



Full wwPDB EM Validation Report ⓘ

Mar 22, 2026 – 06:01 PM UTC

PDB ID : 7AHD / pdb_00007ahd
EMDB ID : EMD-11783
Title : OpuA (E190Q) occluded
Authors : Sikkema, H.R.; Rheinberger, J.; Paulino, C.; Poolman, B.
Deposited on : 2020-09-24
Resolution : 3.40 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
Mogul : 2022.3.0, CSD as543be (2022)
MolProbity : 4-5-2 with Phenix2.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
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

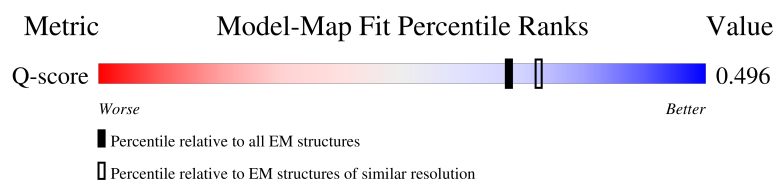
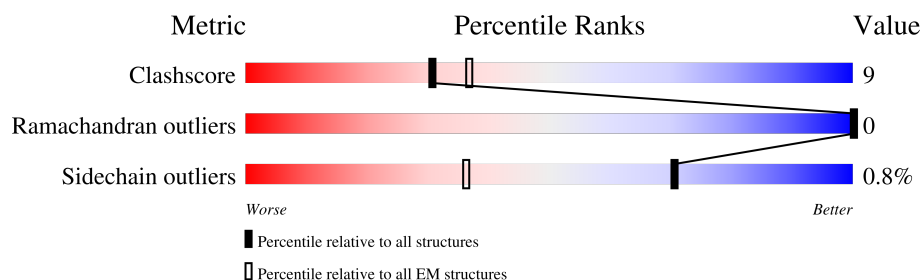
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.40 Å.

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



Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	229148	23984	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
Q-score	-	25397	14717 (2.90 - 3.90)

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	C	408	9% 51% 12% 36%
1	D	408	10% 51% 12% 36%
2	A	585	19% 70% 23% 6%
2	B	585	6% 39% 11% 50%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 10562 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 ABC-type proline/glycine betaine transport system ATPase component.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	C	260	Total	C	N	O	S	0	0
			2069	1309	362	389	9		
1	D	260	Total	C	N	O	S	0	0
			2069	1309	362	389	9		

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	1	MET	-	initiating methionine	UNP A0A0R2NIU5
C	2	ALA	-	expression tag	UNP A0A0R2NIU5
C	190	GLN	GLU	engineered mutation	UNP A0A0R2NIU5
D	1	MET	-	initiating methionine	UNP A0A0R2NIU5
D	2	ALA	-	expression tag	UNP A0A0R2NIU5
D	190	GLN	GLU	engineered mutation	UNP A0A0R2NIU5

- Molecule 2 is a protein called ABC transporter permease subunit.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	A	547	Total	C	N	O	S	0	0
			4170	2712	680	757	21		
2	B	294	Total	C	N	O	S	0	0
			2184	1450	347	376	11		

There are 24 discrepancies between the modelled and reference sequences:

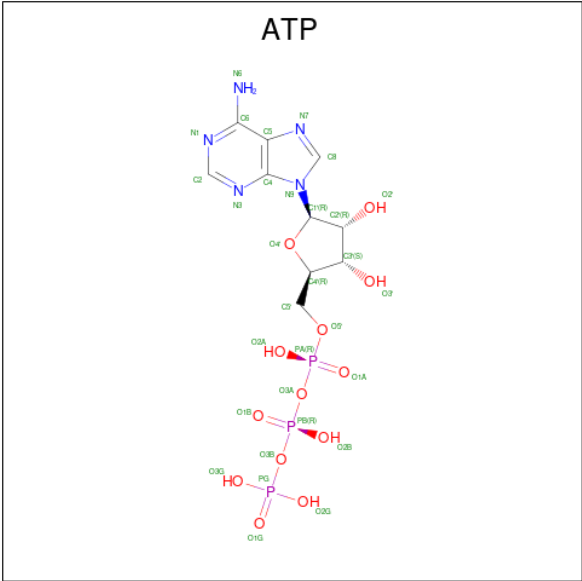
Chain	Residue	Modelled	Actual	Comment	Reference
A	574	GLY	-	expression tag	UNP A0A0V8ETW8
A	575	SER	-	expression tag	UNP A0A0V8ETW8
A	576	ILE	-	expression tag	UNP A0A0V8ETW8
A	577	GLU	-	expression tag	UNP A0A0V8ETW8
A	578	GLY	-	expression tag	UNP A0A0V8ETW8
A	579	ARG	-	expression tag	UNP A0A0V8ETW8

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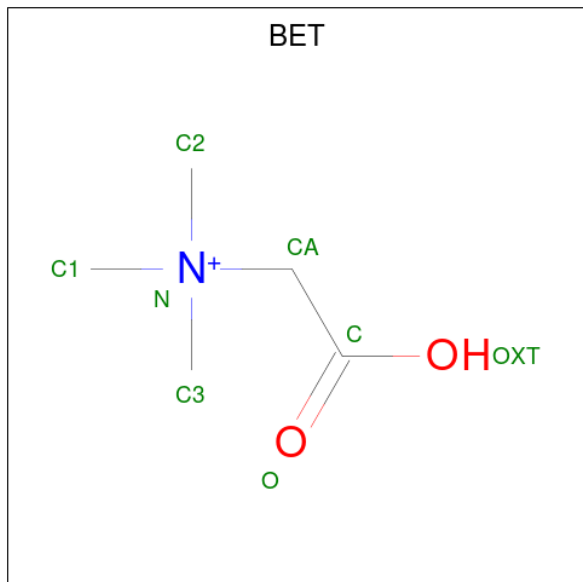
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Chain	Residue	Modelled	Actual	Comment	Reference
A	580	HIS	-	expression tag	UNP A0A0V8ETW8
A	581	HIS	-	expression tag	UNP A0A0V8ETW8
A	582	HIS	-	expression tag	UNP A0A0V8ETW8
A	583	HIS	-	expression tag	UNP A0A0V8ETW8
A	584	HIS	-	expression tag	UNP A0A0V8ETW8
A	585	HIS	-	expression tag	UNP A0A0V8ETW8
B	574	GLY	-	expression tag	UNP A0A0V8ETW8
B	575	SER	-	expression tag	UNP A0A0V8ETW8
B	576	ILE	-	expression tag	UNP A0A0V8ETW8
B	577	GLU	-	expression tag	UNP A0A0V8ETW8
B	578	GLY	-	expression tag	UNP A0A0V8ETW8
B	579	ARG	-	expression tag	UNP A0A0V8ETW8
B	580	HIS	-	expression tag	UNP A0A0V8ETW8
B	581	HIS	-	expression tag	UNP A0A0V8ETW8
B	582	HIS	-	expression tag	UNP A0A0V8ETW8
B	583	HIS	-	expression tag	UNP A0A0V8ETW8
B	584	HIS	-	expression tag	UNP A0A0V8ETW8
B	585	HIS	-	expression tag	UNP A0A0V8ETW8

- Molecule 3 is ADENOSINE-5'-TRIPHOSPHATE (CCD ID: ATP) (formula: C₁₀H₁₆N₅O₁₃P₃).

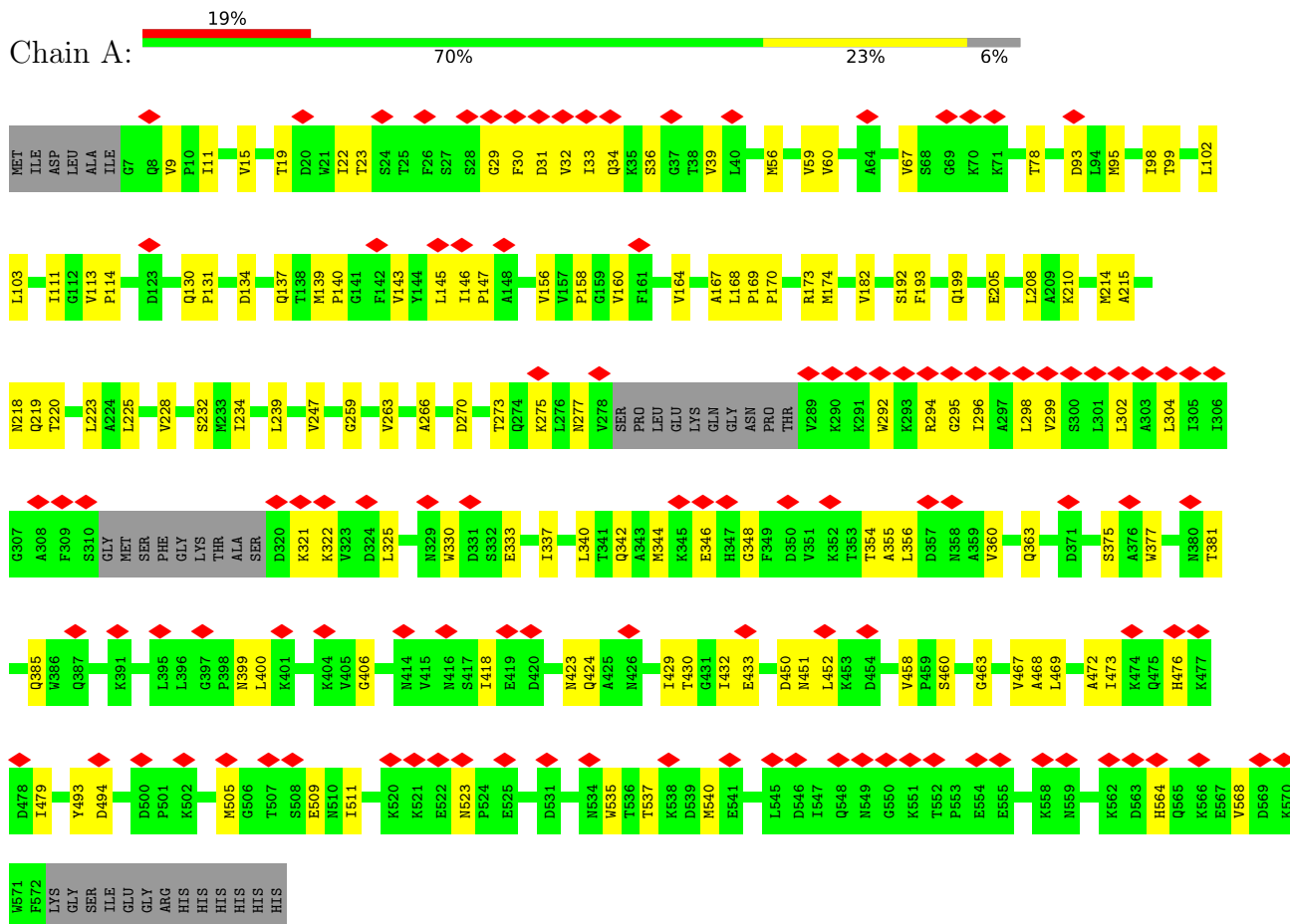


- Molecule 4 is TRIMETHYL GLYCINE (CCD ID: BET) (formula: $C_5H_{12}NO_2$) (labeled as "Ligand of Interest" by depositor).

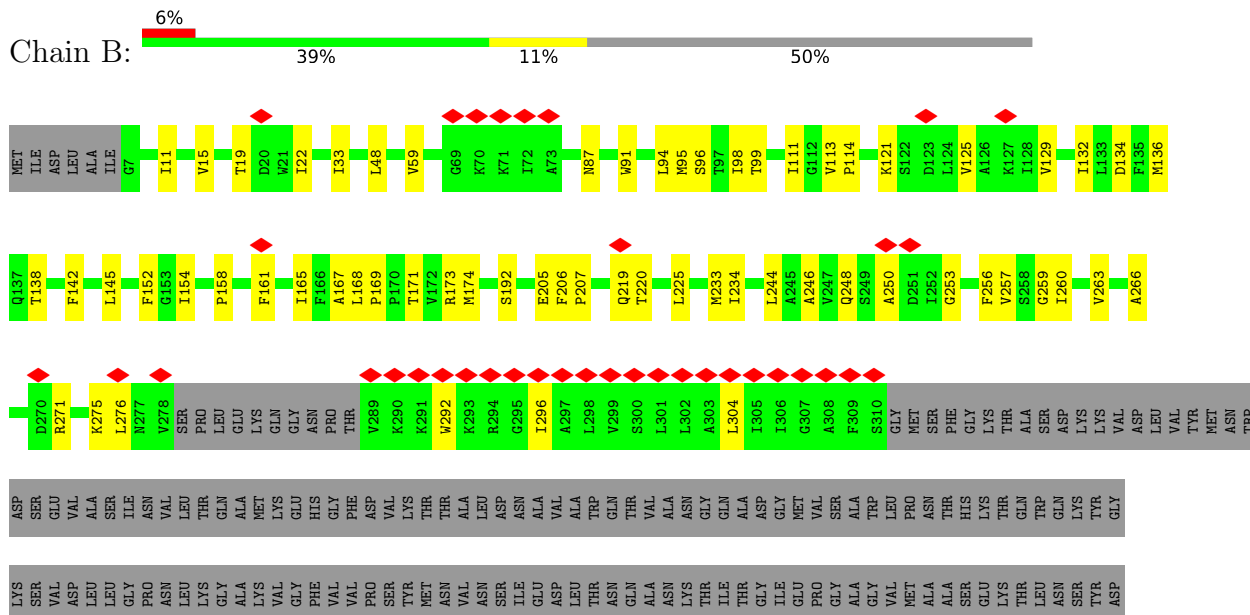


Mol	Chain	Residues	Atoms				AltConf
			Total	C	N	O	
4	B	1	8	5	1	2	0

Chain A:



Chain B:



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

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	90870	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TALOS ARCTICA	Depositor
Voltage (kV)	200	Depositor
Electron dose ($e^-/\text{\AA}^2$)	53	Depositor
Minimum defocus (nm)	500	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	49407	Depositor
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	0.188	Depositor
Minimum map value	-0.092	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.005	Depositor
Recommended contour level	0.051	Depositor
Map size (Å)	259.072, 259.072, 259.072	wwPDB
Map dimensions	256, 256, 256	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.012, 1.012, 1.012	Depositor

5 Model quality [i](#)

5.1 Standard geometry [i](#)

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

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	C	0.32	0/2094	0.53	1/2811 (0.0%)
1	D	0.32	0/2094	0.52	1/2811 (0.0%)
2	A	0.24	0/4256	0.37	0/5781
2	B	0.25	0/2225	0.35	0/3027
All	All	0.27	0/10669	0.43	2/14430 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	226	ASN	CA-C-O	-5.15	115.15	120.92
1	C	226	ASN	CA-C-O	-5.05	115.26	120.92

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	C	2069	0	2146	30	0
1	D	2069	0	2146	37	0
2	A	4170	0	4316	96	0
2	B	2184	0	2351	45	0
3	C	31	0	12	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	D	31	0	12	1	0
4	B	8	0	11	1	0
All	All	10562	0	10994	192	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 9.

All (192) 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:A:139:MET:HE3	2:A:143:VAL:HG21	1.36	1.04
2:A:214:MET:HE1	2:A:273:THR:HG22	1.38	1.01
2:B:225:LEU:HD13	2:B:266:ALA:HB2	1.70	0.74
2:A:134:ASP:OD1	2:A:173:ARG:NH1	2.22	0.73
1:C:19:LYS:O	1:C:23:THR:HG23	1.89	0.72
1:D:19:LYS:O	1:D:23:THR:HG23	1.89	0.72
2:A:385:GLN:NE2	2:B:248:GLN:O	2.23	0.71
1:D:7:ILE:HD11	1:D:74:LEU:HD21	1.72	0.70
1:C:7:ILE:HD11	1:C:74:LEU:HD21	1.72	0.70
2:A:259:GLY:O	2:A:263:VAL:HG23	1.91	0.70
1:D:76:ARG:HH21	1:D:100:LEU:HD22	1.58	0.68
1:C:76:ARG:HH21	1:C:100:LEU:HD22	1.58	0.68
2:B:259:GLY:O	2:B:263:VAL:HG23	1.92	0.68
2:B:33:ILE:HD11	2:B:152:PHE:CE1	2.32	0.65
1:D:123:ILE:HD12	1:D:173:VAL:HG21	1.77	0.65
1:D:246:ILE:HG22	1:D:246:ILE:O	1.97	0.65
1:C:246:ILE:O	1:C:246:ILE:HG22	1.97	0.65
1:C:123:ILE:HD12	1:C:173:VAL:HG21	1.77	0.64
2:A:321:LYS:NZ	2:A:348:GLY:O	2.22	0.64
2:B:292:TRP:CD1	2:B:296:ILE:HD11	2.33	0.64
2:A:400:LEU:HD11	2:A:537:THR:HA	1.80	0.63
2:A:424:GLN:OE1	2:A:424:GLN:N	2.31	0.62
2:A:139:MET:HE3	2:A:143:VAL:CG2	2.22	0.61
2:B:134:ASP:OD1	2:B:173:ARG:NH1	2.33	0.61
2:A:137:GLN:NE2	2:B:219:GLN:OE1	2.33	0.61
1:D:208:LEU:HD11	1:D:231:ILE:HG22	1.83	0.60
1:C:208:LEU:HD11	1:C:231:ILE:HG22	1.83	0.60
1:C:202:GLU:O	1:C:206:GLU:HG2	2.01	0.60
2:A:146:ILE:HG23	2:A:363:GLN:OE1	2.00	0.60
2:A:225:LEU:HD13	2:A:266:ALA:HB2	1.83	0.60
1:C:172:ARG:NH2	1:D:63:SER:OG	2.35	0.60

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:A:182:VAL:HG11	2:A:205:GLU:OE1	2.01	0.60
2:B:59:VAL:HG21	2:B:304:LEU:HD21	1.83	0.60
2:B:253:GLY:O	2:B:257:VAL:HG23	2.01	0.60
2:A:333:GLU:OE2	2:A:377:TRP:NE1	2.36	0.59
1:C:63:SER:OG	1:D:172:ARG:NH2	2.36	0.59
2:A:59:VAL:HG21	2:A:304:LEU:CD2	2.33	0.58
2:A:218:ASN:ND2	2:A:270:ASP:OD2	2.36	0.58
2:A:59:VAL:HG21	2:A:304:LEU:HD21	1.85	0.58
2:A:325:LEU:HD13	2:A:337:ILE:HD11	1.86	0.57
1:C:7:ILE:HD12	1:C:49:PHE:CZ	2.41	0.56
2:A:295:GLY:O	2:A:299:VAL:HG23	2.04	0.56
1:C:42:VAL:HG13	1:C:42:VAL:O	2.06	0.56
1:D:48:ASN:C	1:D:48:ASN:OD1	2.48	0.56
2:A:60:VAL:HG12	2:A:78:THR:HG21	1.88	0.55
2:B:276:LEU:O	2:B:276:LEU:HD23	2.06	0.55
1:D:7:ILE:HD12	1:D:49:PHE:CZ	2.41	0.55
1:D:42:VAL:O	1:D:42:VAL:HG13	2.06	0.55
2:A:473:ILE:HG21	2:A:493:TYR:HD1	1.71	0.55
2:A:418:ILE:O	2:A:451:ASN:ND2	2.39	0.55
2:A:56:MET:O	2:A:60:VAL:HG23	2.06	0.55
1:C:75:ASN:ND2	2:B:192:SER:OG	2.40	0.55
1:D:192:PHE:O	1:D:200:ARG:NH2	2.40	0.55
2:A:9:VAL:HG23	2:B:87:ASN:ND2	2.22	0.54
2:A:30:PHE:HA	2:A:33:ILE:HG12	1.89	0.54
1:C:192:PHE:O	1:C:200:ARG:NH2	2.40	0.54
2:A:473:ILE:HG21	2:A:493:TYR:CD1	2.43	0.54
2:A:99:THR:O	2:A:103:LEU:HD23	2.07	0.54
2:A:451:ASN:OD1	2:A:452:LEU:N	2.41	0.54
2:A:193:PHE:O	1:D:133:VAL:HG21	2.08	0.54
2:A:266:ALA:HB2	2:B:138:THR:HG21	1.90	0.54
1:D:87:ILE:HD12	1:D:92:VAL:HG11	1.90	0.54
1:C:87:ILE:HD12	1:C:92:VAL:HG11	1.90	0.53
2:A:19:THR:O	2:A:23:THR:HG22	2.09	0.53
2:A:342:GLN:O	2:A:346:GLU:OE1	2.27	0.53
1:D:234:ARG:HE	1:D:246:ILE:HG22	1.74	0.53
2:A:381:THR:OG1	2:A:509:GLU:OE2	2.26	0.53
1:C:234:ARG:HE	1:C:246:ILE:HG22	1.74	0.52
2:A:458:VAL:O	2:A:458:VAL:HG23	2.08	0.52
2:A:450:ASP:OD1	2:A:451:ASN:N	2.42	0.52
2:B:121:LYS:NZ	2:B:205:GLU:OE1	2.42	0.52
2:A:168:LEU:N	2:A:169:PRO:CD	2.74	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:A:322:LYS:O	2:A:523:ASN:ND2	2.43	0.51
1:D:101:LEU:HD23	1:D:105:ARG:NE	2.25	0.51
1:C:101:LEU:HD23	1:C:105:ARG:NE	2.25	0.51
2:A:400:LEU:HD13	2:A:540:MET:HE3	1.93	0.51
1:D:248:THR:HG23	1:D:249:GLY:N	2.26	0.51
1:C:248:THR:HG23	1:C:249:GLY:N	2.26	0.51
2:B:246:ALA:O	2:B:250:ALA:N	2.44	0.51
2:B:154:ILE:HD12	2:B:154:ILE:H	1.76	0.51
2:B:171:THR:OG1	2:B:220:THR:OG1	2.25	0.50
2:A:174:MET:HE2	2:B:174:MET:SD	2.51	0.50
2:A:463:GLY:O	2:A:467:VAL:HG23	2.12	0.50
2:A:31:ASP:O	2:A:34:GLN:HG2	2.11	0.50
2:A:29:GLY:O	2:A:32:VAL:HG12	2.11	0.50
1:D:225:LEU:HD11	1:D:261:VAL:HG12	1.93	0.50
2:B:19:THR:HA	2:B:22:ILE:HG22	1.92	0.50
2:B:167:ALA:HB1	2:B:220:THR:HG23	1.93	0.50
2:B:132:ILE:O	2:B:136:MET:HG3	2.12	0.50
2:A:145:LEU:HD11	2:A:234:ILE:HG21	1.94	0.50
2:A:95:MET:HE2	2:A:98:ILE:HD12	1.95	0.48
2:B:11:ILE:O	2:B:15:VAL:HG23	2.13	0.48
4:B:601:BET:H22	4:B:601:BET:O	2.14	0.48
2:A:432:ILE:HG23	2:A:433:GLU:N	2.29	0.48
2:A:247:VAL:HG21	2:B:142:PHE:HB3	1.95	0.48
1:D:169:MET:O	1:D:173:VAL:HG23	2.14	0.47
2:B:271:ARG:O	2:B:275:LYS:HG2	2.15	0.47
2:B:161:PHE:CE2	2:B:165:ILE:HD11	2.50	0.47
2:A:494:ASP:OD1	2:A:494:ASP:N	2.47	0.47
1:D:164:GLN:O	1:D:165:LEU:HD12	2.15	0.47
1:C:164:GLN:O	1:C:165:LEU:HD12	2.15	0.47
2:A:146:ILE:HB	2:A:147:PRO:HD3	1.95	0.47
2:A:228:VAL:O	2:A:232:SER:N	2.46	0.47
1:C:113:GLN:NE2	3:C:501:ATP:O3G	2.41	0.47
1:C:169:MET:O	1:C:173:VAL:HG23	2.14	0.47
2:A:208:LEU:HD21	1:D:120:HIS:ND1	2.30	0.47
2:A:298:LEU:O	2:A:302:LEU:HD23	2.15	0.47
2:A:429:ILE:HG22	2:A:430:THR:N	2.30	0.47
2:A:93:ASP:HB3	2:A:239:LEU:HD23	1.96	0.46
1:D:179:LEU:HD13	1:D:206:GLU:OE2	2.15	0.46
1:D:60:MET:HE2	1:D:260:TYR:HE2	1.81	0.46
1:C:60:MET:HE2	1:C:260:TYR:HE2	1.81	0.46
2:A:354:THR:HG22	2:A:356:LEU:CD1	2.45	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:A:158:PRO:HB2	2:A:234:ILE:HD12	1.98	0.46
2:A:294:ARG:O	2:A:298:LEU:HD23	2.15	0.46
2:A:399:ASN:OD1	2:A:511:ILE:HG22	2.16	0.46
2:A:167:ALA:HB1	2:A:220:THR:HG23	1.98	0.46
1:D:121:ARG:NH1	1:D:132:GLU:OE1	2.50	0.45
1:C:121:ARG:NH1	1:C:132:GLU:OE1	2.50	0.45
2:A:210:LYS:NZ	2:A:277:ASN:O	2.39	0.45
2:B:145:LEU:HG	2:B:234:ILE:HG22	1.97	0.45
1:D:261:VAL:O	1:D:262:LYS:C	2.59	0.44
1:D:192:PHE:HA	1:D:195:LEU:HD12	1.99	0.44
2:B:96:SER:O	2:B:99:THR:HG22	2.16	0.44
1:C:192:PHE:HA	1:C:195:LEU:HD12	1.99	0.44
2:A:215:ALA:HB1	2:B:174:MET:HE1	1.98	0.44
2:B:94:LEU:O	2:B:98:ILE:HG13	2.16	0.44
2:B:256:PHE:O	2:B:260:ILE:HG12	2.17	0.44
2:B:142:PHE:O	2:B:145:LEU:HB3	2.18	0.44
2:A:356:LEU:HD23	2:A:360:VAL:HG12	1.98	0.44
2:B:95:MET:HE2	2:B:98:ILE:HD12	1.99	0.44
2:A:330:TRP:HB2	2:A:333:GLU:OE1	2.18	0.44
2:A:400:LEU:HD23	2:A:400:LEU:C	2.43	0.44
2:B:113:VAL:HB	2:B:114:PRO:HD3	1.99	0.44
2:B:158:PRO:HB2	2:B:234:ILE:HD12	1.98	0.44
2:A:19:THR:HA	2:A:22:ILE:HG22	1.99	0.44
2:A:472:ALA:O	2:A:476:HIS:N	2.51	0.44
1:C:113:GLN:HG3	1:C:189:ASP:OD2	2.17	0.43
2:A:219:GLN:O	2:A:223:LEU:HG	2.18	0.43
1:C:107:THR:O	1:C:185:ILE:N	2.52	0.43
1:D:107:THR:O	1:D:185:ILE:N	2.52	0.43
2:A:333:GLU:HG2	2:A:375:SER:OG	2.18	0.43
2:A:535:TRP:CZ3	2:A:540:MET:HB2	2.53	0.43
2:A:11:ILE:O	2:A:15:VAL:HG23	2.18	0.43
2:A:468:ALA:HB2	2:B:154:ILE:HD11	2.00	0.43
1:D:113:GLN:HG3	1:D:189:ASP:OD2	2.18	0.43
2:A:170:PRO:HB3	2:B:219:GLN:NE2	2.33	0.43
2:A:355:ALA:C	2:A:356:LEU:HD12	2.43	0.43
1:D:113:GLN:NE2	3:D:501:ATP:O3G	2.41	0.43
1:D:76:ARG:NH2	1:D:100:LEU:HD22	2.31	0.43
2:A:111:ILE:O	2:A:111:ILE:HG22	2.19	0.42
2:A:192:SER:OG	1:D:77:LEU:HD11	2.19	0.42
2:A:292:TRP:O	2:A:296:ILE:HD12	2.19	0.42
2:A:406:GLY:HA2	2:A:505:MET:HG2	2.02	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:A:433:GLU:HA	2:A:460:SER:O	2.19	0.42
1:C:243:ILE:HG21	1:C:246:ILE:HD11	2.00	0.42
2:B:48:LEU:HB3	2:B:95:MET:SD	2.60	0.42
1:D:225:LEU:O	1:D:229:LEU:HD12	2.19	0.42
1:D:243:ILE:HG21	1:D:246:ILE:HD11	2.00	0.42
2:B:33:ILE:HD11	2:B:152:PHE:HE1	1.83	0.42
2:A:36:SER:O	2:A:39:VAL:HG12	2.20	0.42
2:A:469:LEU:HD12	2:A:479:ILE:HG21	2.01	0.42
2:B:125:VAL:O	2:B:129:VAL:HG23	2.19	0.42
2:A:98:ILE:HG23	2:A:102:LEU:HD13	2.01	0.42
2:A:423:ASN:N	2:A:424:GLN:OE1	2.52	0.42
2:A:452:LEU:HD12	2:A:452:LEU:O	2.20	0.42
1:D:197:PRO:O	1:D:201:ARG:HG3	2.20	0.42
2:A:169:PRO:N	2:A:170:PRO:HD2	2.34	0.41
1:D:48:ASN:OD1	1:D:48:ASN:O	2.37	0.41
1:C:76:ARG:NH2	1:C:100:LEU:HD22	2.31	0.41
2:A:140:PRO:O	2:A:143:VAL:HG22	2.21	0.41
2:A:9:VAL:HG23	2:B:87:ASN:HD21	1.84	0.41
2:A:199:GLN:NE2	1:D:133:VAL:HA	2.35	0.41
1:C:154:LEU:HD21	1:C:169:MET:HG2	2.02	0.41
1:C:197:PRO:O	1:C:201:ARG:HG3	2.20	0.41
2:A:340:LEU:O	2:A:344:MET:HG3	2.20	0.41
2:B:111:ILE:O	2:B:111:ILE:HG22	2.19	0.41
2:A:59:VAL:CG2	2:A:304:LEU:HD21	2.51	0.41
2:B:206:PHE:HB3	2:B:207:PRO:HD3	2.02	0.41
2:A:113:VAL:HB	2:A:114:PRO:HD3	2.02	0.40
2:A:458:VAL:O	2:A:458:VAL:CG2	2.69	0.40
2:A:156:VAL:O	2:A:160:VAL:HG23	2.21	0.40
2:A:234:ILE:HG22	2:A:360:VAL:HG21	2.03	0.40
1:D:154:LEU:HD21	1:D:169:MET:HG2	2.02	0.40
2:A:67:VAL:HG12	2:A:275:LYS:HD2	2.03	0.40
2:A:130:GLN:N	2:A:131:PRO:HD2	2.36	0.40
2:A:160:VAL:O	2:A:164:VAL:HG23	2.22	0.40
2:B:233:MET:HG3	2:B:244:LEU:HD11	2.02	0.40
2:A:564:HIS:O	2:A:568:VAL:HG23	2.21	0.40
2:B:168:LEU:N	2:B:169:PRO:CD	2.84	0.40
1:C:229:LEU:HD21	1:C:252:ILE:HD11	2.04	0.40
2:B:91:TRP:O	2:B:95:MET:HG2	2.21	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	C	258/408 (63%)	246 (95%)	12 (5%)	0	100	100
1	D	258/408 (63%)	246 (95%)	12 (5%)	0	100	100
2	A	541/585 (92%)	518 (96%)	23 (4%)	0	100	100
2	B	290/585 (50%)	286 (99%)	4 (1%)	0	100	100
All	All	1347/1986 (68%)	1296 (96%)	51 (4%)	0	100	100

There are no Ramachandran outliers to report.

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	C	227/356 (64%)	222 (98%)	5 (2%)	45	63
1	D	227/356 (64%)	223 (98%)	4 (2%)	51	67
2	A	453/484 (94%)	453 (100%)	0	100	100
2	B	238/484 (49%)	238 (100%)	0	100	100
All	All	1145/1680 (68%)	1136 (99%)	9 (1%)	70	77

All (9) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	35	LEU
1	C	101	LEU

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Mol	Chain	Res	Type
1	C	211	GLN
1	C	225	LEU
1	C	242	LYS
1	D	48	ASN
1	D	101	LEU
1	D	211	GLN
1	D	225	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	C	160	GLN
1	C	170	GLN
2	A	137	GLN
2	A	358	ASN
2	A	382	HIS
2	A	548	GLN
1	D	170	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

3 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
3	ATP	C	501	-	32,33,33	3.72	6 (18%)	48,52,52	2.19	13 (27%)
3	ATP	D	501	-	32,33,33	3.72	6 (18%)	48,52,52	2.20	13 (27%)
4	BET	B	601	-	7,7,7	2.25	1 (14%)	10,10,10	1.26	2 (20%)

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
3	ATP	C	501	-	-	2/22/38/38	0/3/3/3
3	ATP	D	501	-	-	2/22/38/38	0/3/3/3
4	BET	B	601	-	-	2/5/5/5	-

All (13) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	D	501	ATP	PB-O3A	17.89	1.78	1.59
3	C	501	ATP	PB-O3A	17.88	1.78	1.59
3	C	501	ATP	PA-O5'	5.89	1.82	1.59
3	D	501	ATP	PA-O5'	5.87	1.82	1.59
4	B	601	BET	CA-C	5.34	1.61	1.52
3	C	501	ATP	PA-O3A	-4.55	1.54	1.59
3	C	501	ATP	PB-O3B	-4.54	1.54	1.59
3	D	501	ATP	PB-O3B	-4.53	1.54	1.59
3	D	501	ATP	PA-O3A	-4.52	1.54	1.59
3	C	501	ATP	C8-N9	2.63	1.42	1.37
3	D	501	ATP	C8-N9	2.62	1.42	1.37
3	D	501	ATP	O5'-C5'	-2.56	1.34	1.44
3	C	501	ATP	O5'-C5'	-2.55	1.35	1.44

All (28) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	501	ATP	O3A-PB-O1B	-6.51	91.13	110.70
3	C	501	ATP	O3A-PB-O1B	-6.50	91.14	110.70
3	D	501	ATP	O2B-PB-O3B	5.26	121.49	107.27

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	501	ATP	O2B-PB-O3B	5.26	121.48	107.27
3	D	501	ATP	O2A-PA-O3A	5.24	121.42	107.27
3	C	501	ATP	O2A-PA-O3A	5.23	121.40	107.27
3	C	501	ATP	O2B-PB-O3A	-4.61	94.80	107.27
3	D	501	ATP	O2B-PB-O3A	-4.60	94.84	107.27
3	C	501	ATP	O5'-PA-O1A	-4.20	92.29	108.94
3	D	501	ATP	O5'-PA-O1A	-4.20	92.31	108.94
3	D	501	ATP	O3G-PG-O2G	3.32	120.25	107.80
3	C	501	ATP	O3G-PG-O2G	3.31	120.23	107.80
3	D	501	ATP	O3G-PG-O3B	-3.18	93.96	104.64
3	C	501	ATP	O3G-PG-O3B	-3.18	93.98	104.64
3	C	501	ATP	O3B-PG-O1G	-3.13	94.55	111.04
3	D	501	ATP	O3B-PG-O1G	-3.13	94.56	111.04
3	D	501	ATP	PA-O5'-C5'	-2.92	104.61	121.35
3	C	501	ATP	PA-O5'-C5'	-2.92	104.62	121.35
3	C	501	ATP	O2G-PG-O1G	2.68	121.27	110.83
3	D	501	ATP	O2G-PG-O1G	2.67	121.25	110.83
4	B	601	BET	OXT-C-O	2.59	130.00	123.33
3	C	501	ATP	O2A-PA-O5'	-2.40	96.68	107.57
3	D	501	ATP	O2A-PA-O5'	-2.40	96.70	107.57
3	C	501	ATP	O2A-PA-O1A	2.28	123.03	112.44
3	D	501	ATP	O2A-PA-O1A	2.27	123.02	112.44
3	D	501	ATP	C2-N1-C6	-2.12	115.25	118.73
3	C	501	ATP	C2-N1-C6	-2.10	115.28	118.73
4	B	601	BET	C-CA-N	-2.06	113.53	116.31

There are no chirality outliers.

All (6) torsion outliers are listed below:

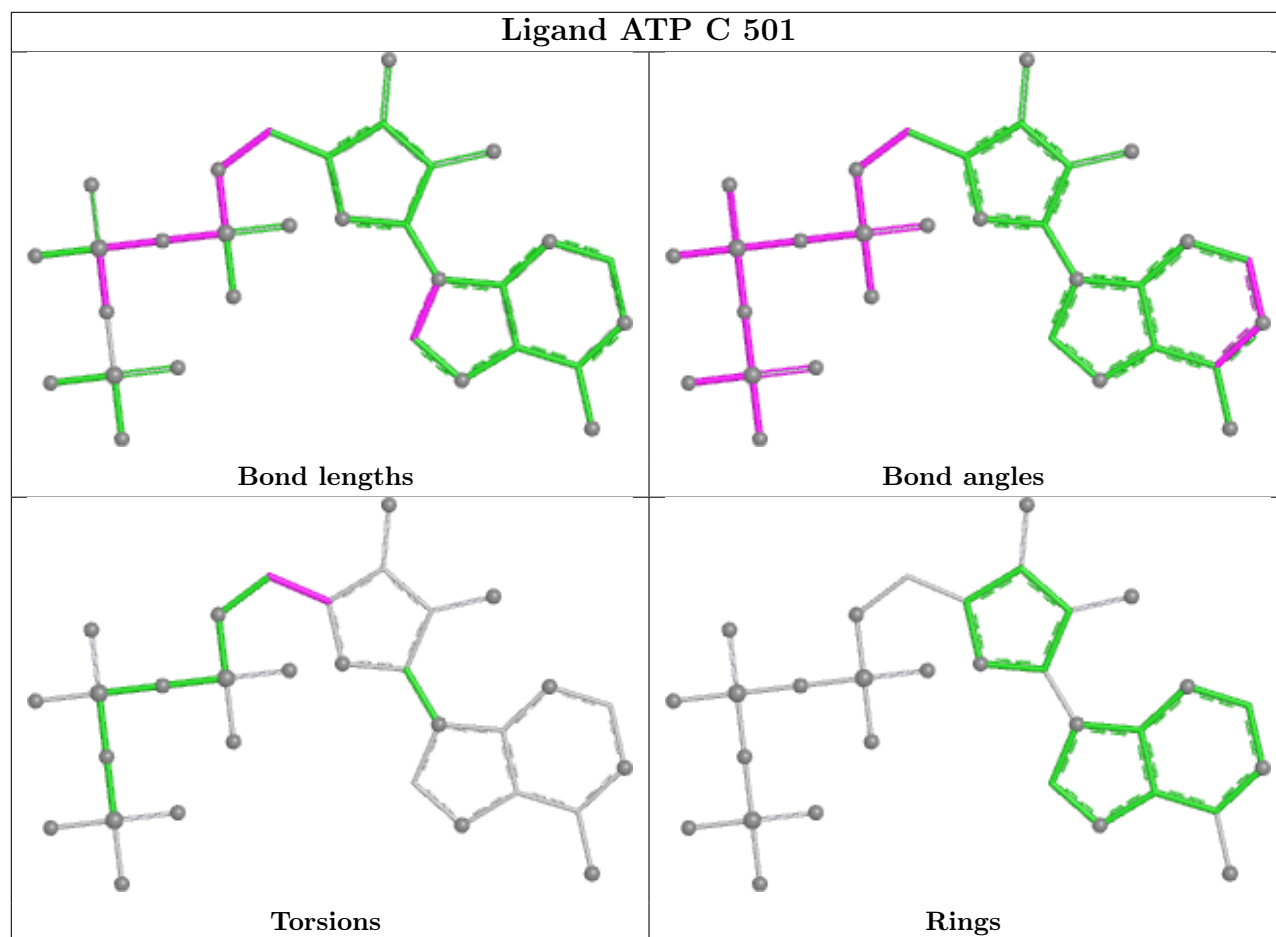
Mol	Chain	Res	Type	Atoms
4	B	601	BET	O-C-CA-N
4	B	601	BET	OXT-C-CA-N
3	C	501	ATP	O4'-C4'-C5'-O5'
3	D	501	ATP	O4'-C4'-C5'-O5'
3	C	501	ATP	C3'-C4'-C5'-O5'
3	D	501	ATP	C3'-C4'-C5'-O5'

There are no ring outliers.

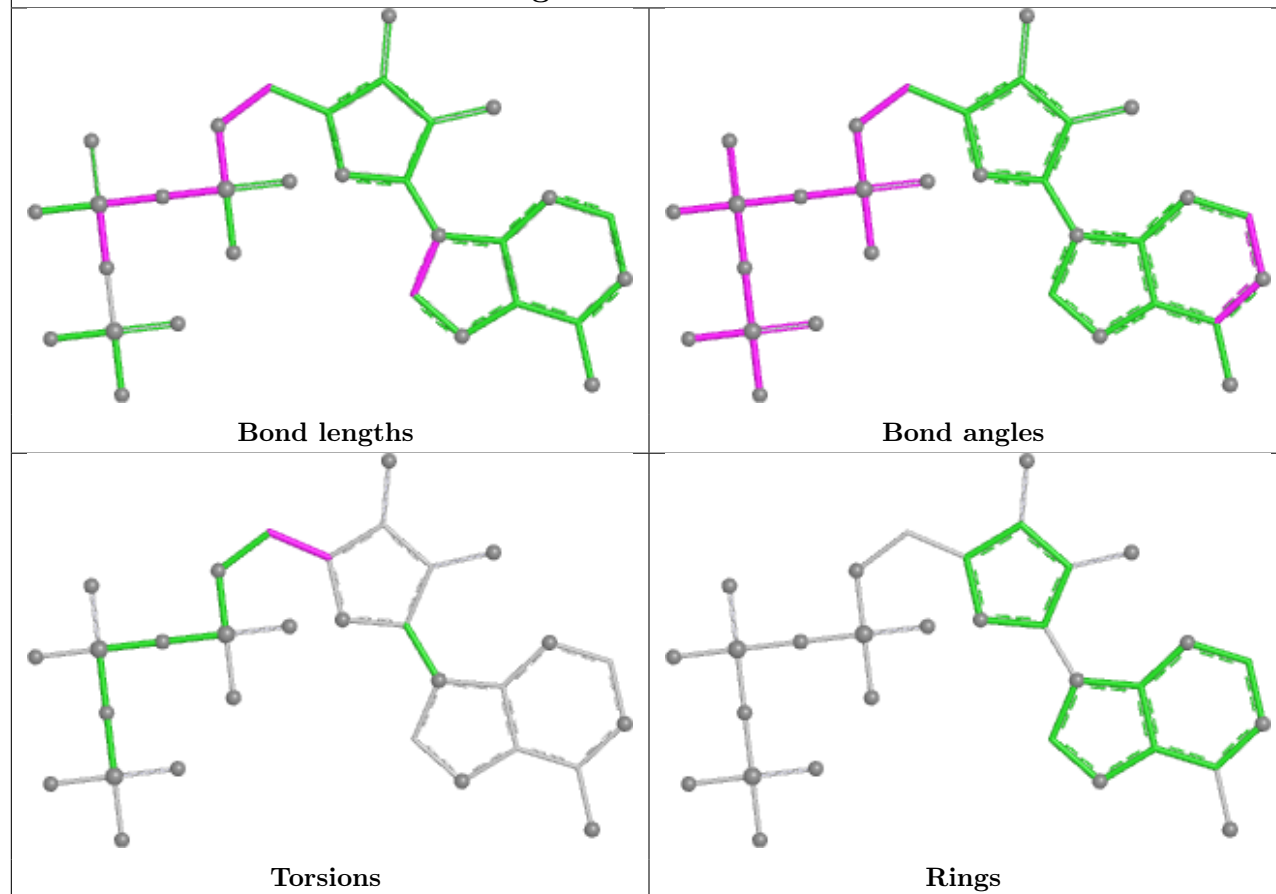
3 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	C	501	ATP	1	0
3	D	501	ATP	1	0
4	B	601	BET	1	0

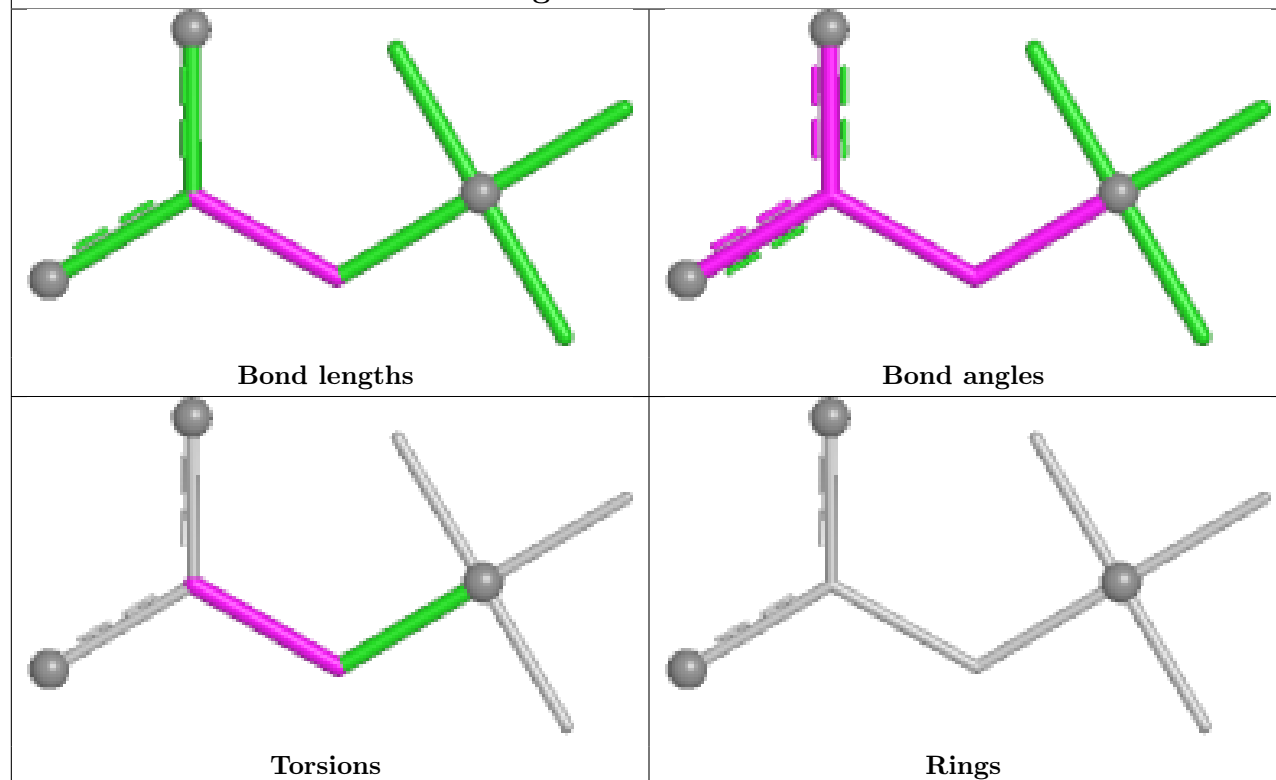
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 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 ATP D 501



Ligand BET B 601



5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

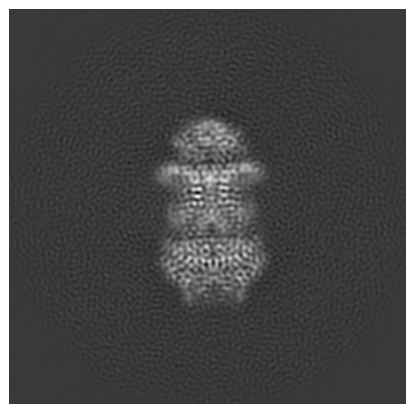
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-11783. These allow visual inspection of the internal detail of the map and identification of artifacts.

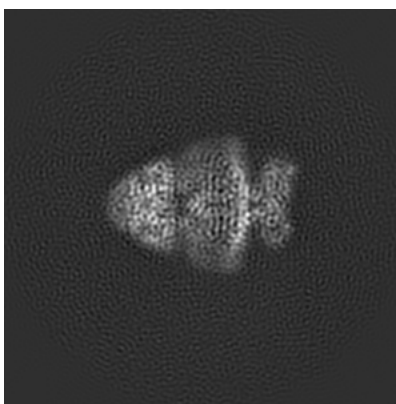
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

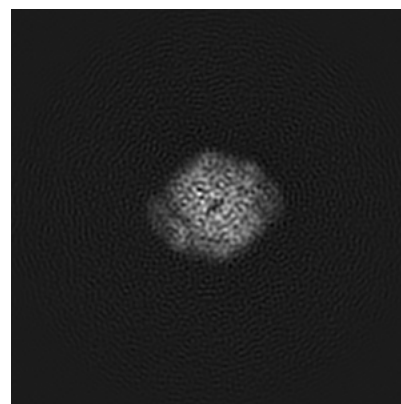
6.1.1 Primary map



X

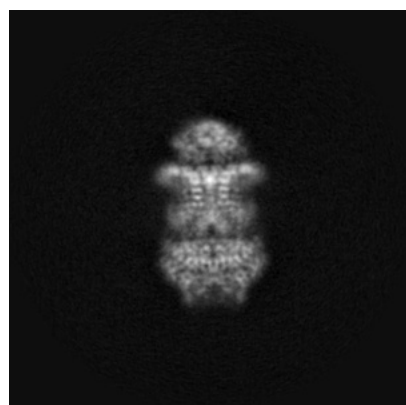


Y

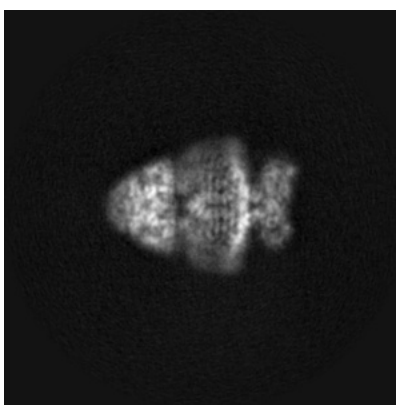


Z

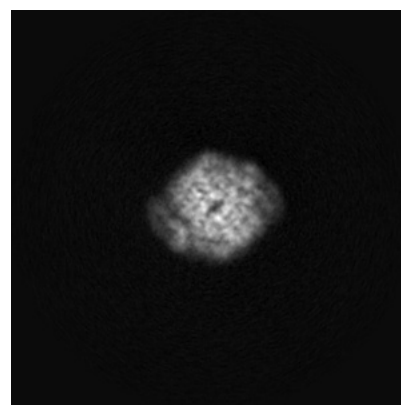
6.1.2 Raw map



X



Y

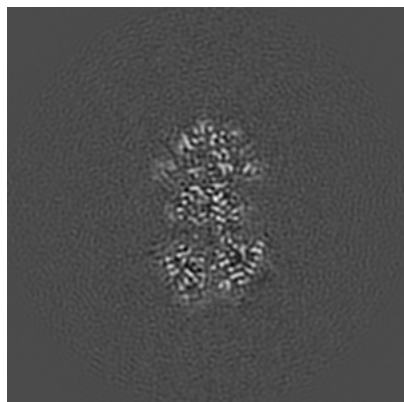


Z

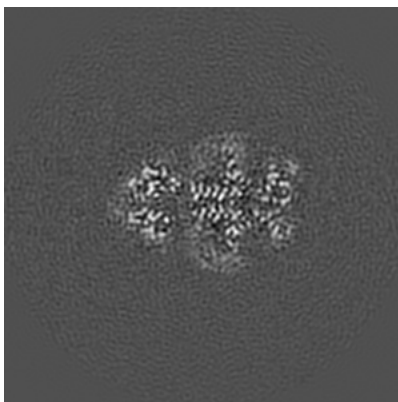
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

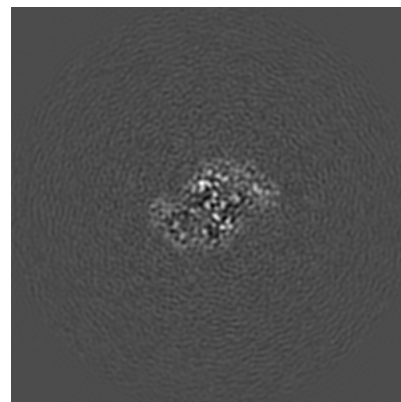
6.2.1 Primary map



X Index: 128

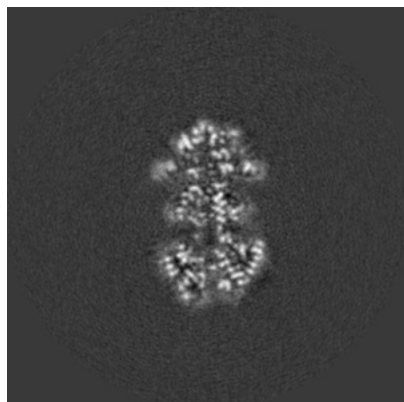


Y Index: 128

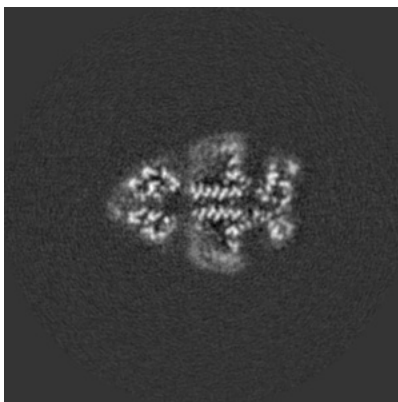


Z Index: 128

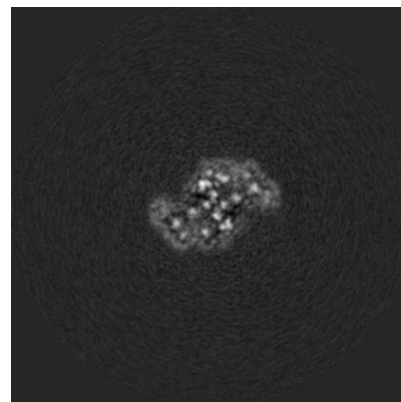
6.2.2 Raw map



X Index: 128



Y Index: 128

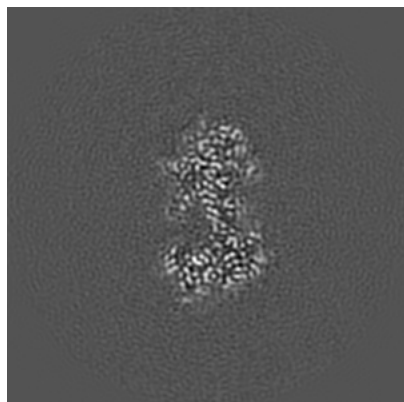


Z Index: 128

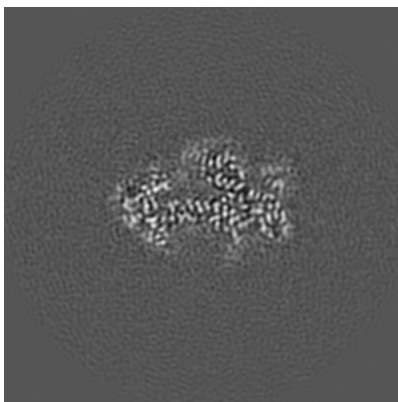
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

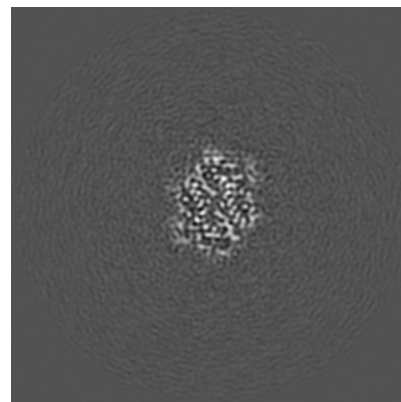
6.3.1 Primary map



X Index: 123

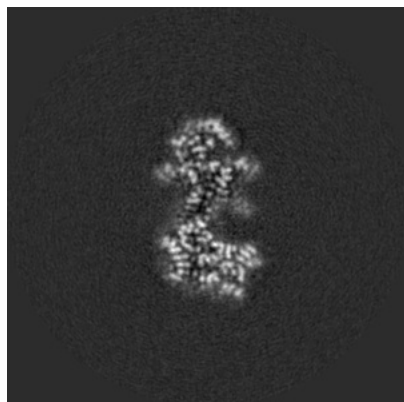


Y Index: 137

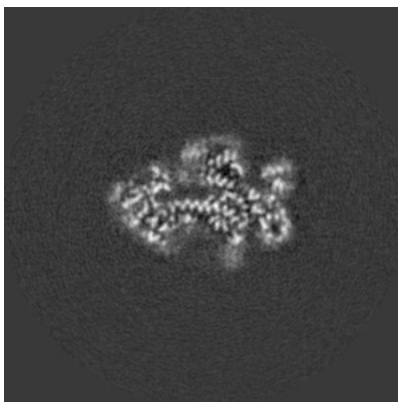


Z Index: 96

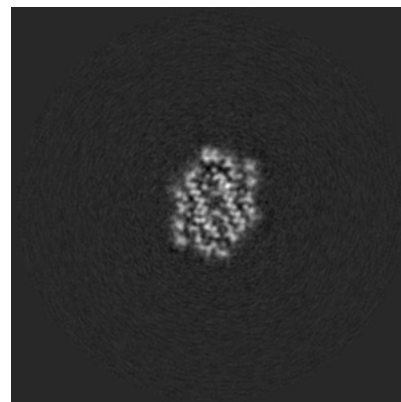
6.3.2 Raw map



X Index: 141



Y Index: 136

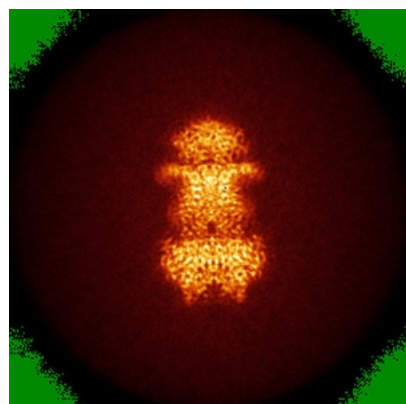


Z Index: 95

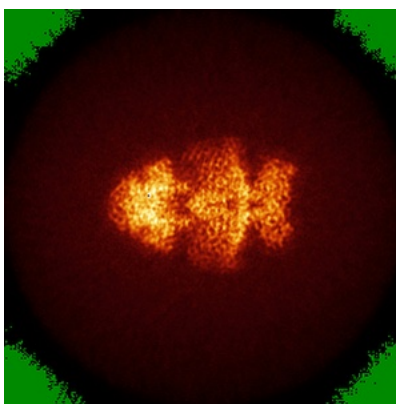
The images above show the largest variance slices of the map in three orthogonal directions.

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

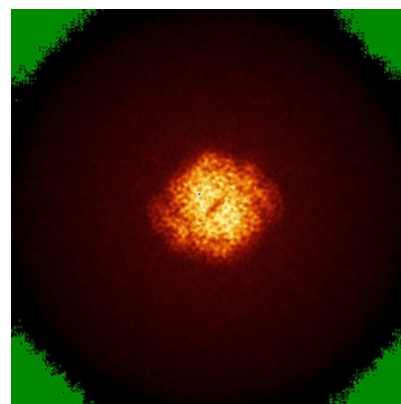
6.4.1 Primary map



X

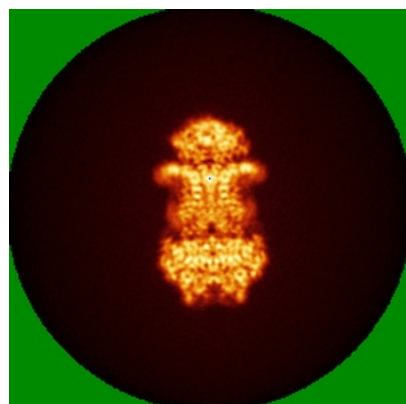


Y

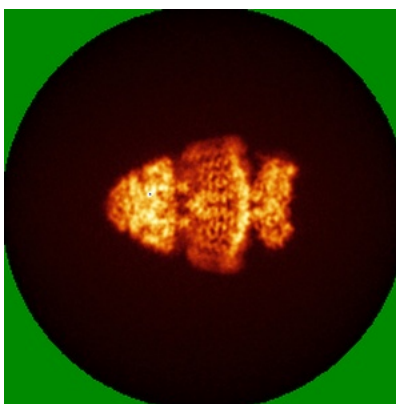


Z

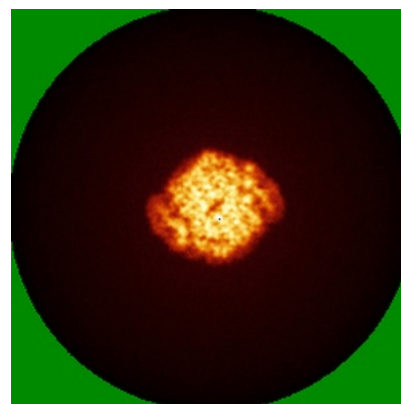
6.4.2 Raw map



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](#)

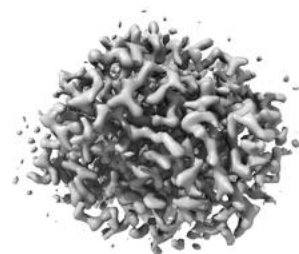
6.5.1 Primary map



X



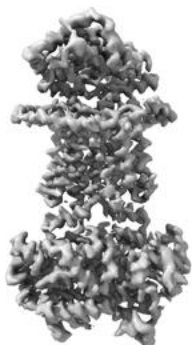
Y



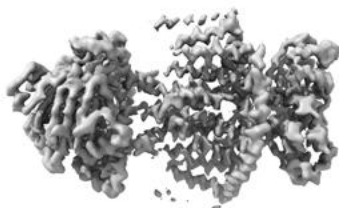
Z

The images above show the 3D surface view of the map at the recommended contour level 0.051. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

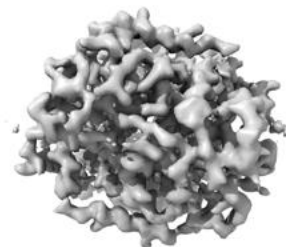
6.5.2 Raw map



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.

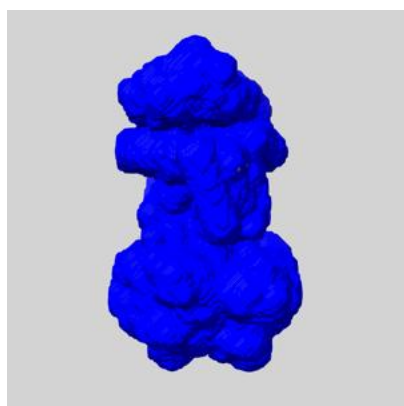
6.6 Mask visualisation [i](#)

This section shows the 3D surface view of the primary map at 50% transparency overlaid with the specified mask at 0% transparency

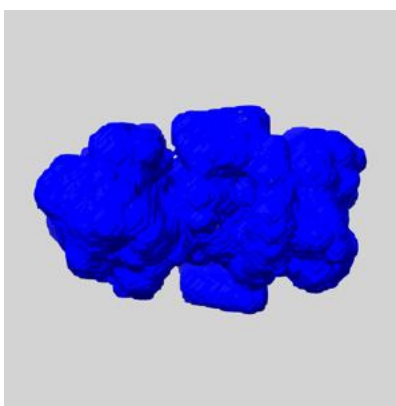
A mask typically either:

- Encompasses the whole structure
- Separates out a domain, a functional unit, a monomer or an area of interest from a larger structure

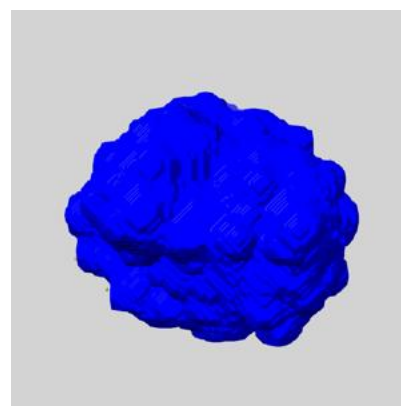
6.6.1 emd_11783_msk_1.map [i](#)



X



Y

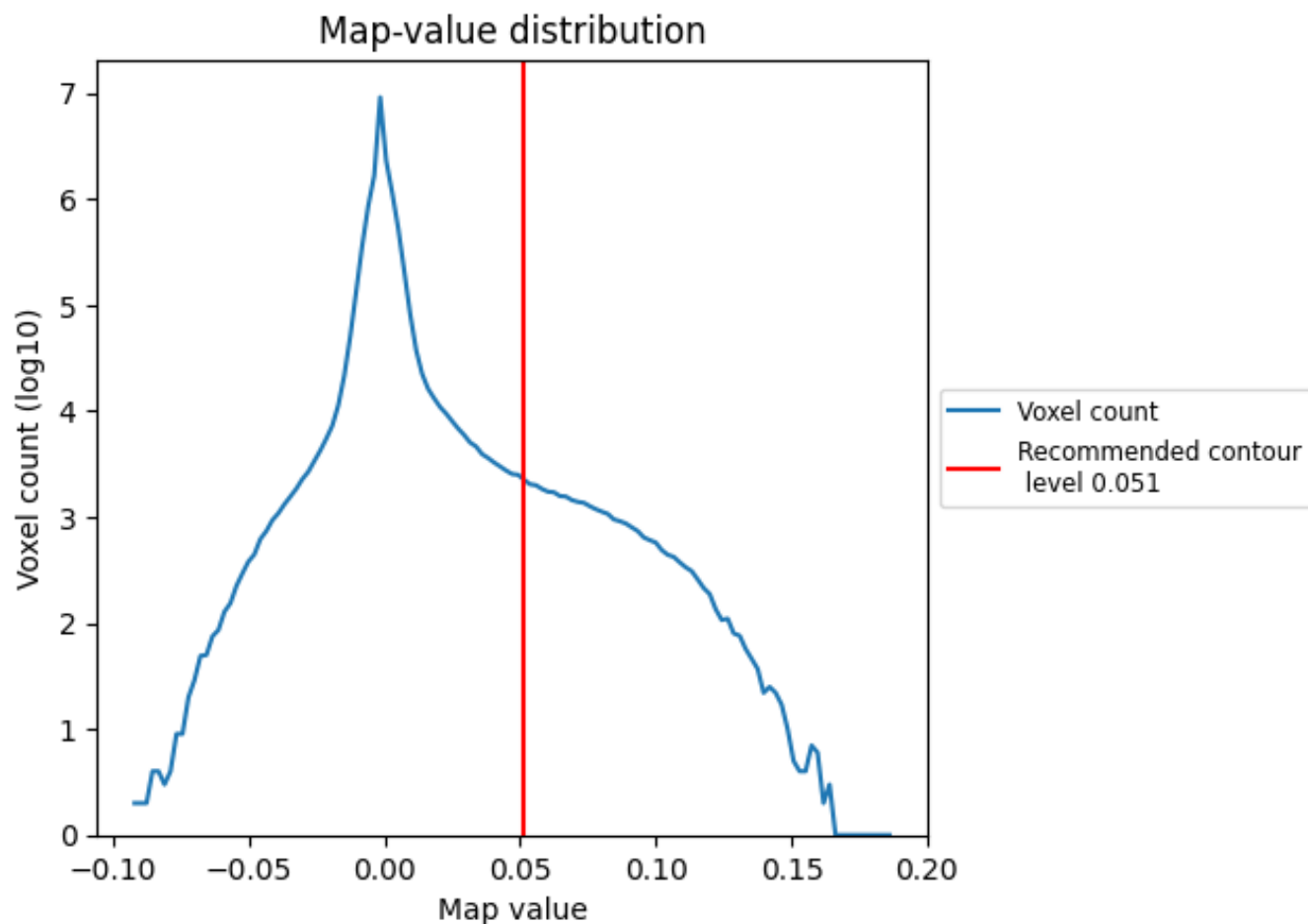


Z

7 Map analysis [i](#)

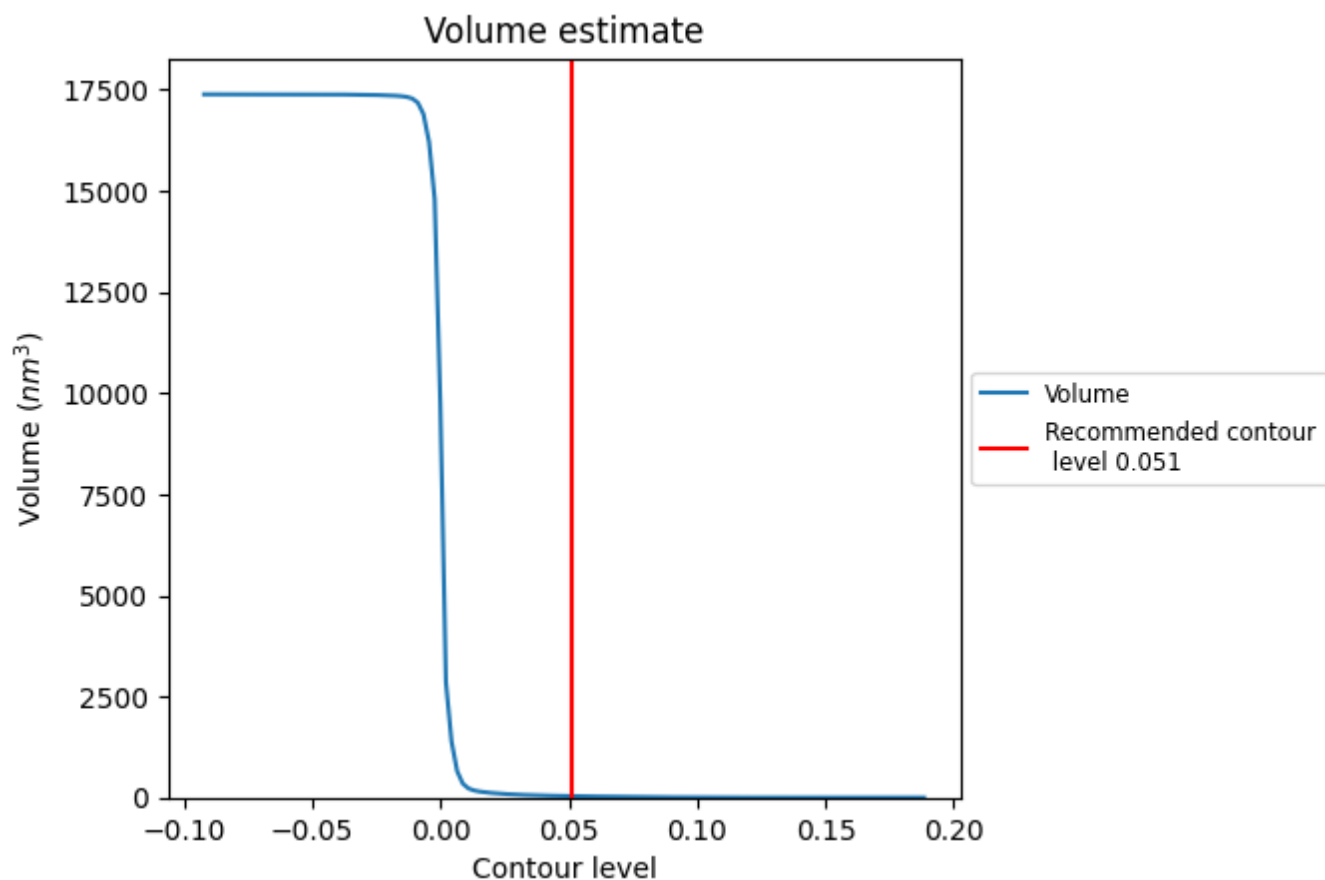
This section contains the results of statistical analysis of the map.

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.

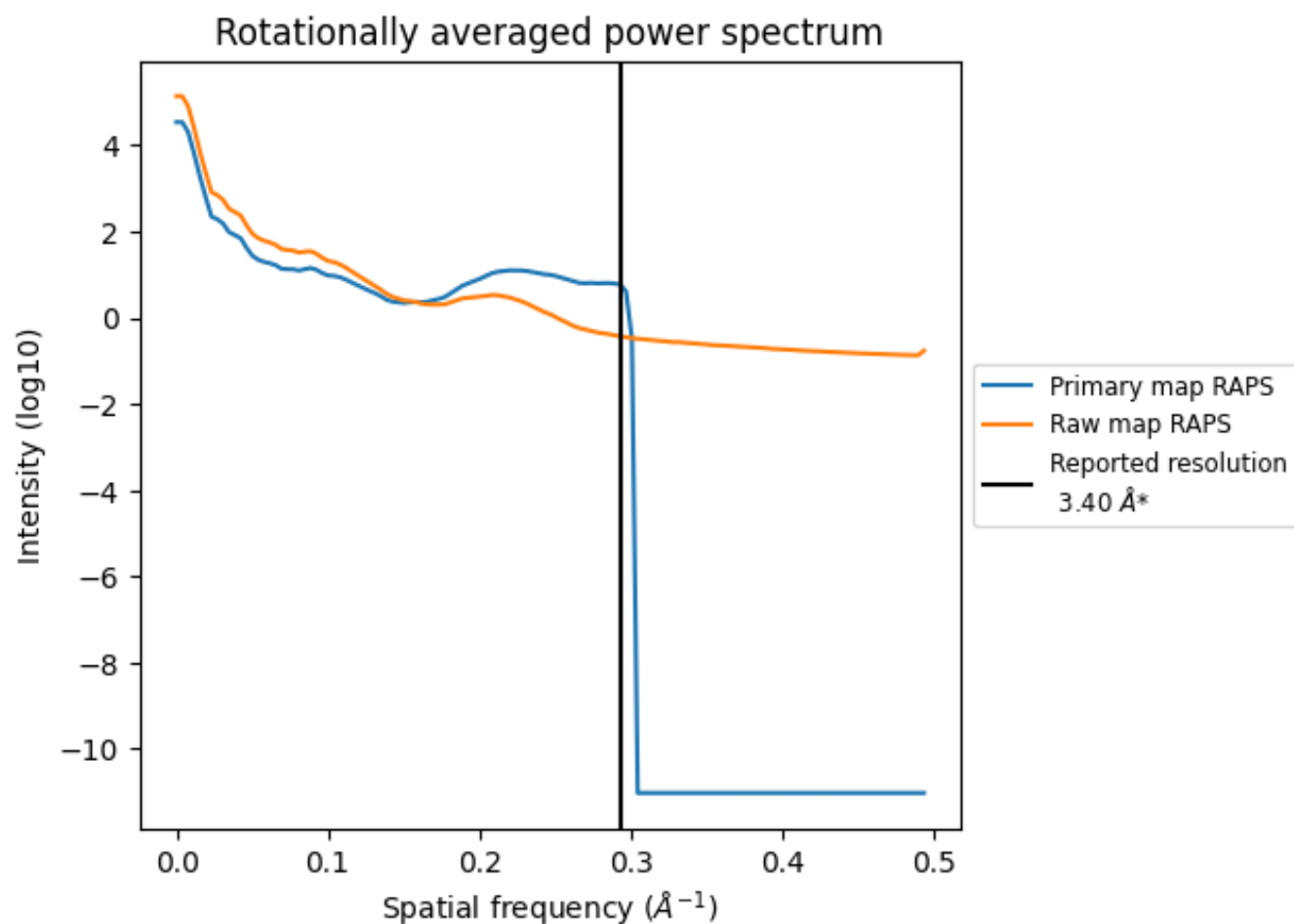
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 35 nm³; this corresponds to an approximate mass of 32 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 ⓘ

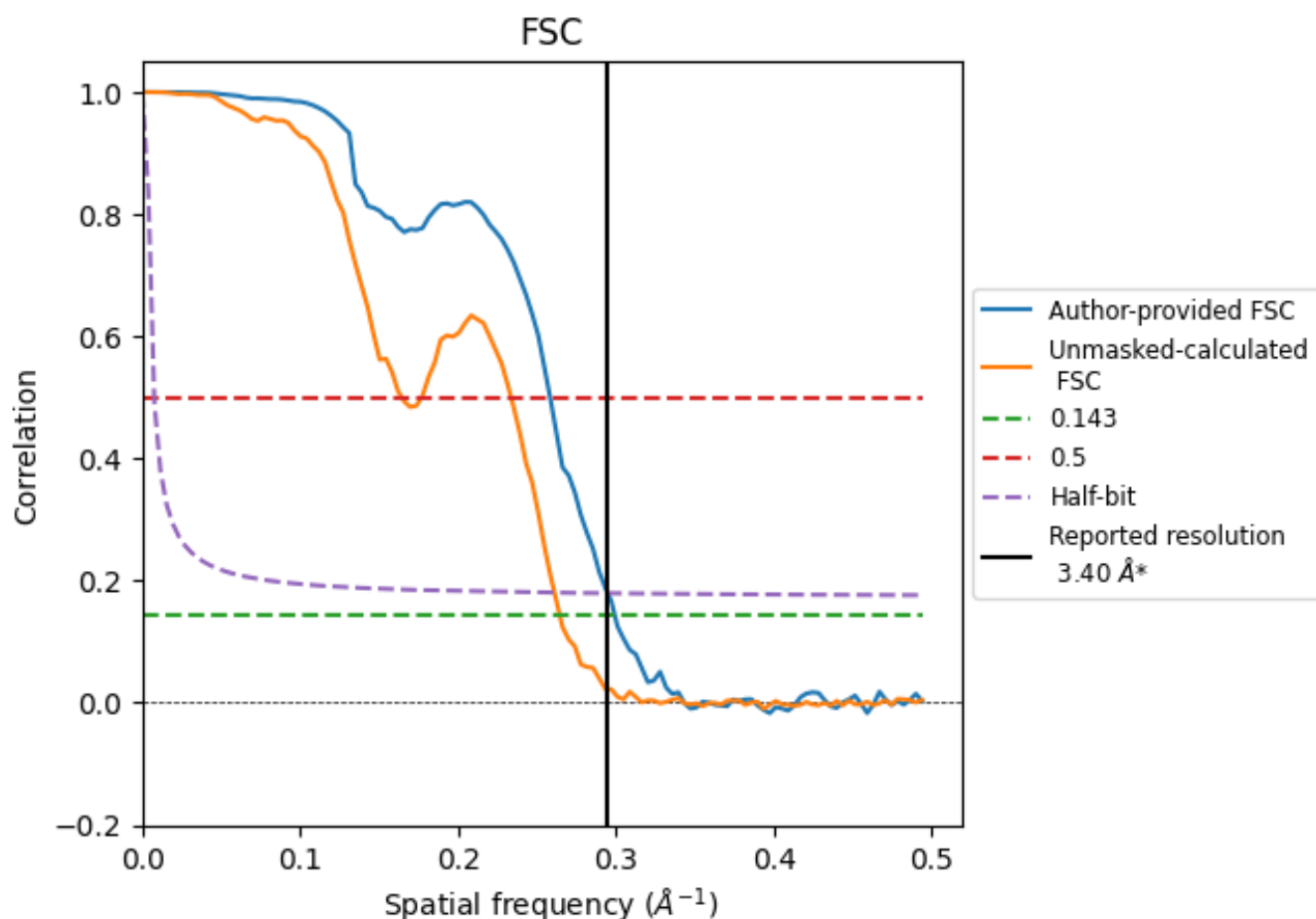


*Reported resolution corresponds to spatial frequency of 0.294 Å⁻¹

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 0.294 Å⁻¹

8.2 Resolution estimates [i](#)

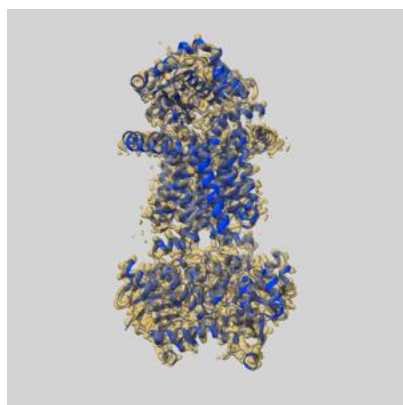
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.40	-	-
Author-provided FSC curve	3.34	3.87	3.39
Unmasked-calculated*	3.78	6.08	3.83

*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 3.78 differs from the reported value 3.4 by more than 10 %

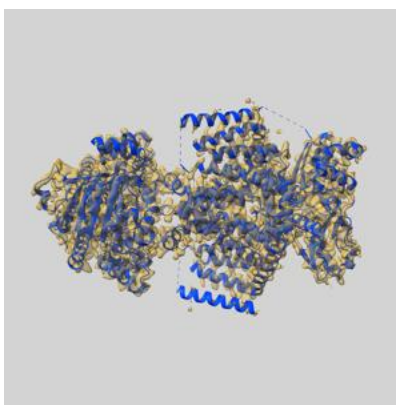
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-11783 and PDB model 7AHD. Per-residue inclusion information can be found in [section 3](#) on [page 6](#).

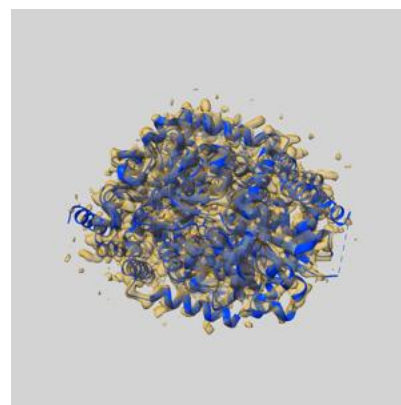
9.1 Map-model overlay [i](#)



X



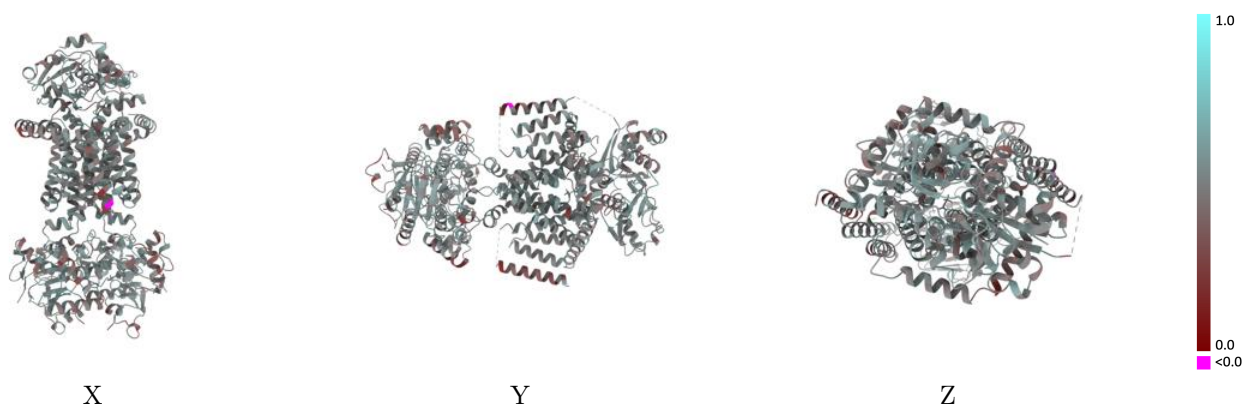
Y



Z

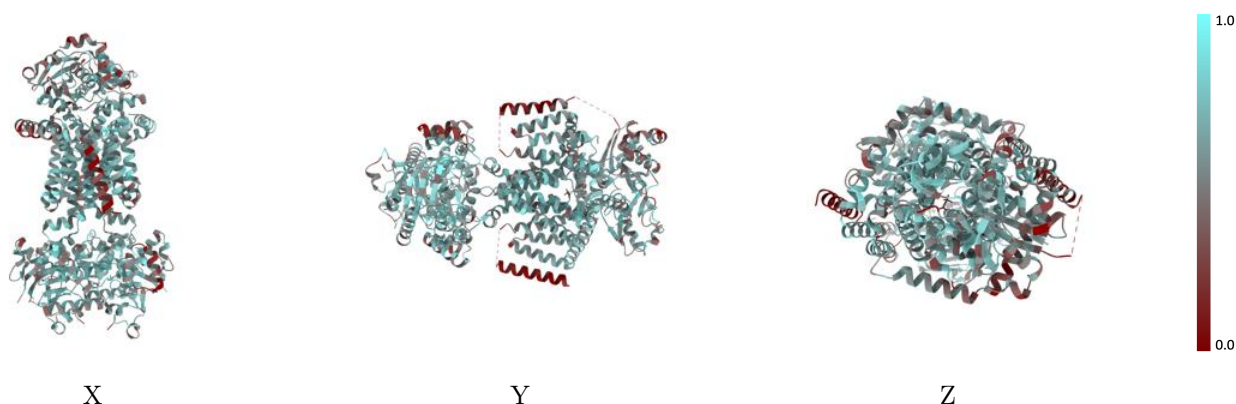
The images above show the 3D surface view of the map at the recommended contour level 0.051 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

9.2 Q-score mapped to coordinate model [i](#)



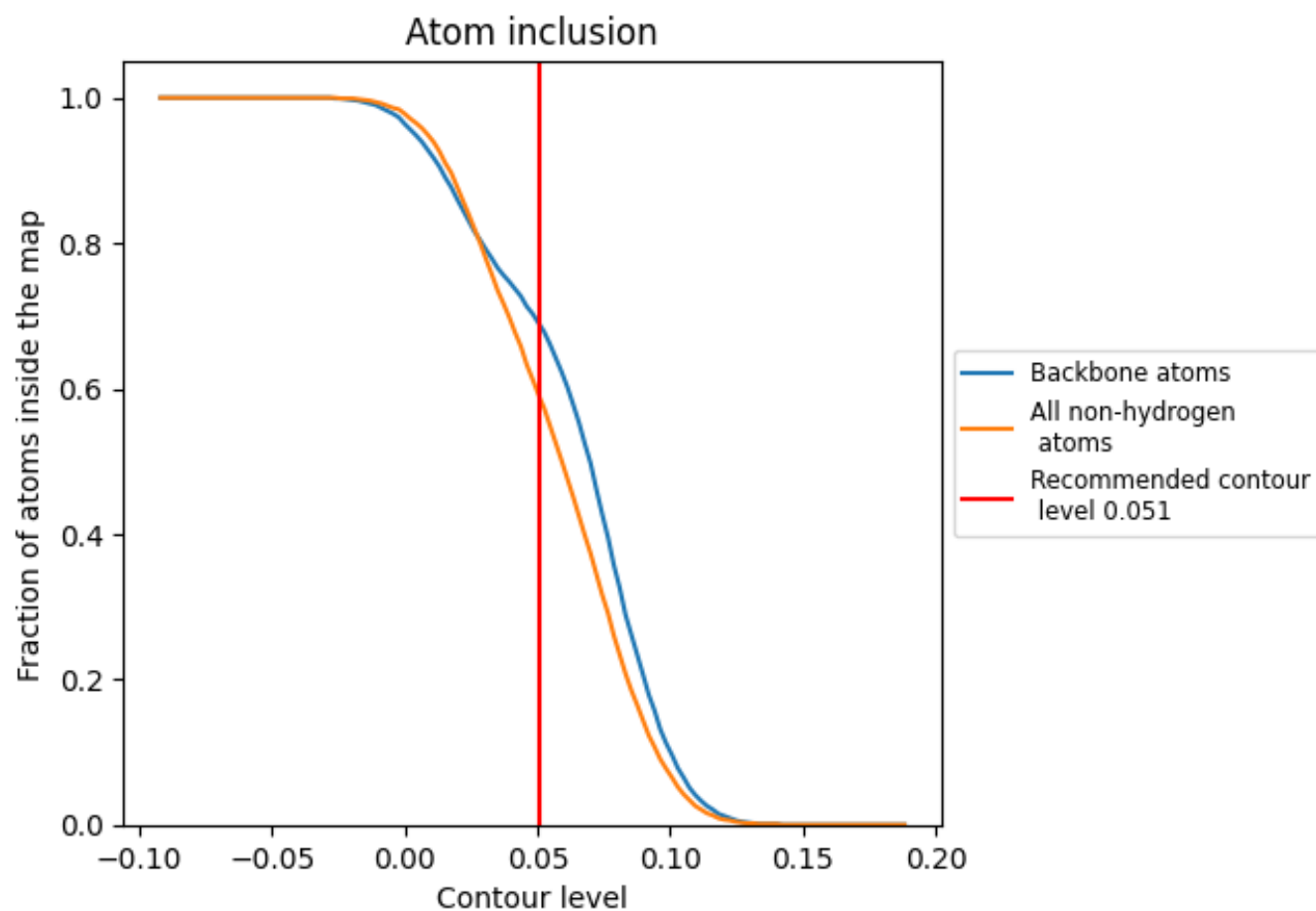
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions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



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 (0.051).

9.4 Atom inclusion [i](#)



At the recommended contour level, 69% of all backbone atoms, 59% 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 (0.051) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.5860	0.4960
A	0.5570	0.5000
B	0.5880	0.4960
C	0.6150	0.4860
D	0.6130	0.5010

