	402	FAD	C5'-O5'-P-O3P
3	B	402	FAD	C5B-O5B-PA-O1A
3	B	402	FAD	C5B-O5B-PA-O3P
3	B	402	FAD	C5'-O5'-P-O1P
3	C	402	FAD	C5B-O5B-PA-O3P
3	D	402	FAD	N10-C1'-C2'-O2'
3	D	402	FAD	N10-C1'-C2'-C3'
3	D	402	FAD	C1'-C2'-C3'-O3'
3	D	402	FAD	C1'-C2'-C3'-C4'
3	D	402	FAD	C2'-C3'-C4'-C5'
3	D	402	FAD	O3'-C3'-C4'-O4'
3	D	402	FAD	O3'-C3'-C4'-C5'
3	D	402	FAD	C5'-O5'-P-O1P
3	D	402	FAD	C5'-O5'-P-O2P
2	D	401	IVC	C18-C19-N7-C20
2	A	401	IVC	C18-C17-N6-C16
2	A	401	IVC	O1-C3-C5-O4
3	D	402	FAD	O4B-C4B-C5B-O5B
3	D	402	FAD	C2'-C3'-C4'-O4'
2	D	401	IVC	O16-C19-N7-C20
2	A	401	IVC	C1-C3-C5-O4
3	B	402	FAD	C2'-C3'-C4'-C5'
3	D	402	FAD	O2'-C2'-C3'-O3'
2	D	401	IVC	O8-C11-C9-C14
3	B	402	FAD	C2'-C3'-C4'-O4'
3	D	402	FAD	O2'-C2'-C3'-C4'
2	B	401	IVC	O11-C10-C16-O15
2	C	401	IVC	O11-C10-C9-C14
2	C	401	IVC	O17-C22-C23-C24
3	B	402	FAD	O3'-C3'-C4'-C5'
2	C	401	IVC	N6-C17-C18-C19
2	A	401	IVC	C22-C23-C24-C25
3	B	402	FAD	C5'-O5'-P-O3P
2	C	401	IVC	C1-C3-C5-O4
3	D	402	FAD	C3B-C4B-C5B-O5B
2	D	401	IVC	P2-O7-P3-O13
2	B	401	IVC	C11-O8-P3-O13
2	D	401	IVC	C5-O4-P2-O12
3	A	402	FAD	C5B-O5B-PA-O1A

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms
3	A	402	FAD	C5'-O5'-P-O2P
3	B	402	FAD	C5'-O5'-P-O2P
3	C	402	FAD	C5B-O5B-PA-O1A
2	B	401	IVC	N7-C20-C21-S1
3	B	402	FAD	O3'-C3'-C4'-O4'
2	B	401	IVC	O8-C11-C9-C13
2	B	401	IVC	O8-C11-C9-C14
2	C	401	IVC	O1-C3-C5-O4
2	C	401	IVC	C20-C21-S1-C22
2	A	401	IVC	C1-O2-P1-O5
3	A	402	FAD	O4'-C4'-C5'-O5'
2	B	401	IVC	C22-C23-C24-C26
2	C	401	IVC	C16-C10-C9-C14
2	A	401	IVC	C1-O2-P1-O9
3	D	402	FAD	C5'-O5'-P-O3P
2	D	401	IVC	P2-O7-P3-O14
2	D	401	IVC	C9-C11-O8-P3
3	D	402	FAD	C4B-C5B-O5B-PA
2	A	401	IVC	C11-O8-P3-O13
3	A	402	FAD	C5'-O5'-P-O1P
3	A	402	FAD	N10-C1'-C2'-O2'
3	D	402	FAD	O4'-C4'-C5'-O5'

There are no ring outliers.

8 monomers are involved in 101 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	401	IVC	12	0
2	D	401	IVC	29	0
2	B	401	IVC	12	0
3	A	402	FAD	8	0
3	C	402	FAD	10	0
2	A	401	IVC	13	0
3	D	402	FAD	12	0
3	B	402	FAD	11	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be

highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

Ligand IVC C 401

Bond lengths

Bond angles

Torsions

Rings

Ligand IVC D 401

Bond lengths

Bond angles

Torsions

Rings

Ligand IVC B 401

Bond lengths

Bond angles

Torsions

Rings

Ligand FAD A 402

Bond lengths

Bond angles

Torsions

Rings

Ligand FAD C 402

Bond lengths

Bond angles

Torsions

Rings

Ligand IVC A 401

Bond lengths

Bond angles

Torsions

Rings

Ligand FAD D 402

Bond lengths

Bond angles

Torsions

Rings

Ligand FAD B 402

Bond lengths

Bond angles

Torsions

Rings

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Map visualisation ⓘ

This section contains visualisations of the EMDB entry EMD-61723. 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 ⓘ
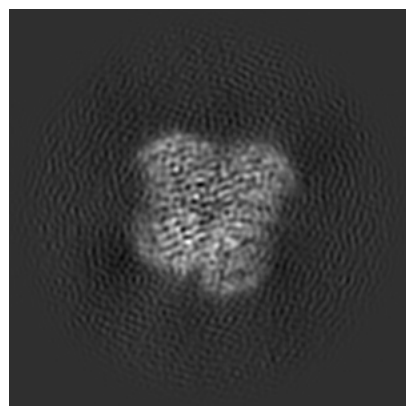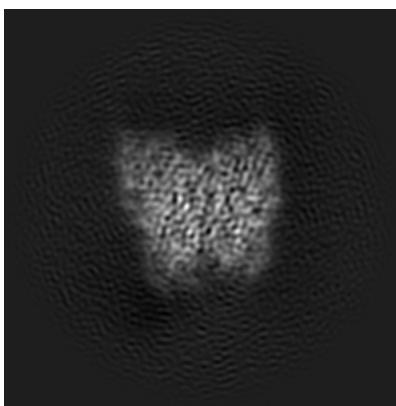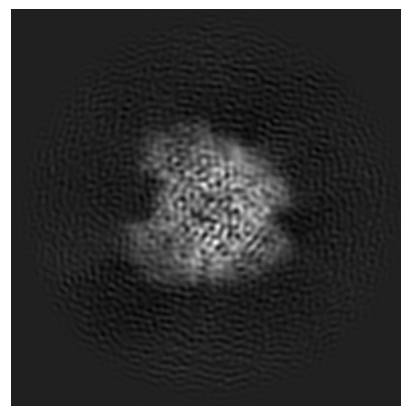
6.1.1 Primary map

X　　　　　Y　　　　　Z

6.1.2 Raw map

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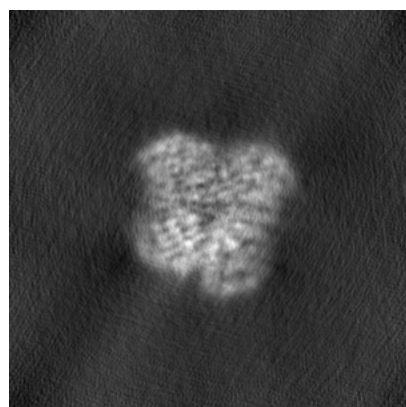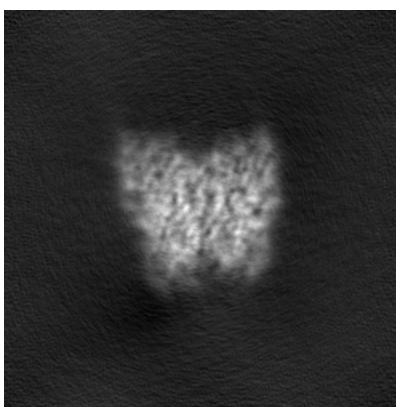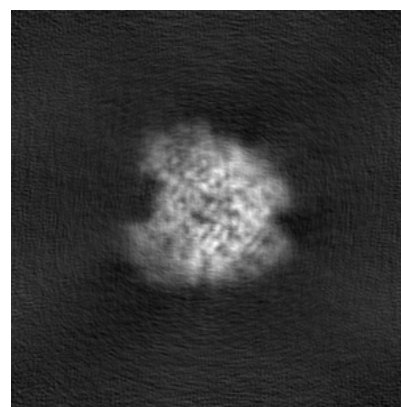
The images above show the map projected in three orthogonal directions.

6.2 Central slices ⓘ
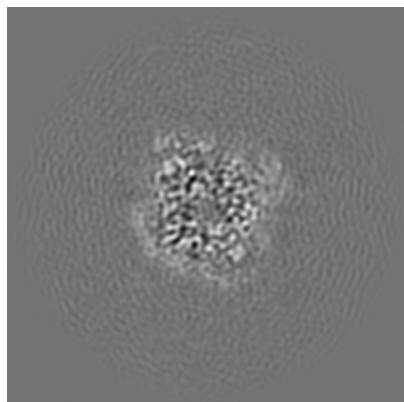
6.2.1 Primary map
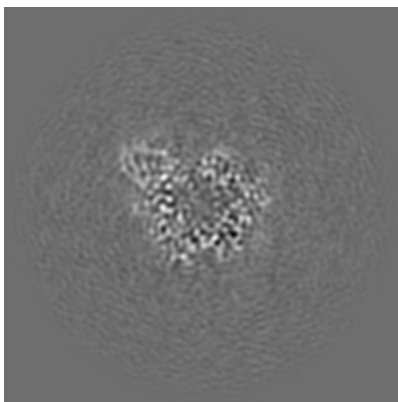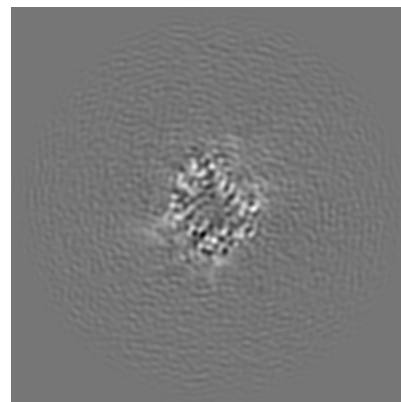
X Index: 128	Y Index: 128	Z Index: 128

6.2.2 Raw map
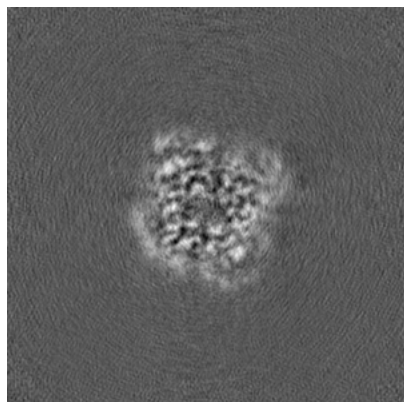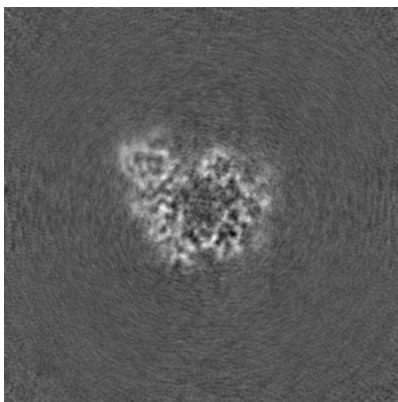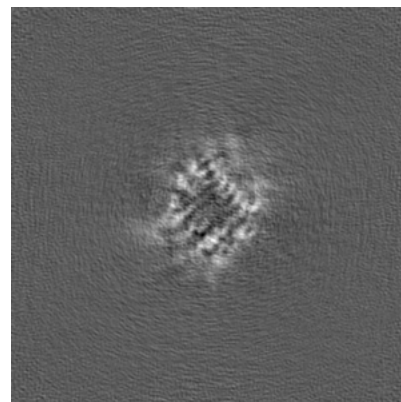
X Index: 128	Y Index: 128	Z Index: 128

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

6.3　Largest variance slices (i)

6.3.1　Primary map
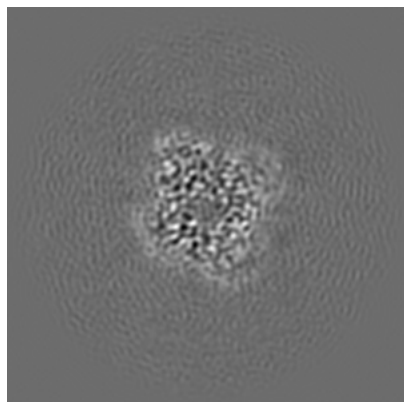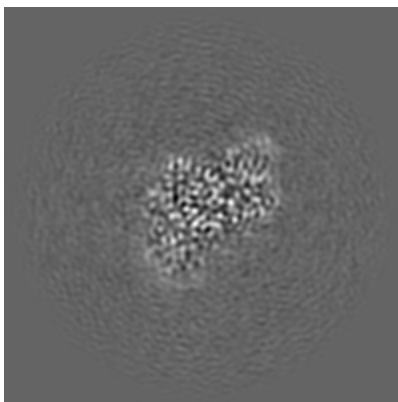
| X Index: 129 | Y Index: 114 | Z Index: 144 |
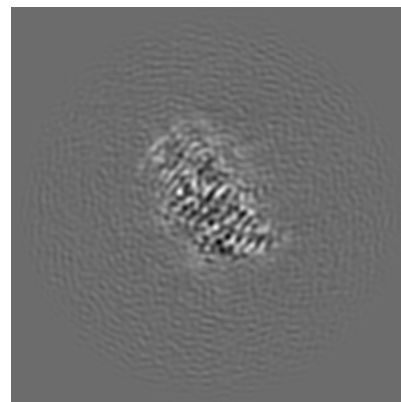
6.3.2　Raw map
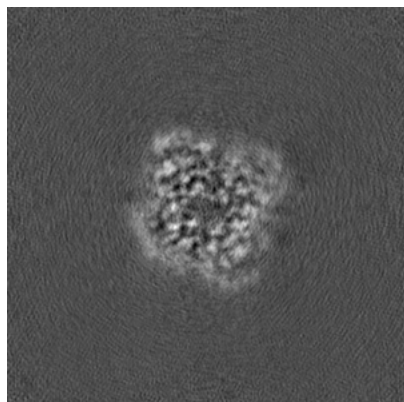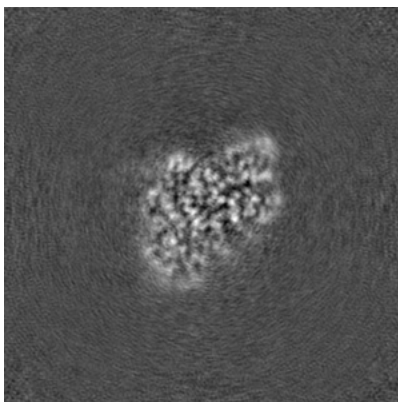
| X Index: 129 | Y Index: 115 | Z Index: 112 |
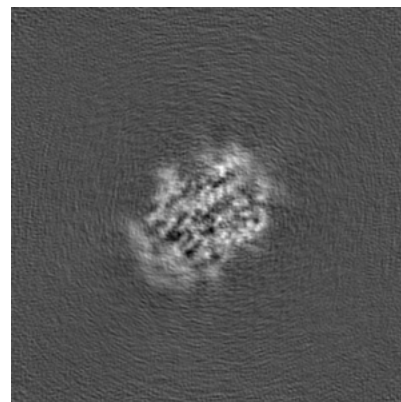
The images above show the largest variance slices of the map in three orthogonal directions.

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

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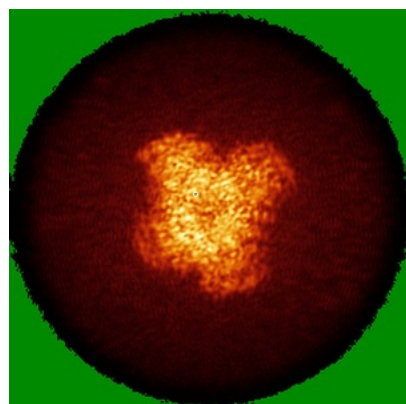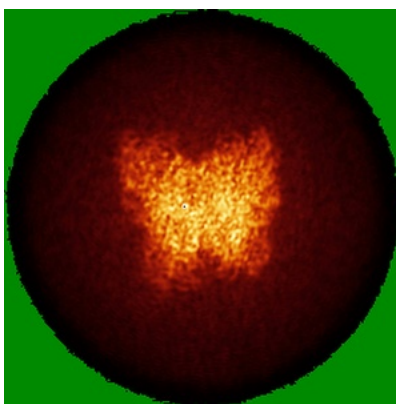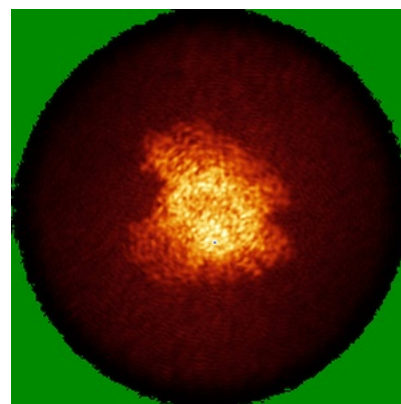
6.4.2 Raw map
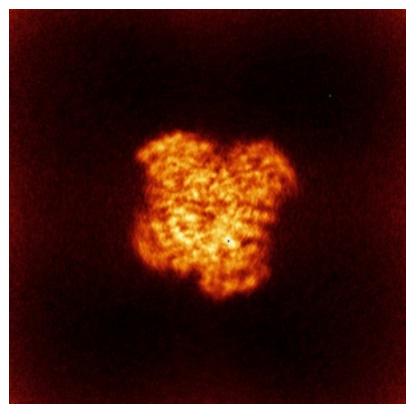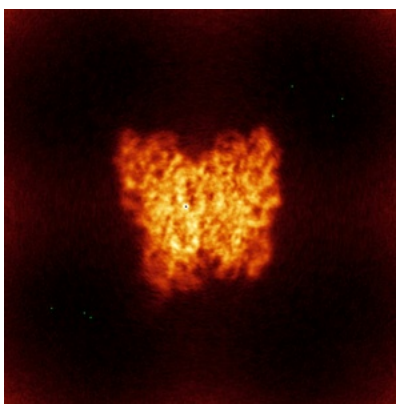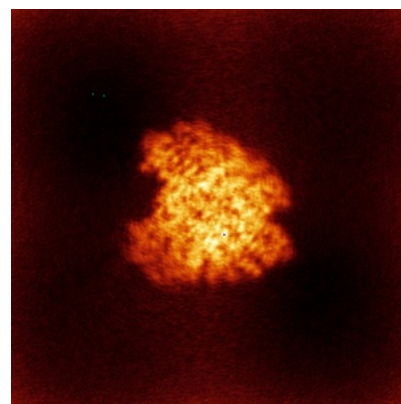
The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

6.5 Orthogonal surface views (i)

6.5.1 Primary map

X Y Z
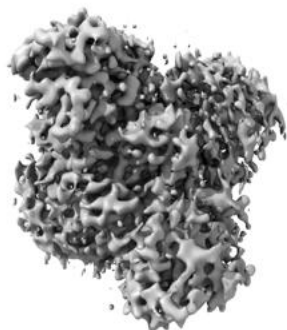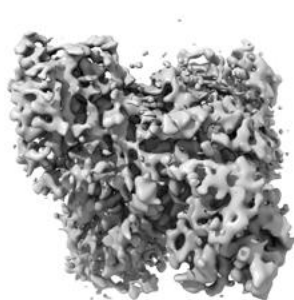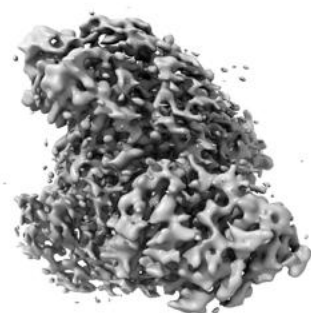
The images above show the 3D surface view of the map at the recommended contour level 0.3. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 Raw map

X Y Z

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 ⓘ

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

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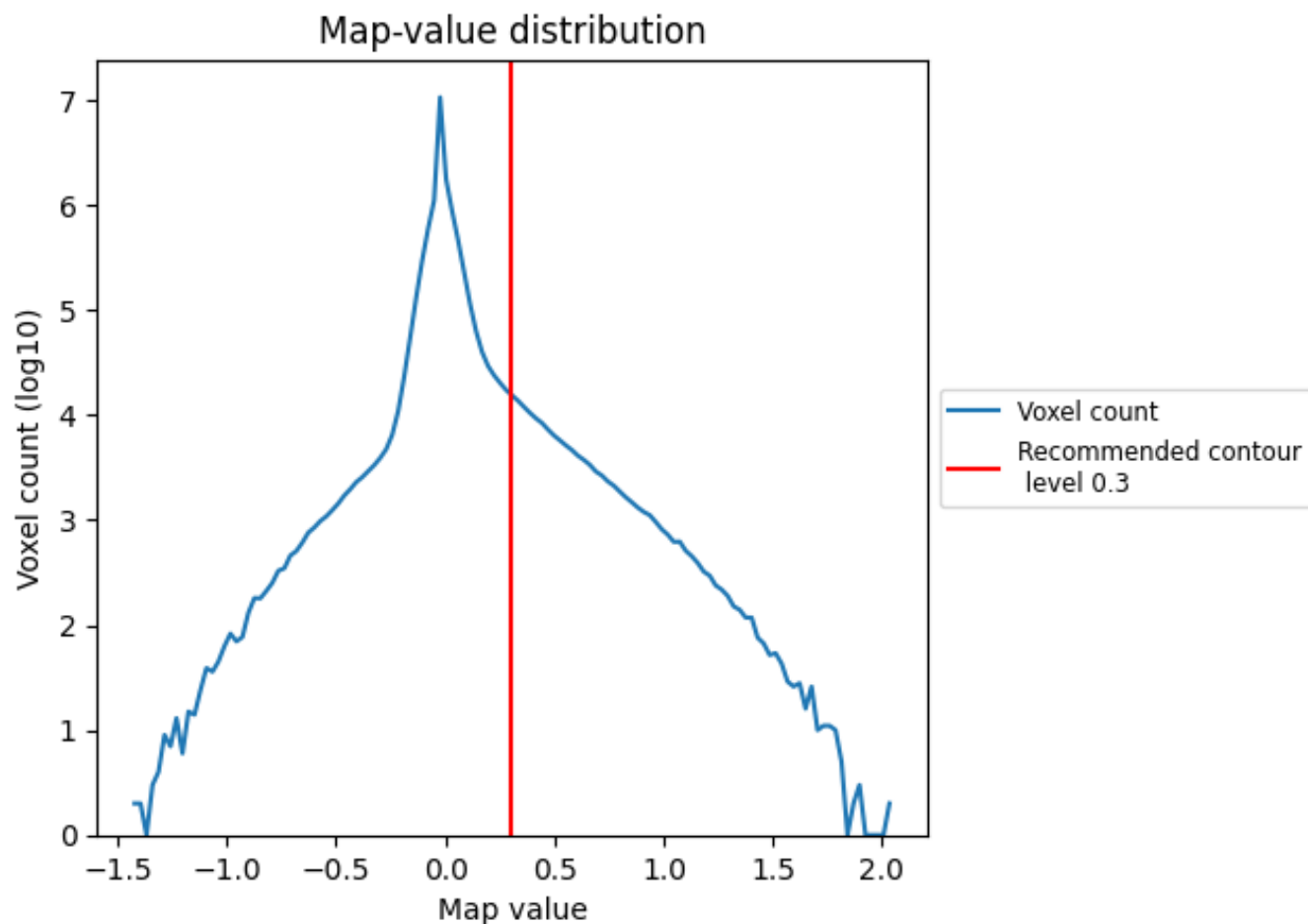
The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

7.2   Volume estimate ⓘ
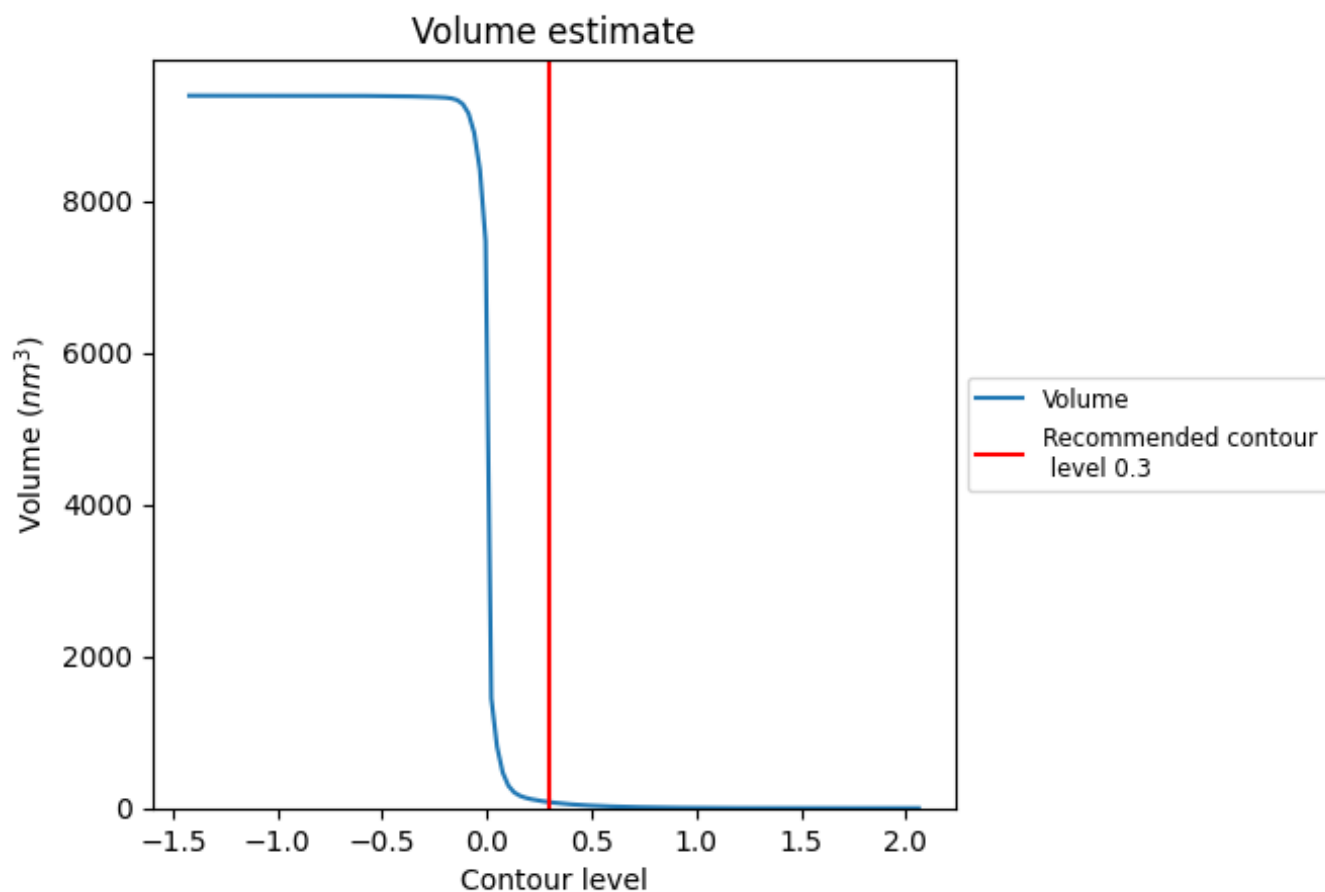
The volume at the recommended contour level is 78 nm^3; this corresponds to an approximate mass of 71 kDa.

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 ⓘ
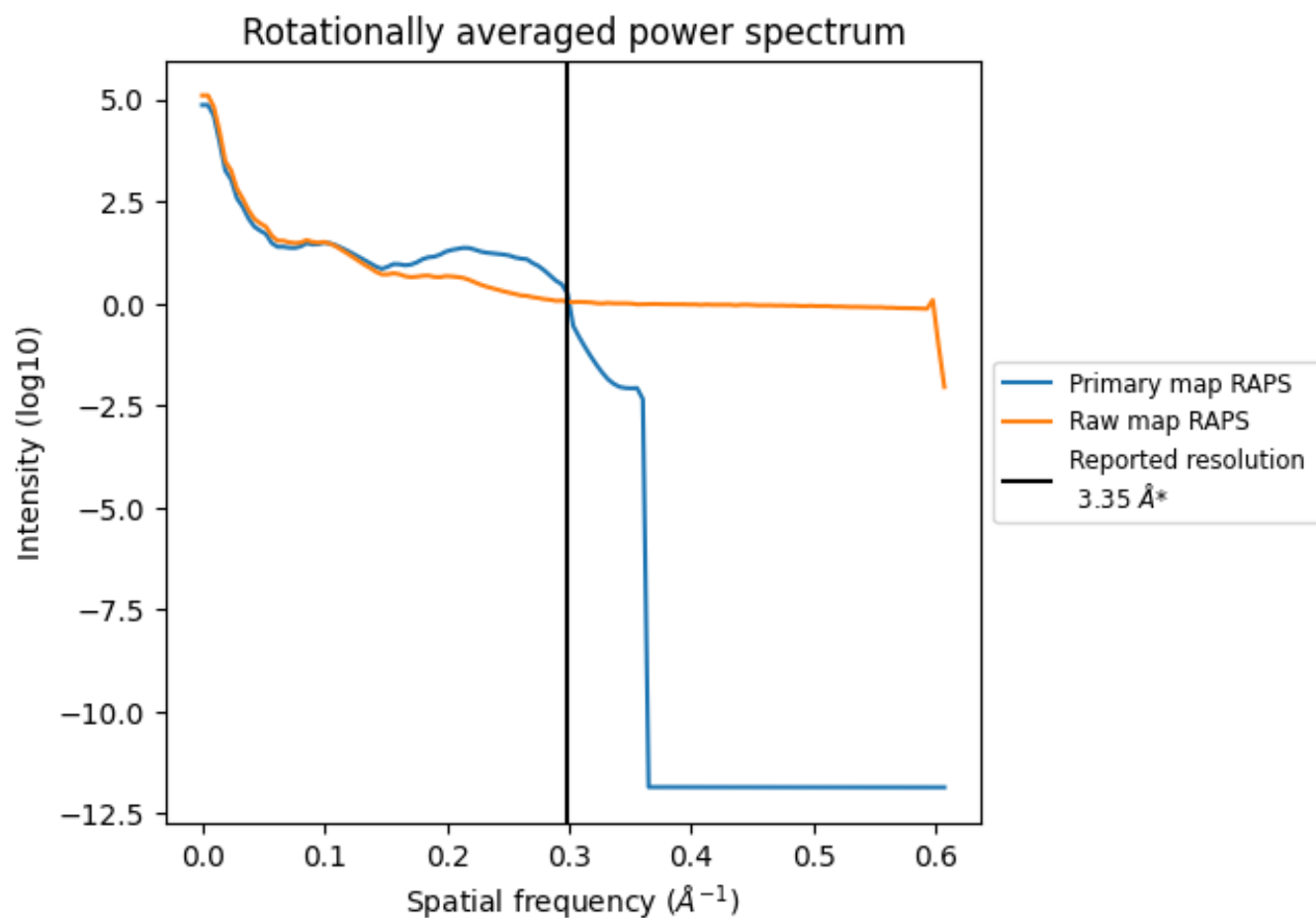
*Reported resolution corresponds to spatial frequency of 0.299 Å^{-1}

8 Fourier-Shell correlation ⓘ

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 ⓘ
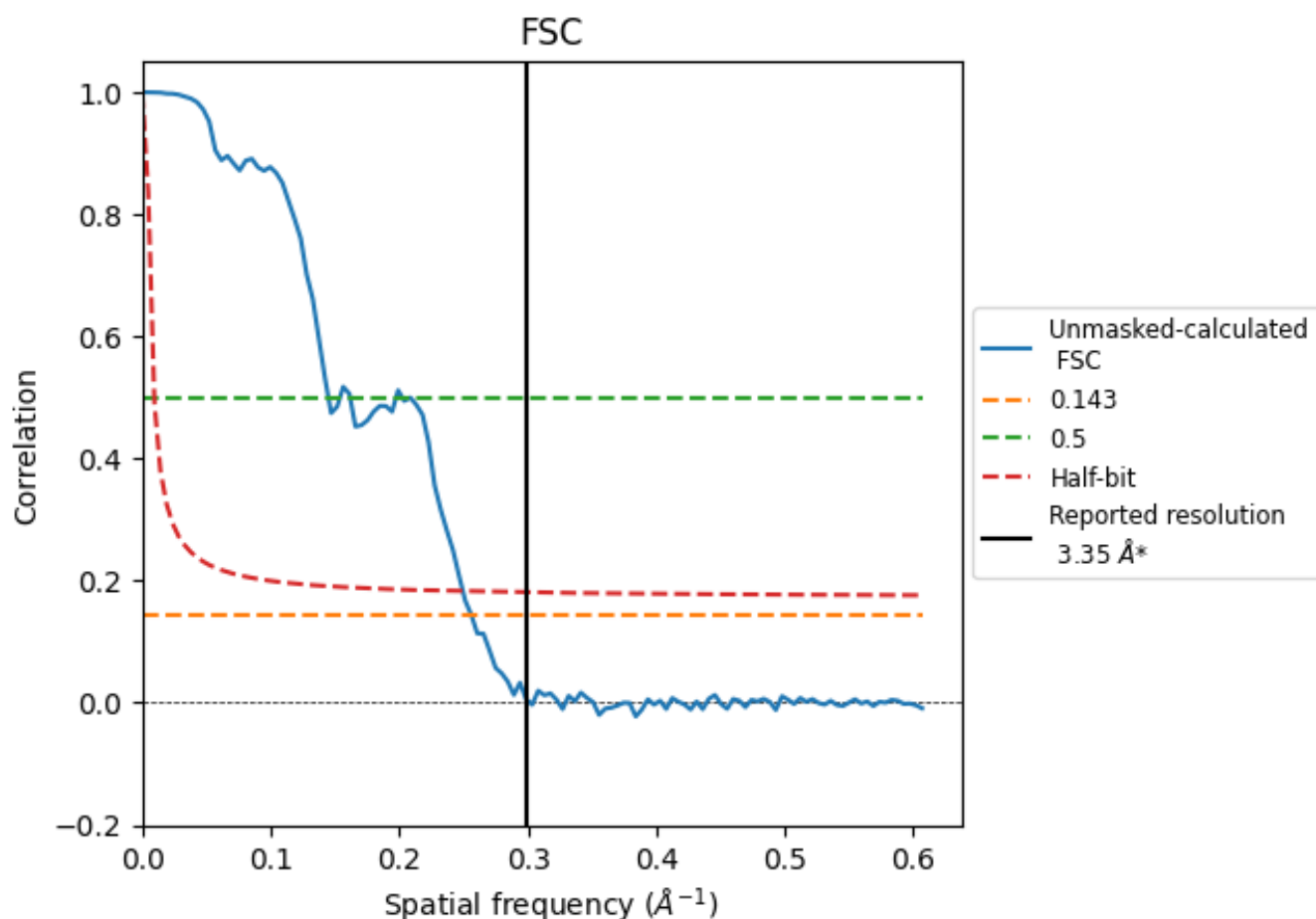
*Reported resolution corresponds to spatial frequency of 0.299 Å^{-1}

8.2　Resolution estimates ⓘ

Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.35	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	3.90	6.91	4.01

*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 3.90 differs from the reported value 3.35 by more than 10 %

9 Map-model fit ⓘ

This section contains information regarding the fit between EMDB map EMD-61723 and PDB model 9JQ5. Per-residue inclusion information can be found in section 3 on page 5.
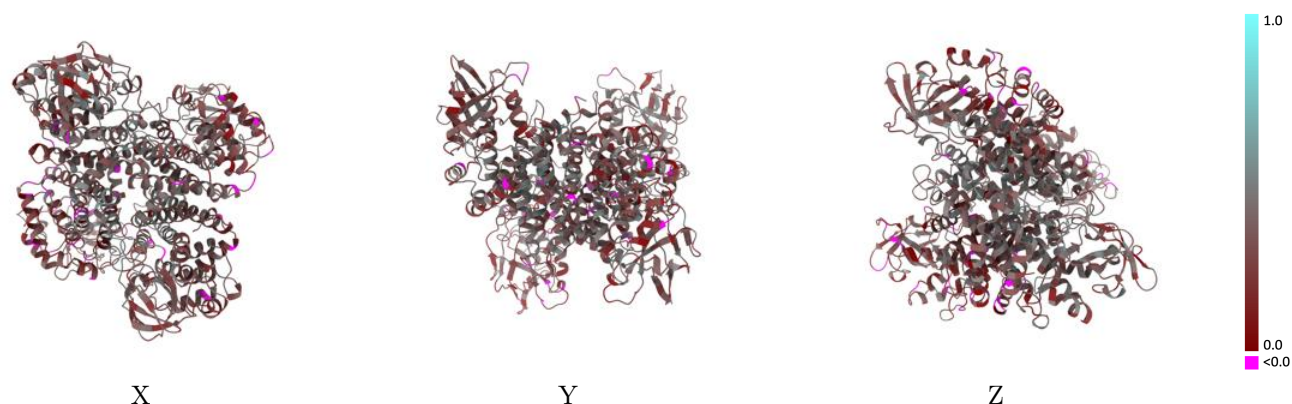
9.1 Map-model overlay ⓘ
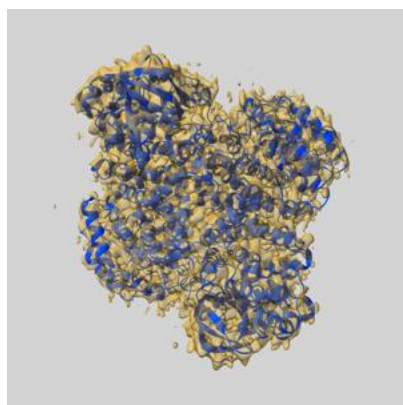
| X | Y | Z |
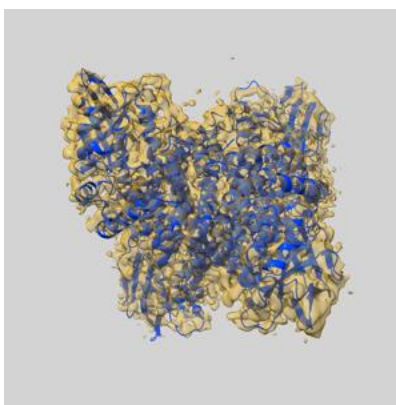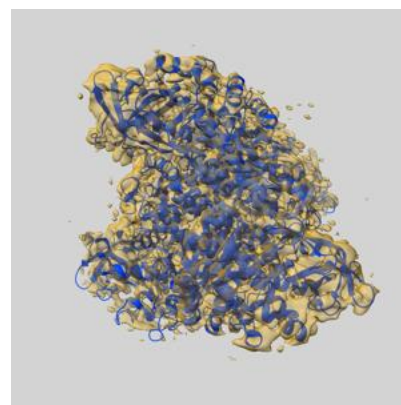
The images above show the 3D surface view of the map at the recommended contour level 0.3 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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
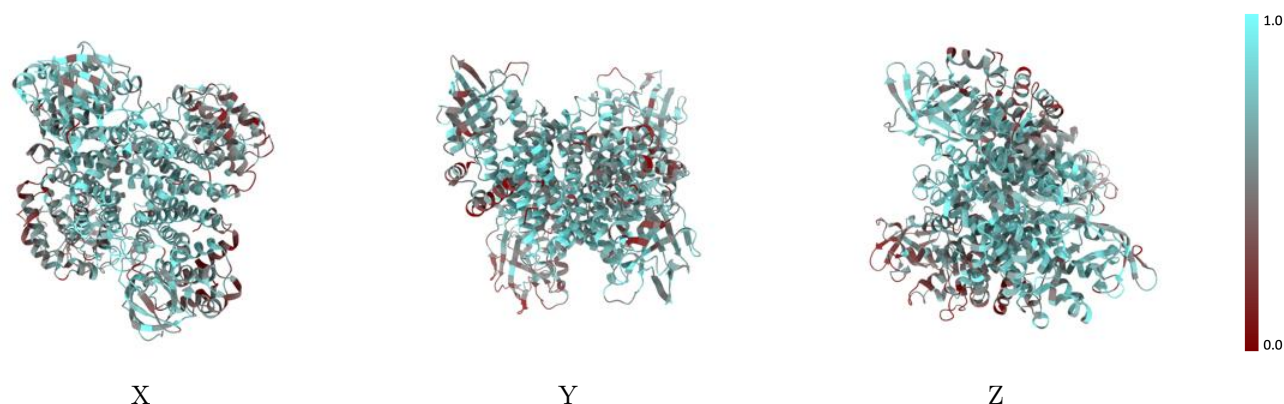
The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.3).

9.4   Atom inclusion ⓘ
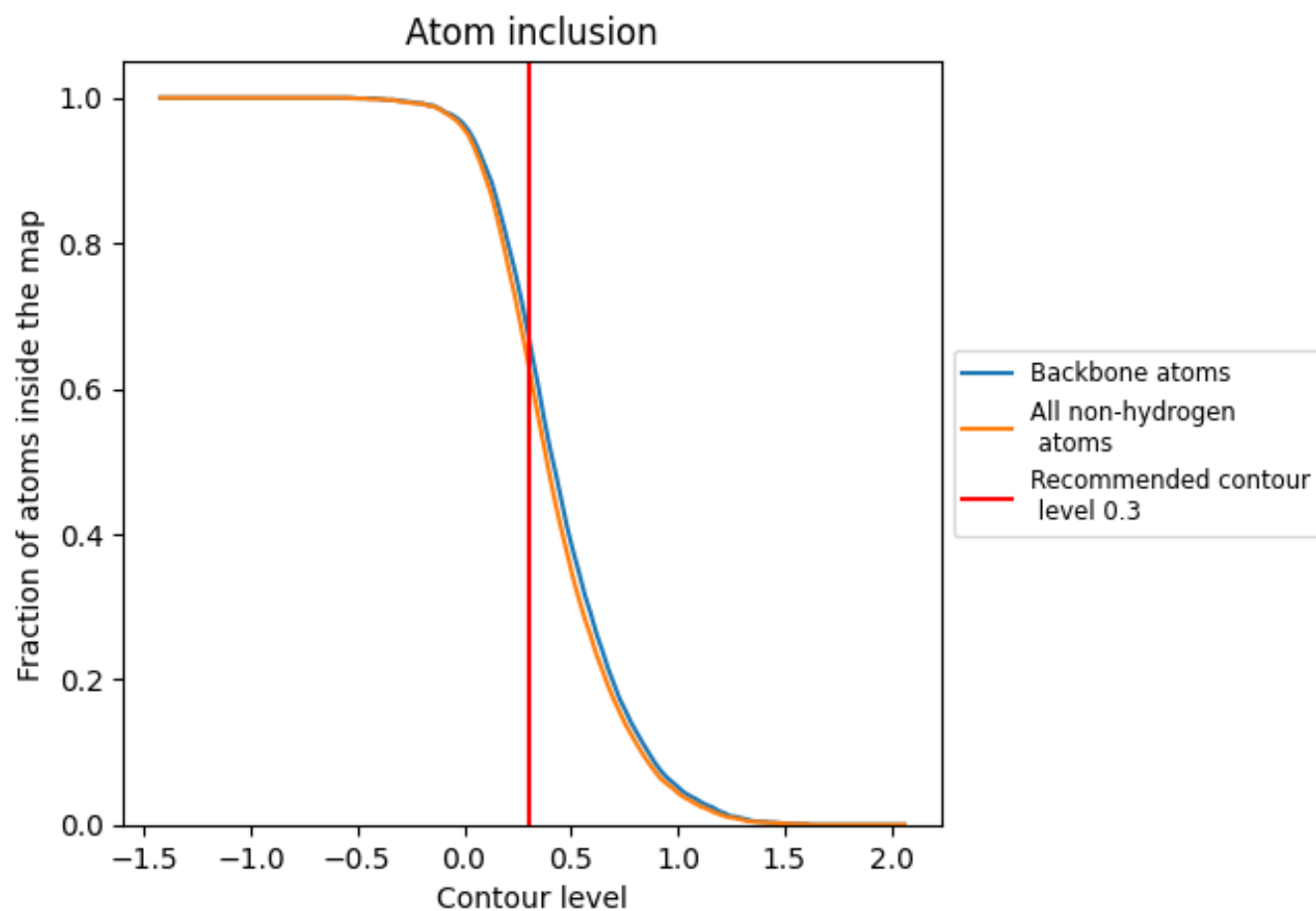
At the recommended contour level, 68% of all backbone atoms, 64% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary (i)

The table lists the average atom inclusion at the recommended contour level (0.3) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.6350	0.3280
A	0.7030	0.3690
B	0.6490	0.3320
C	0.6550	0.3500
D	0.5370	0.2590

1.0

0.0
<0.0