



Full wwPDB EM Validation Report ⓘ

Jul 6, 2026 – 07:56 PM JST

PDB ID : 9VUS / pdb_00009vus
EMDB ID : EMD-65370
Title : The structure of akg bound OXGR1
Authors : Su, Q.; Liang, E.Y.; Ma, T.S.; Chen, Z.Y.; Tang, X.F.
Deposited on : 2025-07-14
Resolution : 2.37 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:

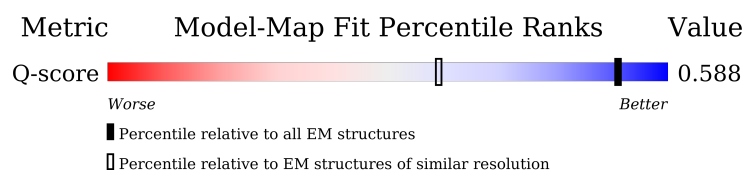
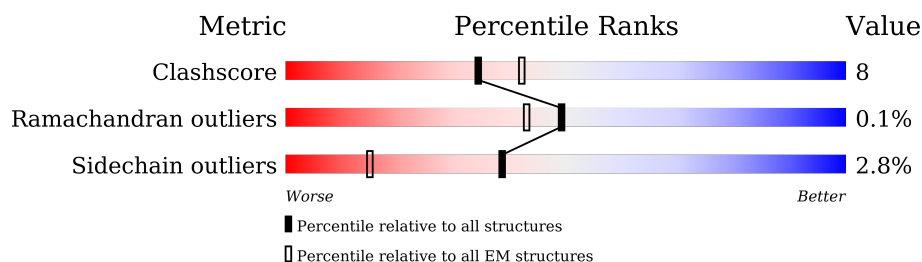
EMDB validation analysis : 0.0.1.dev133
Mogul : 1.8.5 (274361), CSD as541be (2020)
MolProbity : 4-5-2 with Phenix2.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.50

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 2.37 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	4742 (1.87 - 2.87)

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	B	361	
2	C	71	
3	D	609	
4	E	547	

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Mol	Chain	Length	Quality of chain
5	A	1398	 A horizontal bar chart showing the quality of chain 5. The bar is divided into three segments: a red segment at the beginning, a green segment labeled '17%', and a yellow segment labeled '79%'. The total length of the bar represents the chain length of 1398 residues.

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
6	AKG	A	1301	-	X	-	-

2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 9005 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 Gaq.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	B	225	Total	C	N	O	S	0	0
			1857	1180	324	344	9		

- Molecule 2 is a protein called Guanine nucleotide-binding protein G(I)/G(S)/G(O) subunit gamma-2.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	C	52	Total	C	N	O	S	0	0
			399	251	69	76	3		

- Molecule 3 is a protein called Fusion protein, Guanine nucleotide-binding protein G(I)/G(S)/G(T) subunit beta-1, Guanine nucleotide-binding protein G(I)/G(S)/G(T) subunit beta-1, Guanine nucleotide-binding protein G(I)/G(S)/G(T) subunit beta-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	D	334	Total	C	N	O	S	0	0
			2566	1584	462	499	21		

There are 26 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	341	GLY	-	expression tag	UNP P62873
D	342	SER	-	expression tag	UNP P62873
D	343	SER	-	expression tag	UNP P62873
D	344	GLY	-	expression tag	UNP P62873
D	345	GLY	-	expression tag	UNP P62873
D	346	GLY	-	expression tag	UNP P62873
D	347	GLY	-	expression tag	UNP P62873
D	348	SER	-	expression tag	UNP P62873
D	349	GLY	-	expression tag	UNP P62873
D	350	GLY	-	expression tag	UNP P62873
D	351	GLY	-	expression tag	UNP P62873
D	352	GLY	-	expression tag	UNP P62873

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Chain	Residue	Modelled	Actual	Comment	Reference
D	353	SER	-	expression tag	UNP P62873
D	354	SER	-	expression tag	UNP P62873
D	355	GLY	-	expression tag	UNP P62873
D	356	VAL	-	expression tag	UNP P62873
D	357	SER	-	expression tag	UNP P62873
D	358	GLY	-	expression tag	UNP P62873
D	359	TRP	-	expression tag	UNP P62873
D	360	ARG	-	expression tag	UNP P62873
D	361	LEU	-	expression tag	UNP P62873
D	362	PHE	-	expression tag	UNP P62873
D	363	LYS	-	expression tag	UNP P62873
D	364	LYS	-	expression tag	UNP P62873
D	365	ILE	-	expression tag	UNP P62873
D	366	SER	-	expression tag	UNP P62873

- Molecule 4 is a protein called scFv16.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	E	233	Total	C	N	O	S	0	0
			1790	1135	296	349	10		

- Molecule 5 is a protein called Soluble cytochrome b562,2-oxoglutarate receptor 1,Soluble cytochrome b562,2-oxoglutarate receptor 1,Soluble cytochrome b562,2-oxoglutarate receptor 1,Fusion protein,Maltose/maltodextrin-binding periplasmic protein,Maltose/maltodextrin-binding periplasmic protein,Maltose/maltodextrin-binding periplasmic protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	A	297	Total	C	N	O	S	0	0
			2383	1574	385	403	21		

There are 50 discrepancies between the modelled and reference sequences:

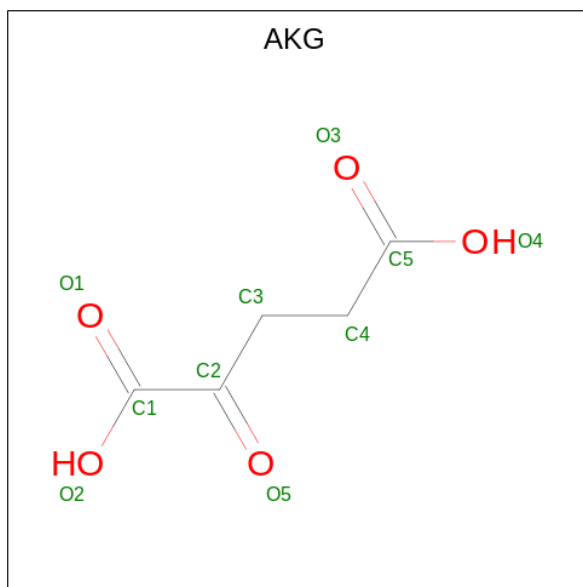
Chain	Residue	Modelled	Actual	Comment	Reference
A	-141	MET	-	initiating methionine	UNP P0ABE7
A	-140	ASP	-	expression tag	UNP P0ABE7
A	-139	MET	-	expression tag	UNP P0ABE7
A	-138	ARG	-	expression tag	UNP P0ABE7
A	-137	VAL	-	expression tag	UNP P0ABE7
A	-136	PRO	-	expression tag	UNP P0ABE7
A	-135	ALA	-	expression tag	UNP P0ABE7
A	-134	GLN	-	expression tag	UNP P0ABE7
A	-133	LEU	-	expression tag	UNP P0ABE7

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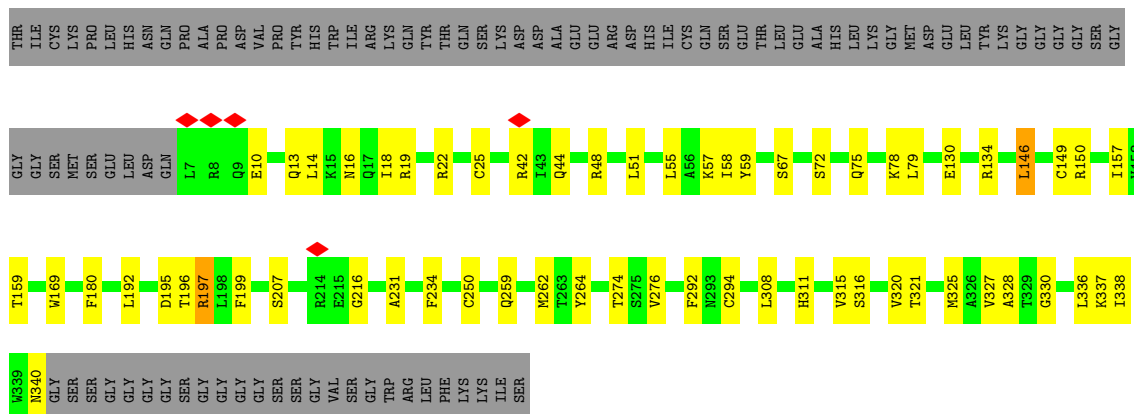
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Chain	Residue	Modelled	Actual	Comment	Reference
A	-132	LEU	-	expression tag	UNP P0ABE7
A	-131	GLY	-	expression tag	UNP P0ABE7
A	-130	LEU	-	expression tag	UNP P0ABE7
A	-129	LEU	-	expression tag	UNP P0ABE7
A	-128	LEU	-	expression tag	UNP P0ABE7
A	-127	LEU	-	expression tag	UNP P0ABE7
A	-126	TRP	-	expression tag	UNP P0ABE7
A	-125	LEU	-	expression tag	UNP P0ABE7
A	-124	SER	-	expression tag	UNP P0ABE7
A	-123	GLY	-	expression tag	UNP P0ABE7
A	-122	ALA	-	expression tag	UNP P0ABE7
A	-121	ARG	-	expression tag	UNP P0ABE7
A	-120	CYS	-	expression tag	UNP P0ABE7
A	-119	MET	-	expression tag	UNP P0ABE7
A	-118	ASP	-	expression tag	UNP P0ABE7
A	-117	TYR	-	expression tag	UNP P0ABE7
A	-116	LYS	-	expression tag	UNP P0ABE7
A	-115	ASP	-	expression tag	UNP P0ABE7
A	-114	ASP	-	expression tag	UNP P0ABE7
A	-113	ASP	-	expression tag	UNP P0ABE7
A	-112	ASP	-	expression tag	UNP P0ABE7
A	-111	LYS	-	expression tag	UNP P0ABE7
A	-110	GLY	-	expression tag	UNP P0ABE7
A	-109	GLY	-	expression tag	UNP P0ABE7
A	-108	SER	-	expression tag	UNP P0ABE7
A	-101	TRP	MET	conflict	UNP P0ABE7
A	-6	ILE	HIS	conflict	UNP P0ABE7
A	-2	LEU	-	linker	UNP P0ABE7
A	-1	GLY	-	linker	UNP P0ABE7
A	0	SER	-	linker	UNP P0ABE7
A	879	GLY	-	linker	UNP P0AEX9
A	880	GLY	-	linker	UNP P0AEX9
A	881	GLY	-	linker	UNP P0AEX9
A	882	GLY	-	linker	UNP P0AEX9
A	883	SER	-	linker	UNP P0AEX9
A	884	GLY	-	linker	UNP P0AEX9
A	885	GLY	-	linker	UNP P0AEX9
A	886	GLY	-	linker	UNP P0AEX9
A	887	GLY	-	linker	UNP P0AEX9
A	888	SER	-	linker	UNP P0AEX9
A	889	MET	-	linker	UNP P0AEX9

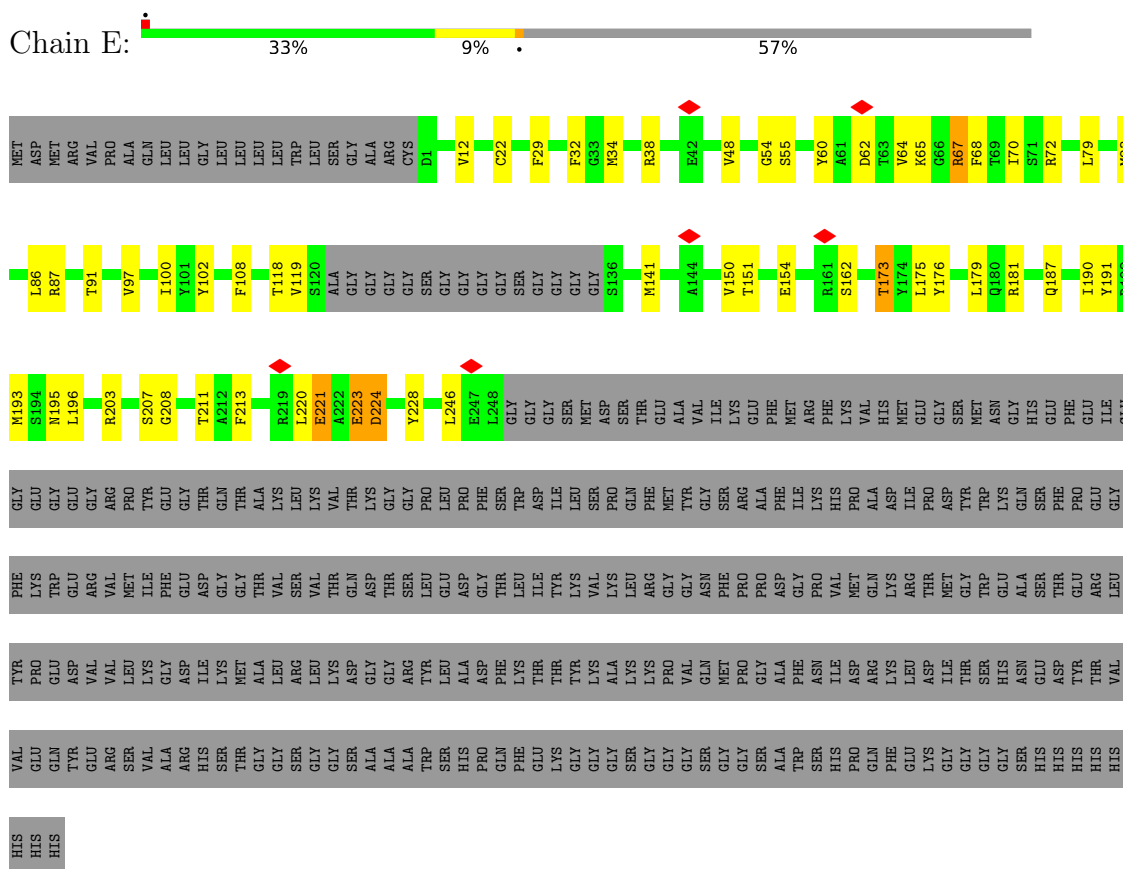
- Molecule 6 is 2-OXOGLUTARIC ACID (CCD ID: AKG) (formula: C₅H₆O₅).



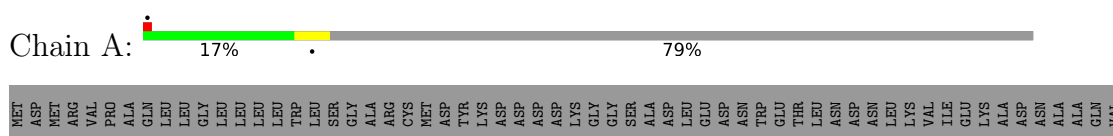
Mol	Chain	Residues	Atoms			AltConf
6	A	1	Total	C	O	0
			10	5	5	



• Molecule 4: scFv16



• Molecule 5: Soluble cytochrome b562,2-oxoglutarate receptor 1,Soluble cytochrome b562,2-oxoglutarate receptor 1,Soluble cytochrome b562,2-oxoglutarate receptor 1,Fusion protein,Maltose/maltodextrin-binding periplasmic protein,Maltose/maltodextrin-binding periplasmic protein ,Maltose/maltodextrin-binding periplasmic protein





VAL
ILE
ASN
ALA
ALA
SER
GLY
ARG
GLN
THR
VAL
ASP
GLU
ALA
LEU
LYS
ASP
ALA
GLN
THR

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	468060	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE	Depositor
Microscope	FEI POLARA 300	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	50	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	Not provided	
Image detector	FEI FALCON IV (4k x 4k)	Depositor
Maximum map value	1.675	Depositor
Minimum map value	-0.002	Depositor
Average map value	0.001	Depositor
Map value standard deviation	0.018	Depositor
Recommended contour level	0.143	Depositor
Map size ($\text{\AA}$)	300.348, 300.348, 300.348	wwPDB
Map dimensions	324, 324, 324	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing ($\text{\AA}$)	0.927, 0.927, 0.927	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: AKG

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	B	0.31	0/1891	0.49	0/2544
2	C	0.30	0/405	0.57	0/547
3	D	0.28	0/2613	0.41	0/3543
4	E	0.33	0/1834	0.54	0/2487
5	A	0.41	0/2443	0.63	1/3330 (0.0%)
All	All	0.34	0/9186	0.53	1/12451 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
5	A	185	ASP	CA-CB-CG	6.48	119.08	112.60

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	B	1857	0	1852	38	0
2	C	399	0	407	3	0
3	D	2566	0	2476	43	0
4	E	1790	0	1724	31	0
5	A	2383	0	2461	41	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	A	10	0	4	1	0
All	All	9005	0	8924	145	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 8.

All (145) 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)
5:A:43:ILE:HA	5:A:296:PHE:CZ	1.83	1.12
1:B:52:GLN:NE2	1:B:56:TYR:HE2	1.57	1.01
5:A:43:ILE:HA	5:A:296:PHE:HZ	1.24	0.93
1:B:52:GLN:O	1:B:56:TYR:HD2	1.51	0.93
1:B:52:GLN:HE21	1:B:56:TYR:HE2	1.11	0.92
1:B:52:GLN:NE2	1:B:56:TYR:CE2	2.46	0.84
3:D:330:GLY:HA2	3:D:336:LEU:HD23	1.68	0.75
1:B:287:THR:CG2	1:B:303:ARG:HA	2.16	0.75
1:B:50:VAL:HG12	1:B:198:MET:HE3	1.69	0.74
1:B:287:THR:HG22	1:B:303:ARG:HA	1.67	0.74
4:E:22:CYS:HB3	4:E:79:LEU:HB3	1.69	0.73
1:B:52:GLN:O	1:B:56:TYR:CD2	2.41	0.71
5:A:192:LEU:HD13	5:A:268:ARG:NH2	2.10	0.67
5:A:162:LEU:HG	5:A:166:ILE:HD11	1.77	0.66
5:A:257:PHE:HE1	5:A:288:ARG:HG2	1.61	0.64
3:D:58:ILE:HD13	3:D:336:LEU:HD21	1.80	0.63
2:C:60:PRO:HD2	3:D:325:MET:HE2	1.79	0.63
1:B:38:LEU:HD21	1:B:46:LYS:HB2	1.81	0.62
5:A:118:TYR:OH	5:A:261:ARG:NH2	2.32	0.62
4:E:32:PHE:O	4:E:72:ARG:NH2	2.33	0.61
3:D:130:GLU:CD	3:D:134:ARG:HH22	2.09	0.60
1:B:287:THR:HG23	1:B:303:ARG:HG3	1.84	0.59
5:A:29:ILE:O	5:A:33:MET:HG3	2.03	0.59
1:B:358:TYR:CE2	5:A:134:VAL:HG11	2.38	0.58
3:D:58:ILE:CD1	3:D:336:LEU:HG	2.34	0.57
3:D:58:ILE:HG21	3:D:336:LEU:HD21	1.84	0.57
5:A:46:VAL:HB	5:A:296:PHE:CZ	2.39	0.57
1:B:309:ARG:HH11	1:B:328:PRO:HG2	1.69	0.56
1:B:226:ASP:OD1	1:B:260:LYS:NZ	2.34	0.56
5:A:162:LEU:O	5:A:166:ILE:HG13	2.05	0.56
3:D:58:ILE:HD13	3:D:336:LEU:CD2	2.36	0.55
5:A:72:MET:HA	5:A:72:MET:HE2	1.88	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:D:330:GLY:CA	3:D:336:LEU:HD23	2.36	0.55
5:A:48:PHE:HB3	5:A:49:PRO:HD3	1.88	0.55
3:D:149:CYS:O	3:D:150:ARG:NH1	2.40	0.54
3:D:51:LEU:HB2	3:D:336:LEU:HB2	1.89	0.54
5:A:131:ARG:HA	5:A:134:VAL:HG22	1.89	0.54
5:A:166:ILE:C	5:A:168:MET:H	2.16	0.54
1:B:216:ASN:OD1	3:D:57:LYS:HE2	2.08	0.54
3:D:146:LEU:HD11	3:D:159:THR:HB	1.89	0.54
3:D:311:HIS:CE1	3:D:337:LYS:HD2	2.42	0.54
1:B:53:MET:HE1	1:B:342:ILE:HD12	1.90	0.53
4:E:191:TYR:O	4:E:195:ASN:HB2	2.09	0.53
1:B:332:CYS:C	1:B:333:SER:HG	2.14	0.53
4:E:83:MET:HE2	4:E:86:LEU:HD21	1.91	0.53
3:D:72:SER:CB	3:D:336:LEU:HD11	2.38	0.52
5:A:107:LYS:HB3	5:A:169:THR:HG22	1.91	0.52
5:A:282:GLU:O	5:A:286:VAL:HG13	2.09	0.52
4:E:173:THR:HG21	4:E:193:MET:SD	2.50	0.52
1:B:298:ASP:OD1	1:B:300:ARG:HG3	2.09	0.52
4:E:67:ARG:HD2	4:E:87:ARG:HH21	1.74	0.52
5:A:229:LEU:O	5:A:236:LYS:NZ	2.43	0.52
1:B:191:VAL:HG21	1:B:339:ALA:HB1	1.92	0.51
4:E:60:TYR:HB2	4:E:65:LYS:HD2	1.93	0.51
5:A:91:HIS:CE1	5:A:100:ILE:HG12	2.45	0.51
3:D:48:ARG:HG3	3:D:340:ASN:ND2	2.26	0.51
5:A:31:LEU:O	5:A:35:TYR:HB3	2.10	0.51
1:B:351:LEU:HD22	5:A:236:LYS:HE2	1.93	0.50
4:E:190:ILE:HD13	4:E:196:LEU:HA	1.93	0.50
3:D:67:SER:HB3	3:D:321:THR:HB	1.93	0.50
2:C:59:ASN:ND2	2:C:61:PHE:O	2.45	0.50
1:B:309:ARG:NH1	1:B:328:PRO:HG2	2.27	0.49
1:B:361:VAL:HG11	5:A:235:LEU:HG	1.93	0.49
3:D:294:CYS:SG	3:D:308:LEU:HD12	2.52	0.49
5:A:47:GLY:O	5:A:51:ASN:ND2	2.35	0.49
5:A:225:LEU:HD22	5:A:236:LYS:HD3	1.95	0.49
1:B:230:TYR:HA	1:B:233:LEU:HB2	1.95	0.49
3:D:192:LEU:HD23	3:D:199:PHE:HB3	1.94	0.49
3:D:231:ALA:HB1	3:D:276:VAL:HG22	1.94	0.49
4:E:62:ASP:HA	4:E:65:LYS:HG2	1.95	0.48
4:E:175:LEU:HD22	4:E:213:PHE:CG	2.48	0.48
5:A:166:ILE:O	5:A:168:MET:N	2.44	0.48
5:A:168:MET:HE2	5:A:186:LEU:HD22	1.95	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:A:192:LEU:HD21	5:A:268:ARG:HB3	1.95	0.47
1:B:27:LYS:HB2	3:D:55:LEU:HD22	1.97	0.47
1:B:185:PHE:HB2	1:B:200:ASP:HB2	1.97	0.47
4:E:97:VAL:HG11	4:E:108:PHE:CD2	2.50	0.47
3:D:58:ILE:HD13	3:D:336:LEU:CG	2.44	0.47
4:E:38:ARG:HD3	4:E:48:VAL:HG22	1.96	0.47
5:A:196:LYS:HD2	5:A:269:LEU:CD2	2.45	0.46
2:C:29:LYS:HA	3:D:25:CYS:HB3	1.96	0.46
3:D:250:CYS:HB2	3:D:264:TYR:HB2	1.96	0.46
4:E:29:PHE:HE1	4:E:34:MET:HE2	1.80	0.46
1:B:346:CYS:O	1:B:350:ILE:HG12	2.15	0.46
1:B:287:THR:CG2	1:B:303:ARG:CA	2.92	0.46
4:E:91:THR:HG23	4:E:118:THR:HA	1.98	0.46
3:D:16:ASN:OD1	3:D:19:ARG:NH2	2.45	0.46
5:A:191:GLU:O	5:A:195:ILE:HG13	2.15	0.46
4:E:208:GLY:HA3	4:E:213:PHE:HD1	1.80	0.46
5:A:125:THR:OG1	5:A:210:PRO:HB3	2.16	0.46
3:D:10:GLU:HA	3:D:13:GLN:HE21	1.80	0.45
1:B:281:GLU:HA	1:B:284:ARG:HH11	1.80	0.45
4:E:162:SER:O	4:E:211:THR:HG23	2.17	0.45
3:D:157:ILE:HG22	3:D:169:TRP:HB2	1.98	0.45
5:A:192:LEU:HD23	5:A:269:LEU:HD12	1.99	0.45
1:B:8:GLU:OE1	4:E:176:TYR:OH	2.24	0.45
3:D:57:LYS:HG3	3:D:75:GLN:HG3	1.98	0.45
3:D:274:THR:OG1	3:D:315:VAL:O	2.30	0.45
3:D:58:ILE:HD13	3:D:336:LEU:HG	1.99	0.45
4:E:203:ARG:NH2	4:E:224:ASP:OD1	2.51	0.44
3:D:292:PHE:CD1	3:D:292:PHE:N	2.85	0.44
4:E:141:MET:HE3	4:E:141:MET:HB3	1.78	0.44
5:A:288:ARG:HD3	6:A:1301:AKG:H42	2.00	0.44
5:A:54:VAL:HG12	5:A:58:TYR:CE2	2.52	0.44
5:A:74:ASN:HB3	5:A:123:PHE:CZ	2.53	0.44
4:E:151:THR:O	4:E:154:GLU:HG2	2.17	0.43
4:E:64:VAL:HB	4:E:68:PHE:CG	2.53	0.43
3:D:195:ASP:OD1	3:D:195:ASP:N	2.41	0.43
3:D:320:VAL:HG22	3:D:327:VAL:HG23	2.00	0.43
3:D:262:MET:HE2	3:D:262:MET:HB2	1.86	0.43
5:A:165:VAL:O	5:A:168:MET:HB2	2.19	0.43
4:E:12:VAL:HG13	4:E:119:VAL:HG22	2.01	0.43
1:B:309:ARG:O	1:B:313:VAL:HG23	2.19	0.43
1:B:360:LEU:HD23	1:B:360:LEU:HA	1.83	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:D:42:ARG:HB3	3:D:44:GLN:HE21	1.84	0.42
5:A:144:ILE:HD12	5:A:144:ILE:HA	1.96	0.42
5:A:177:ARG:HA	5:A:177:ARG:HD2	1.78	0.42
1:B:313:VAL:HA	1:B:316:SER:HB3	2.01	0.42
3:D:180:PHE:CE1	3:D:216:GLY:HA2	2.54	0.42
5:A:114:HIS:ND1	5:A:168:MET:HE1	2.35	0.42
4:E:150:VAL:HG11	4:E:246:LEU:HG	2.01	0.42
4:E:54:GLY:O	4:E:55:SER:C	2.63	0.42
4:E:29:PHE:CE1	4:E:34:MET:HE2	2.55	0.42
5:A:206:THR:O	5:A:210:PRO:HG2	2.20	0.42
4:E:32:PHE:CE1	4:E:100:ILE:HB	2.55	0.42
1:B:261:GLN:HB2	1:B:332:CYS:SG	2.60	0.41
1:B:15:ARG:HD3	4:E:102:TYR:HB3	2.02	0.41
3:D:57:LYS:HD2	3:D:59:TYR:HE1	1.85	0.41
1:B:197:HIS:HB3	1:B:199:PHE:CE2	2.56	0.41
3:D:328:ALA:HB2	3:D:338:ILE:HD13	2.02	0.41
1:B:28:GLN:HG2	5:A:146:LYS:HZ2	1.86	0.41
3:D:197:ARG:HA	3:D:197:ARG:HD3	1.28	0.41
4:E:181:ARG:NH1	4:E:187:GLN:OE1	2.54	0.41
4:E:179:LEU:HD13	4:E:228:TYR:CZ	2.56	0.41
4:E:221:GLU:C	4:E:223:GLU:H	2.29	0.41
5:A:38:VAL:O	5:A:42:ILE:HG12	2.20	0.41
1:B:289:GLU:HA	1:B:289:GLU:OE1	2.20	0.41
3:D:14:LEU:HD23	3:D:14:LEU:HA	1.94	0.41
4:E:34:MET:HB3	4:E:79:LEU:HD22	2.03	0.41
5:A:146:LYS:HZ3	5:A:146:LYS:HG3	1.74	0.41
3:D:25:CYS:HB2	3:D:259:GLN:HE22	1.87	0.40
3:D:79:LEU:HD23	3:D:79:LEU:HA	1.95	0.40
1:B:6:SER:O	1:B:10:LYS:HG3	2.21	0.40
1:B:23:LEU:HD23	3:D:78:LYS:HE3	2.04	0.40
3:D:18:ILE:O	3:D:22:ARG:HG3	2.22	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	219/361 (61%)	213 (97%)	6 (3%)	0	100	100
2	C	50/71 (70%)	49 (98%)	1 (2%)	0	100	100
3	D	332/609 (54%)	322 (97%)	10 (3%)	0	100	100
4	E	229/547 (42%)	218 (95%)	11 (5%)	0	100	100
5	A	295/1398 (21%)	288 (98%)	6 (2%)	1 (0%)	36	48
All	All	1125/2986 (38%)	1090 (97%)	34 (3%)	1 (0%)	49	62

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
5	A	167	PRO

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	B	205/316 (65%)	203 (99%)	2 (1%)	68	82
2	C	42/58 (72%)	42 (100%)	0	100	100
3	D	277/504 (55%)	271 (98%)	6 (2%)	45	65
4	E	197/440 (45%)	189 (96%)	8 (4%)	27	43
5	A	275/1157 (24%)	263 (96%)	12 (4%)	25	40
All	All	996/2475 (40%)	968 (97%)	28 (3%)	38	58

All (28) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	231	ASN
1	B	267	LYS
3	D	146	LEU
3	D	196	THR

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Mol	Chain	Res	Type
3	D	197	ARG
3	D	207	SER
3	D	234	PHE
3	D	316	SER
4	E	67	ARG
4	E	70	ILE
4	E	173	THR
4	E	207	SER
4	E	220	LEU
4	E	221	GLU
4	E	223	GLU
4	E	224	ASP
5	A	38	VAL
5	A	62	MET
5	A	107	LYS
5	A	110	ARG
5	A	127	PHE
5	A	128	SER
5	A	133	CYS
5	A	141	CYS
5	A	178	THR
5	A	180	ARG
5	A	181	SER
5	A	185	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	190	GLN
1	B	195	ASN
1	B	234	GLN
2	C	24	ASN
3	D	13	GLN
3	D	44	GLN
4	E	143	GLN
5	A	91	HIS
5	A	199	ASN

5.3.3 RNA ⓘ

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](#)

1 ligand is 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$
6	AKG	A	1301	-	9,9,9	1.23	1 (11%)	11,11,11	1.96	5 (45%)

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
6	AKG	A	1301	-	-	7/9/9/9	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	A	1301	AKG	O5-C2	-2.30	1.18	1.23

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	A	1301	AKG	O2-C1-O1	-3.11	116.49	123.61
6	A	1301	AKG	C4-C3-C2	-2.89	107.59	113.03
6	A	1301	AKG	O2-C1-C2	2.85	121.76	113.97

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	A	1301	AKG	O5-C2-C1	2.26	122.70	119.43
6	A	1301	AKG	C3-C2-C1	2.16	119.99	115.97

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	A	1301	AKG	O1-C1-C2-O5
6	A	1301	AKG	O1-C1-C2-C3
6	A	1301	AKG	O2-C1-C2-C3
6	A	1301	AKG	C2-C3-C4-C5
6	A	1301	AKG	C1-C2-C3-C4
6	A	1301	AKG	C3-C4-C5-O4
6	A	1301	AKG	C3-C4-C5-O3

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	A	1301	AKG	1	0

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-65370. These allow visual inspection of the internal detail of the map and identification of artifacts.

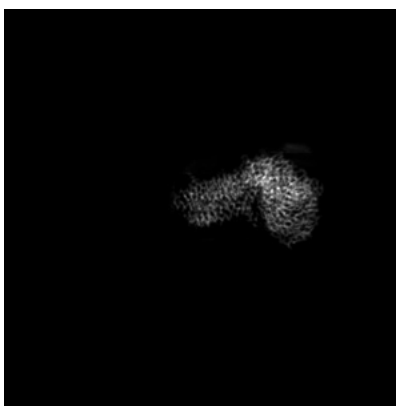
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

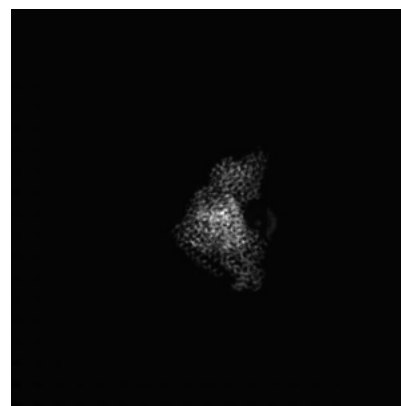
6.1.1 Primary map



X

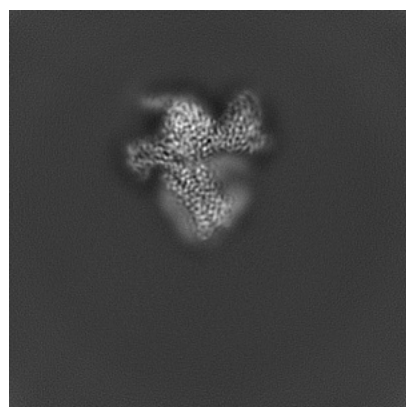


Y

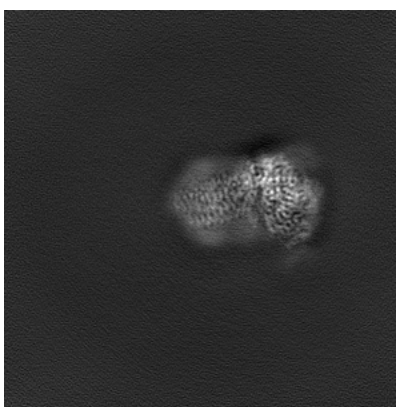


Z

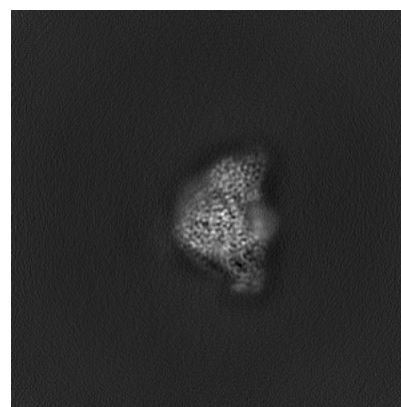
6.1.2 Raw map



X



Y



Z

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

6.2 Central slices [i](#)

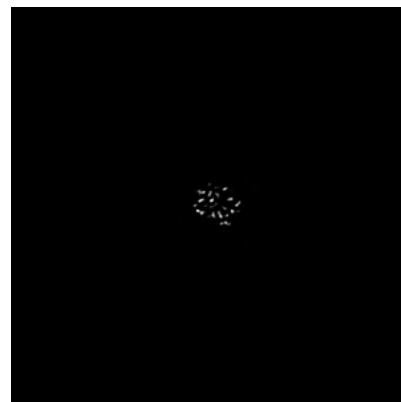
6.2.1 Primary map



X Index: 162

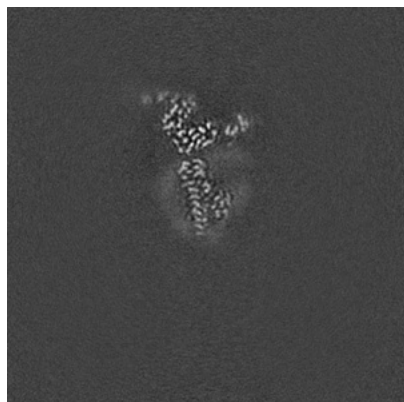


Y Index: 162

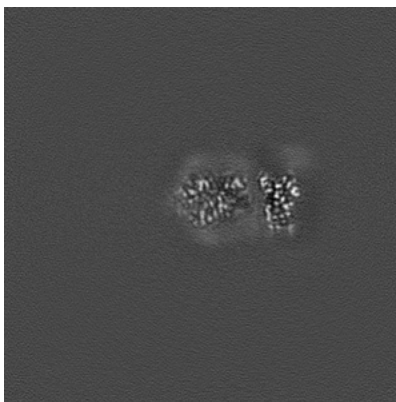


Z Index: 162

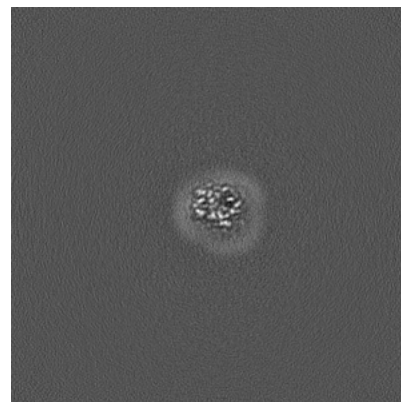
6.2.2 Raw map



X Index: 162



Y Index: 162



Z Index: 162

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: 175

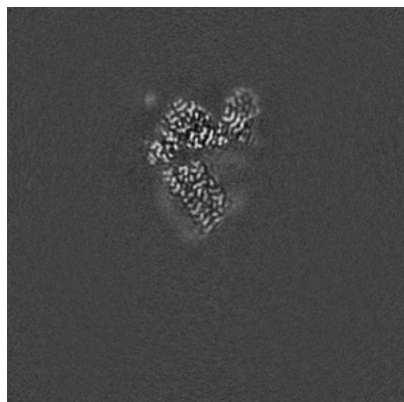


Y Index: 153

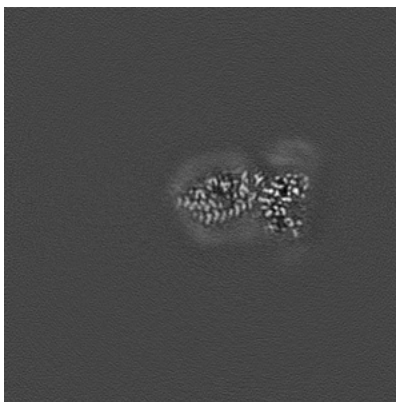


Z Index: 221

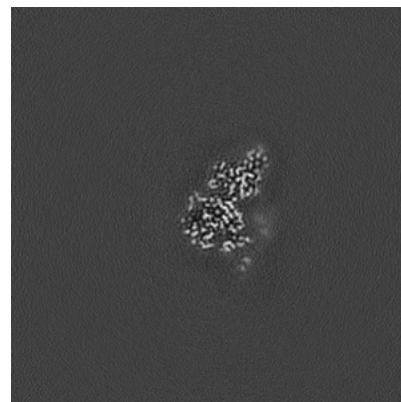
6.3.2 Raw map



X Index: 175



Y Index: 153

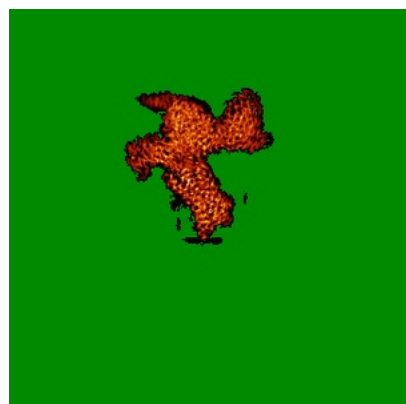


Z Index: 221

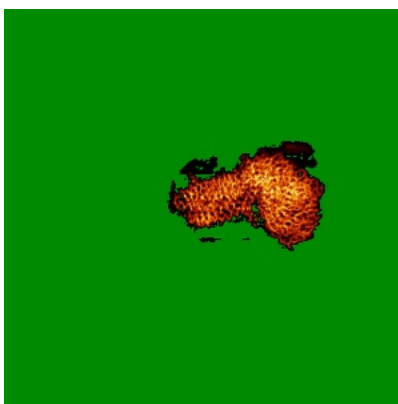
The images above show the largest variance slices of the map in three orthogonal directions.

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

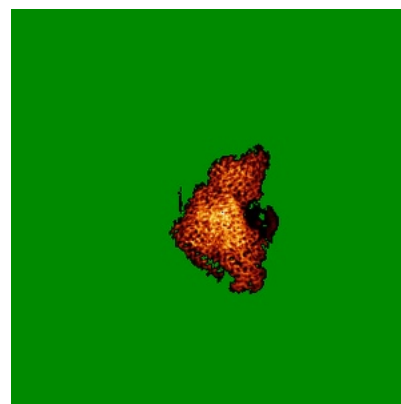
6.4.1 Primary map



X

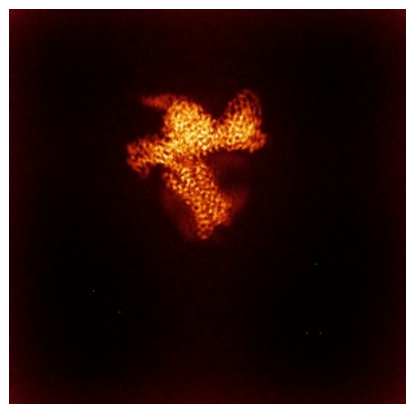


Y

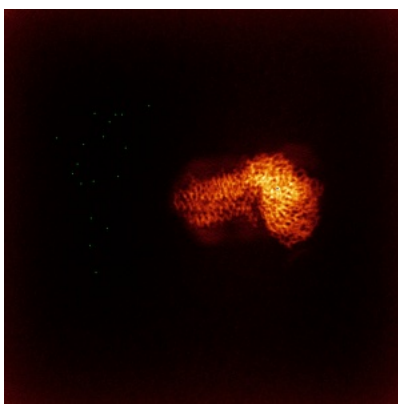


Z

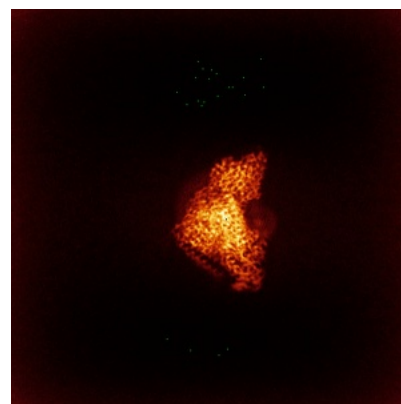
6.4.2 Raw map



X



Y

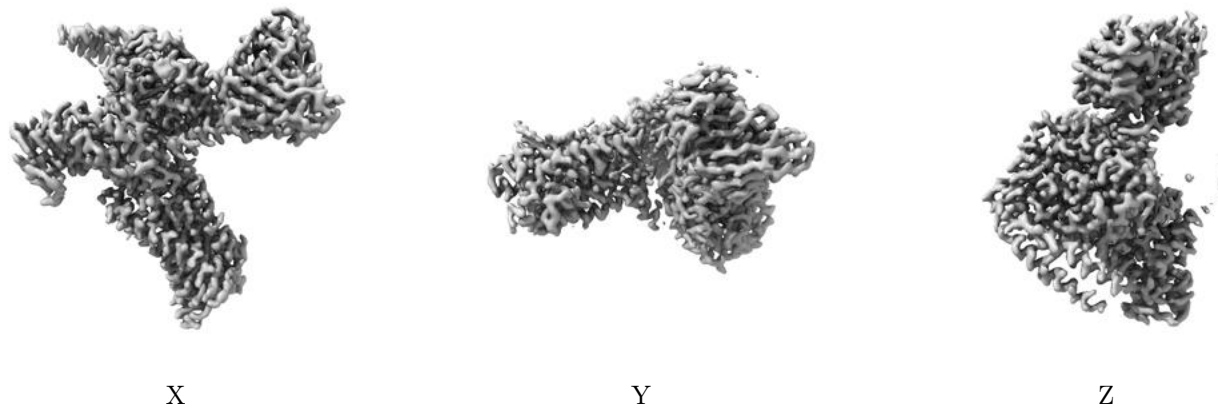


Z

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

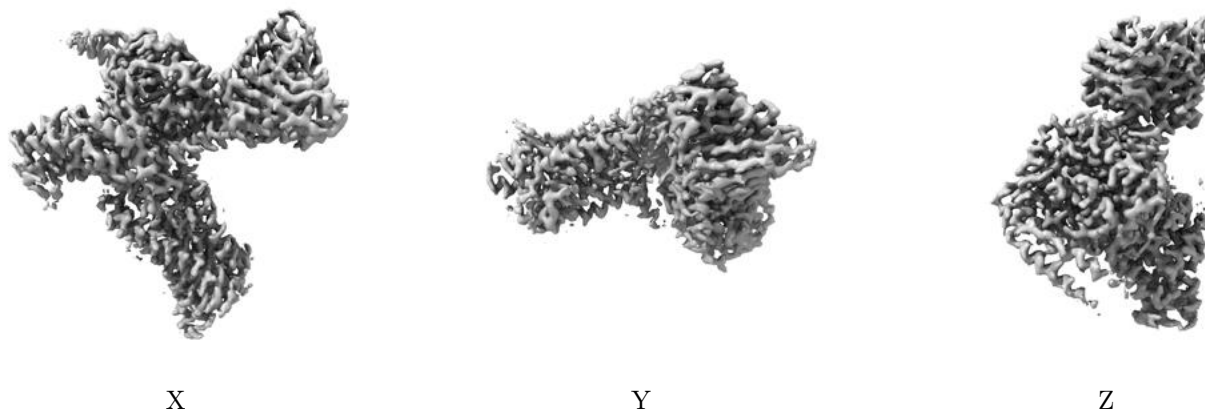
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.143. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 Raw map



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

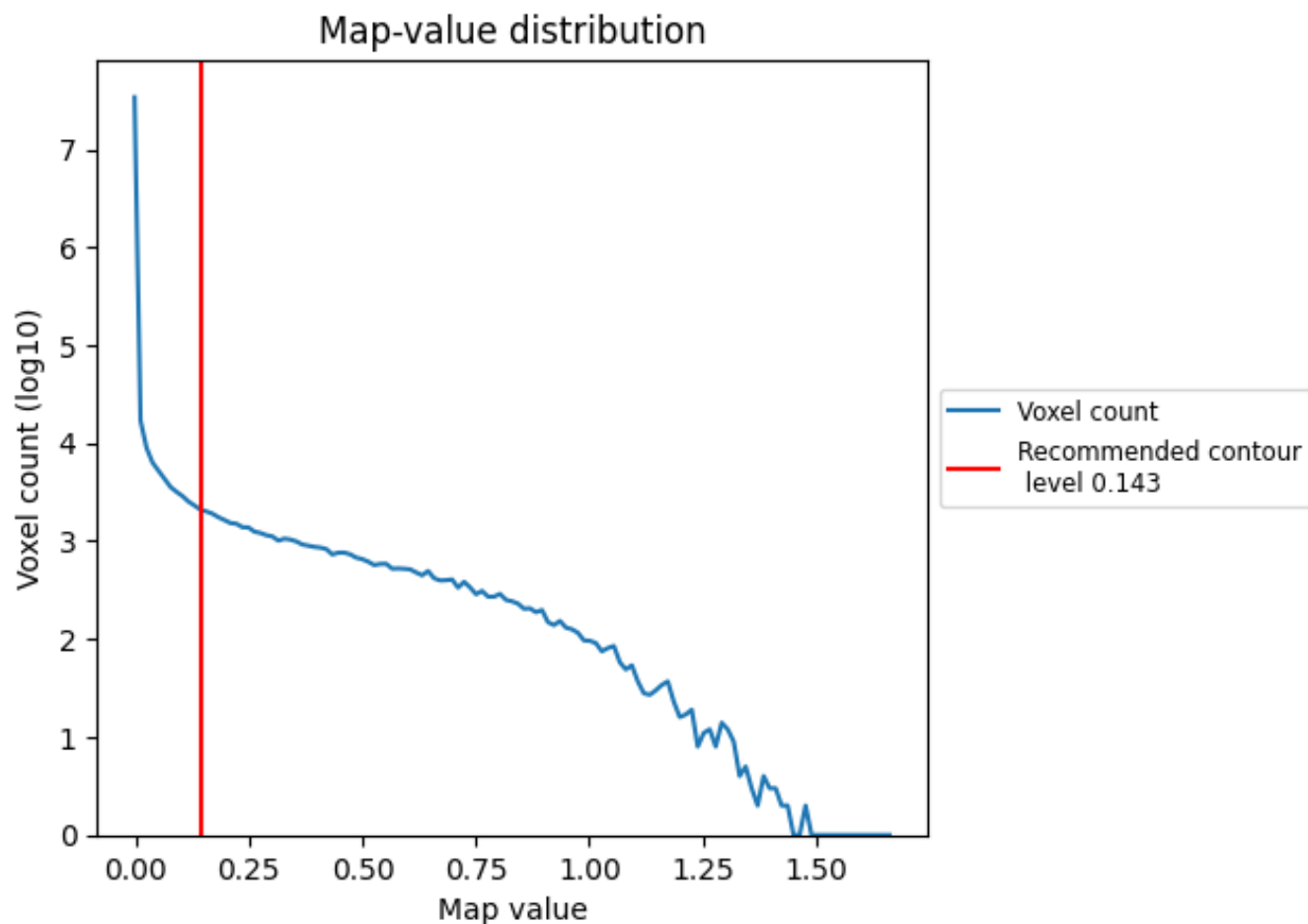
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

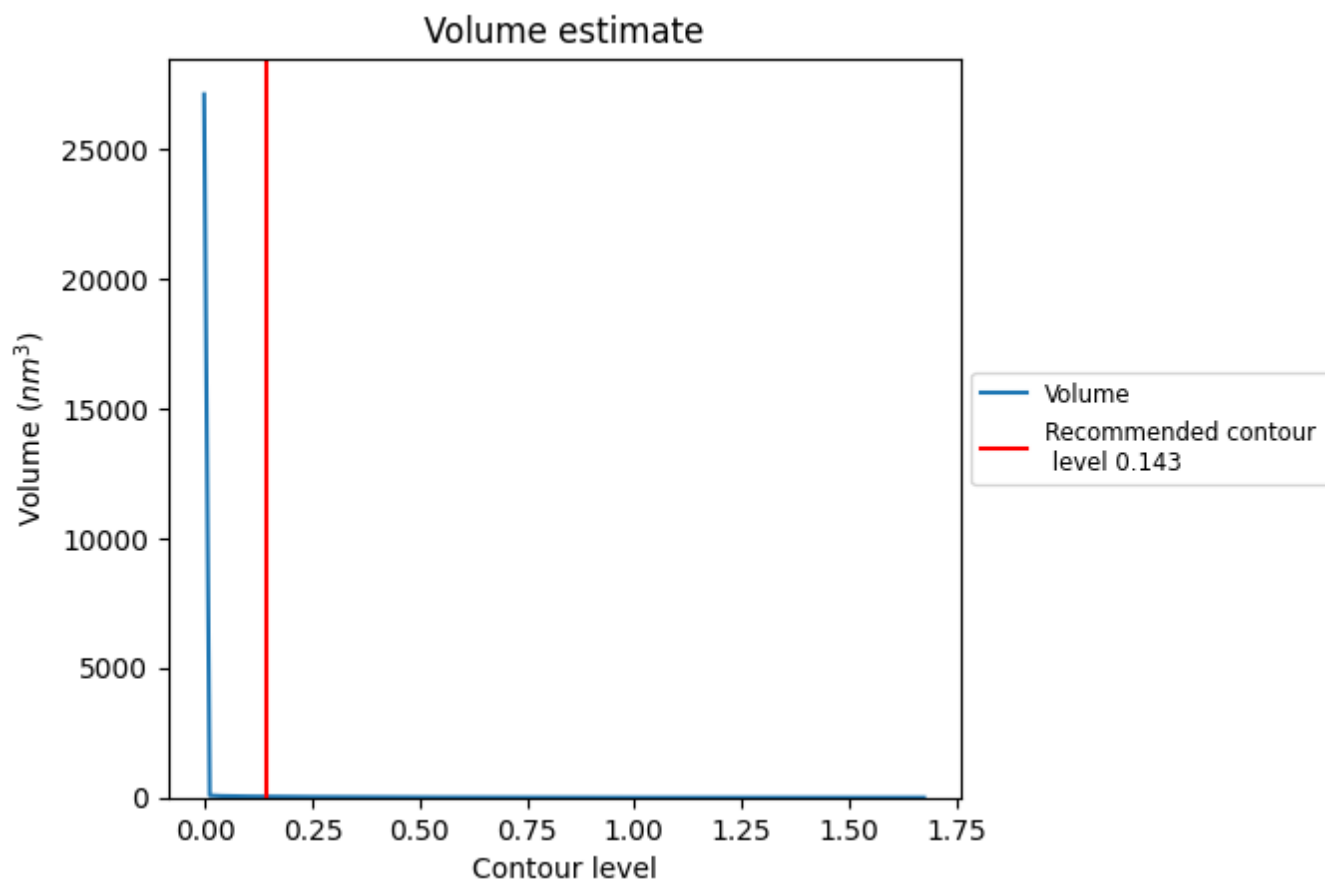
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution [i](#)



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

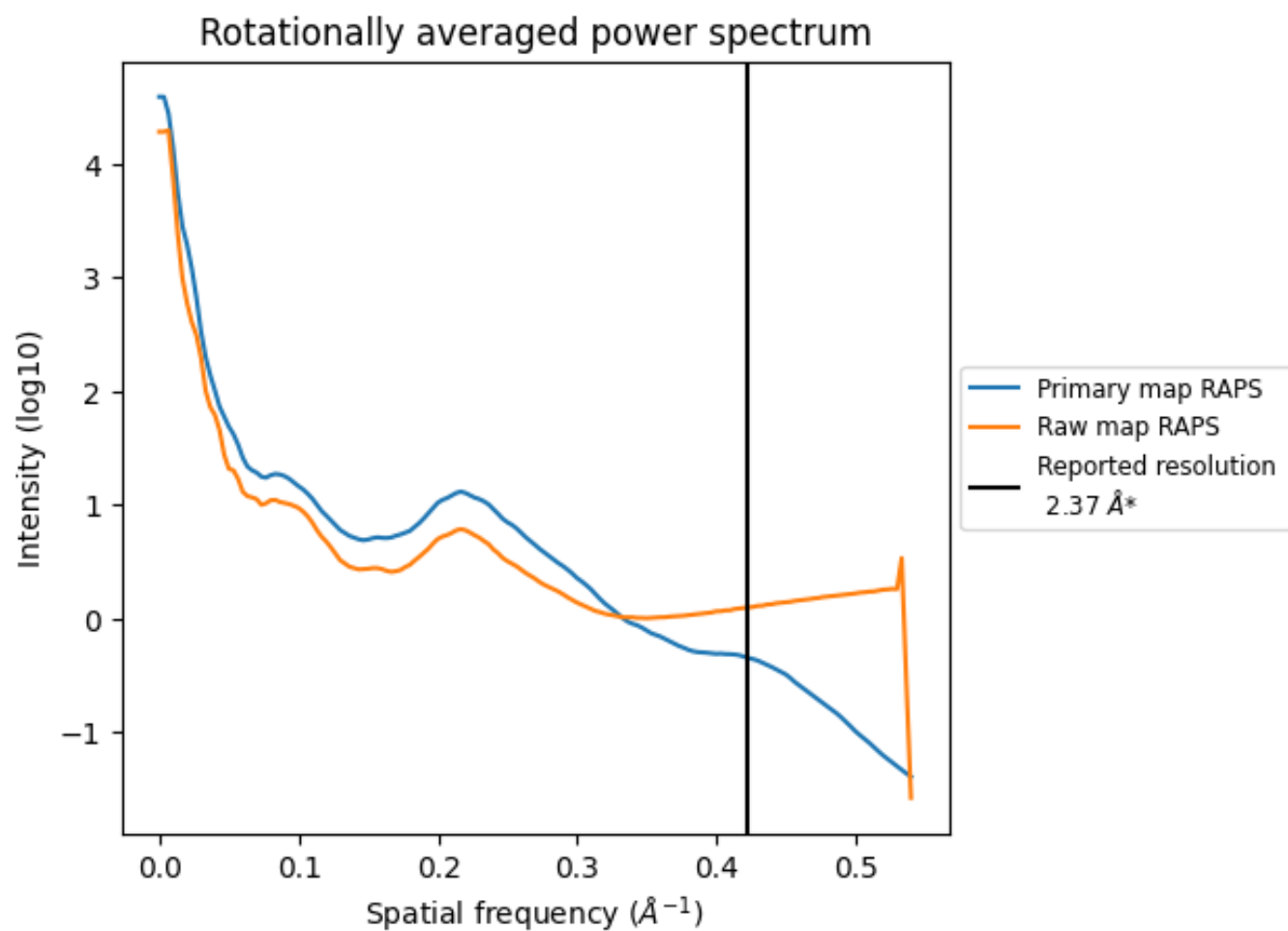
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 37 nm³; this corresponds to an approximate mass of 33 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 ⓘ

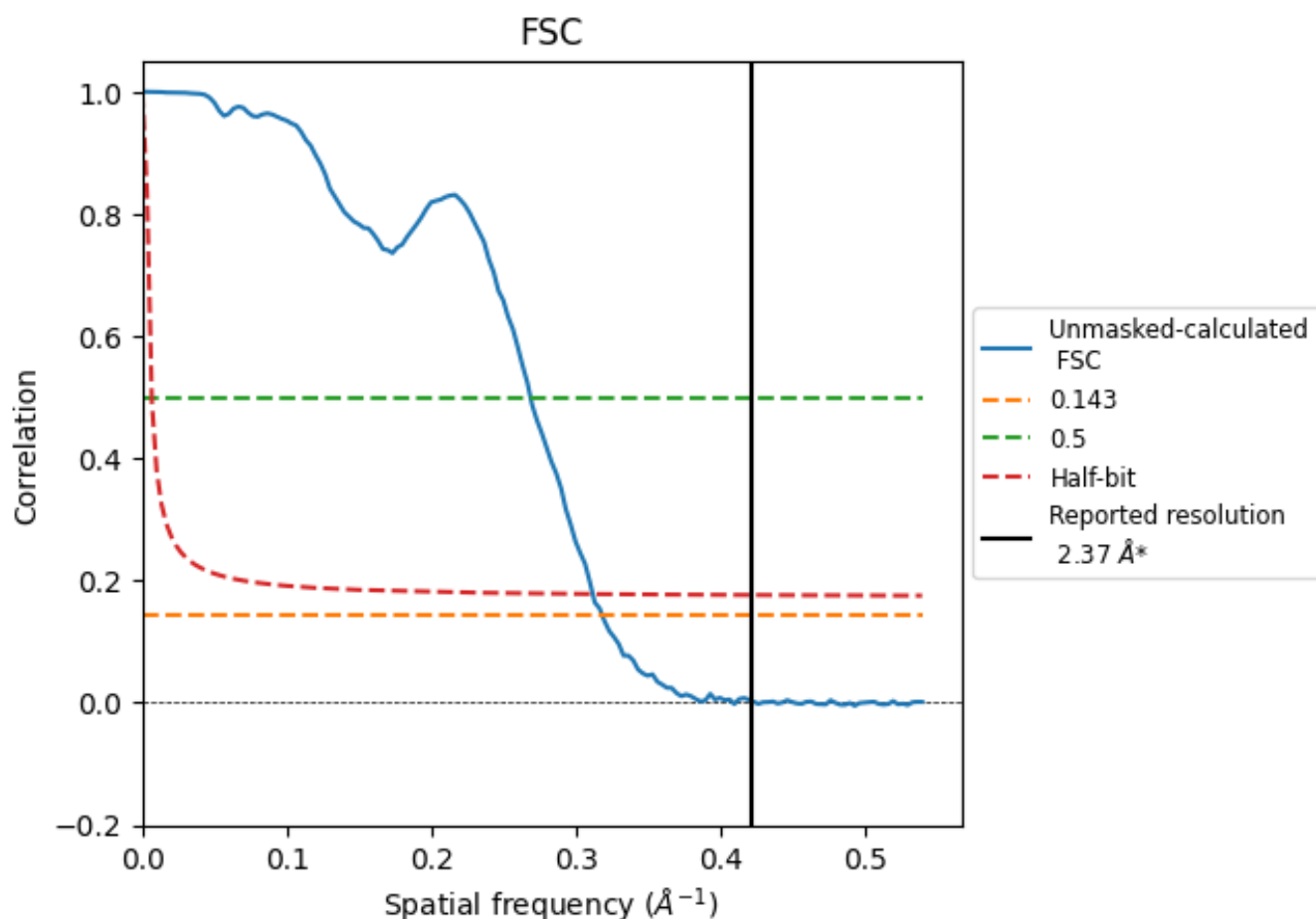


*Reported resolution corresponds to spatial frequency of 0.422 $\text{\AA}^{-1}$

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 0.422 Å⁻¹

8.2 Resolution estimates [i](#)

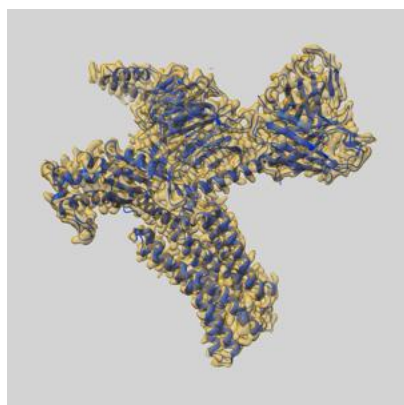
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.37	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	3.14	3.72	3.21

*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 3.14 differs from the reported value 2.37 by more than 10 %

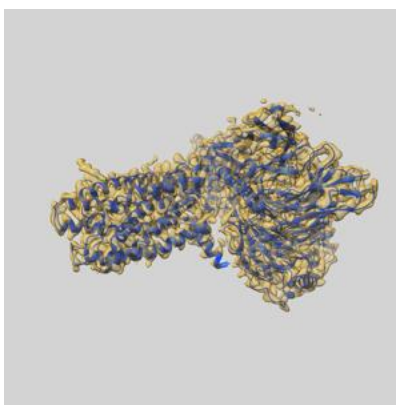
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-65370 and PDB model 9VUS. Per-residue inclusion information can be found in section 3 on page 8.

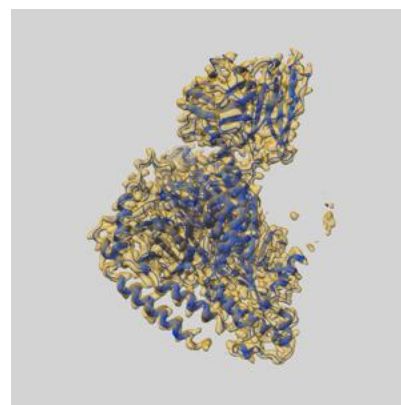
9.1 Map-model overlay [i](#)



X



Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.143 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](#)



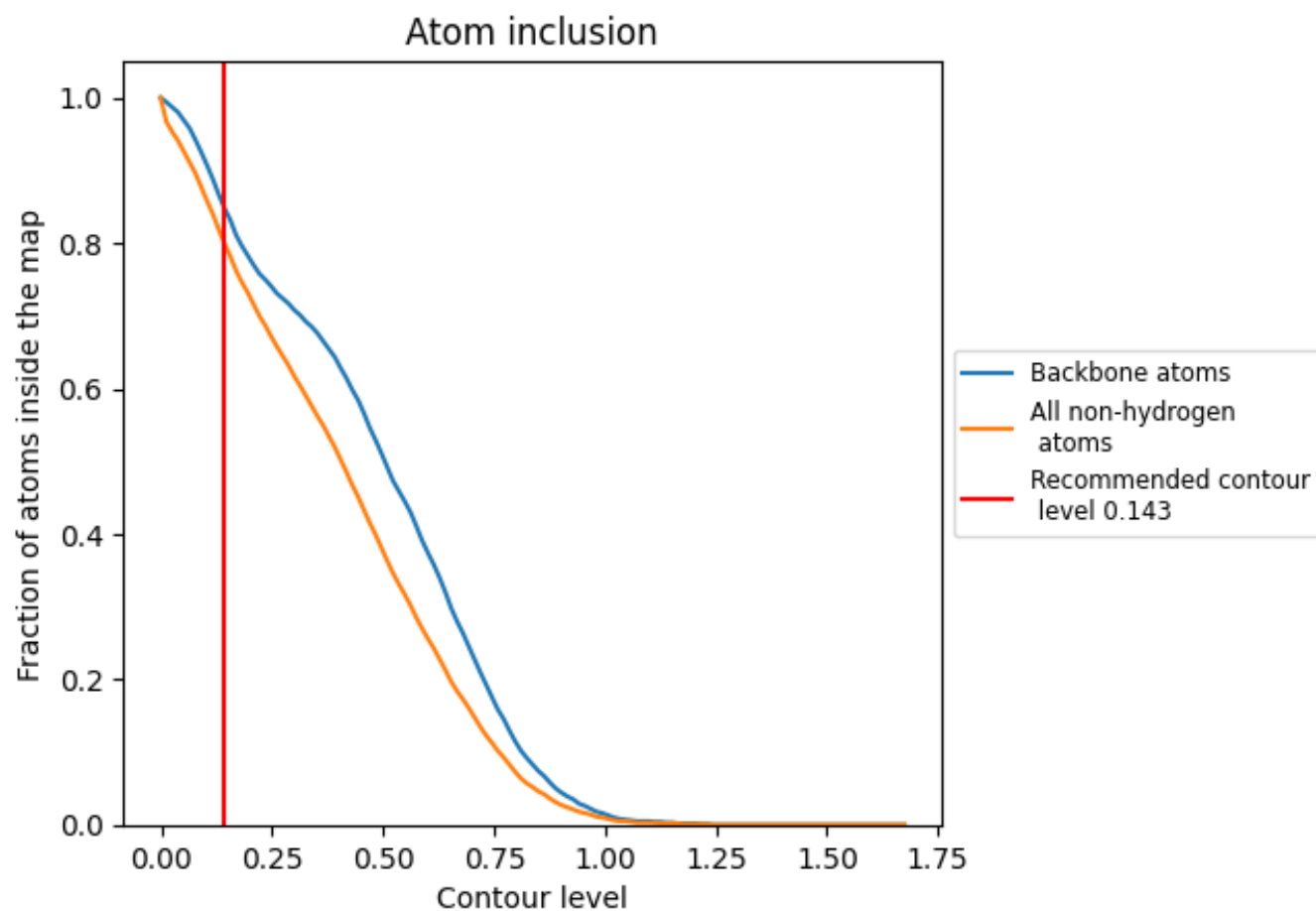
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.143).

9.4 Atom inclusion [i](#)



At the recommended contour level, 85% of all backbone atoms, 80% 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 (0.143) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.7980	0.5880
A	0.7960	0.5810
B	0.7710	0.5690
C	0.6730	0.5180
D	0.8400	0.6170
E	0.7970	0.5940

