Full wwPDB EM Validation Report

Mar 26, 2026 – 06:22 AM UTC

PDB ID	:	8KBZ / pdb_00008kbz
EMDB ID	:	EMD-37088
Title	:	Cryo-EM structure of human ATG9A in LMNG micelles
Authors	:	Yang, W.; Goran, S.
Deposited on	:	2023-08-04
Resolution	:	3.97 Å(reported)

This is a Full wwPDB EM Validation Report for a publicly released PDB entry.

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/EMValidationReportHelp
with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

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

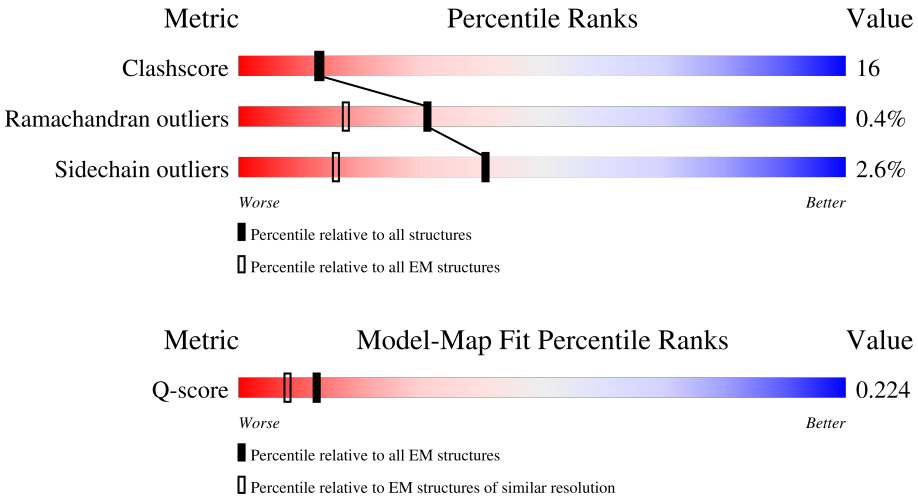
EMDB validation analysis	:	0.0.1.dev132
MolProbity	:	4-5-2 with Phenix2.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics	:	202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ	:	1.9.13
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

1 Overall quality at a glance

The following experimental techniques were used to determine the structure:
ELECTRON MICROSCOPY

The reported resolution of this entry is 3.97 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	7578 (3.47 - 4.47)

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	839	11% 45% 10% • 43%
1	B	839	11% 45% 10% • 43%
1	C	839	9% 45% 10% • 43%

2 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 8860 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.

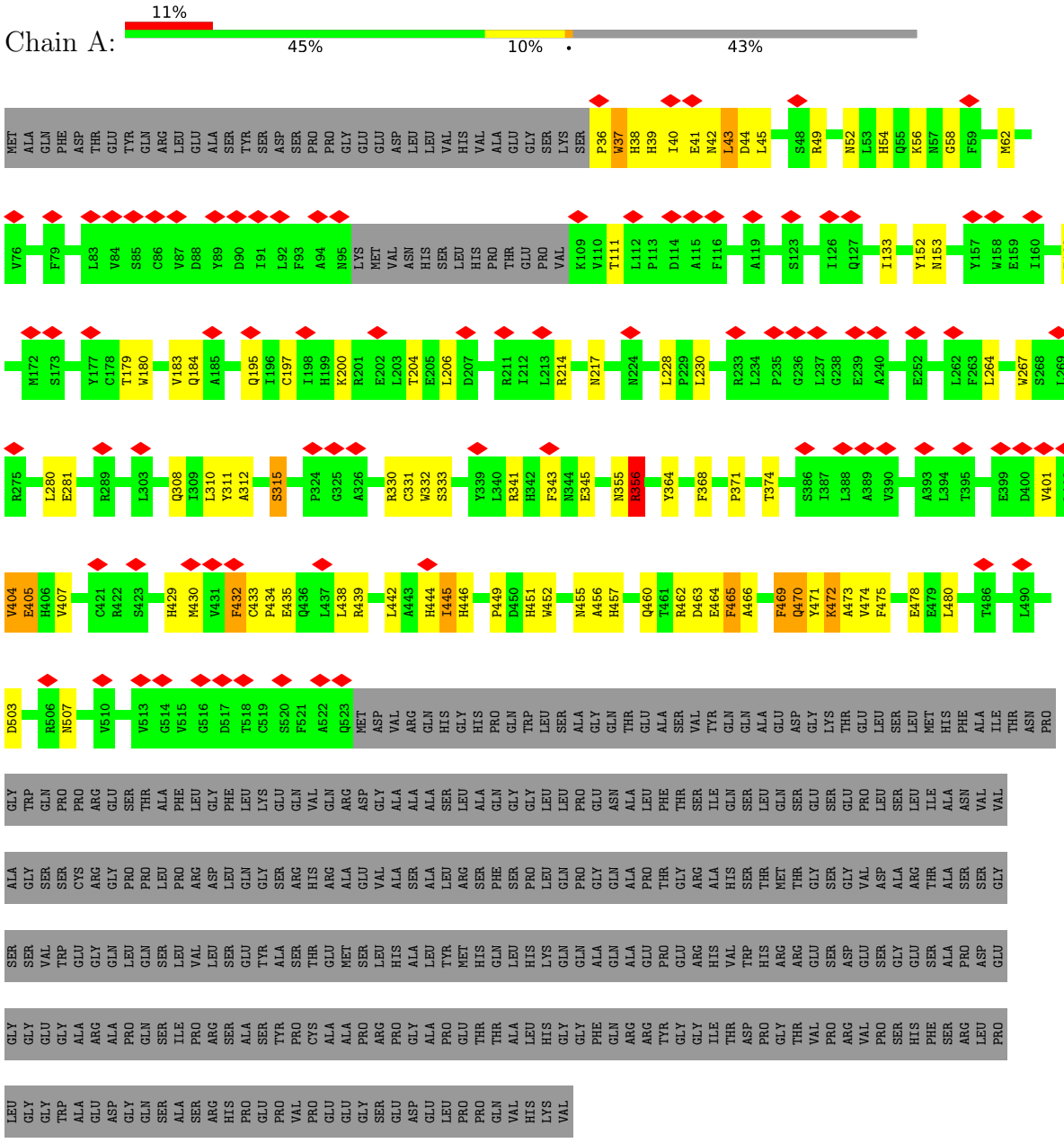
- Molecule 1 is a protein called Autophagy-related protein 9A.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	475	Total	C	N	O	S	0	0
			2998	1891	559	543	5		
1	B	475	Total	C	N	O	S	0	0
			2926	1843	548	532	3		
1	C	475	Total	C	N	O	S	0	0
			2936	1858	538	535	5		

3 Residue-property plots (i)

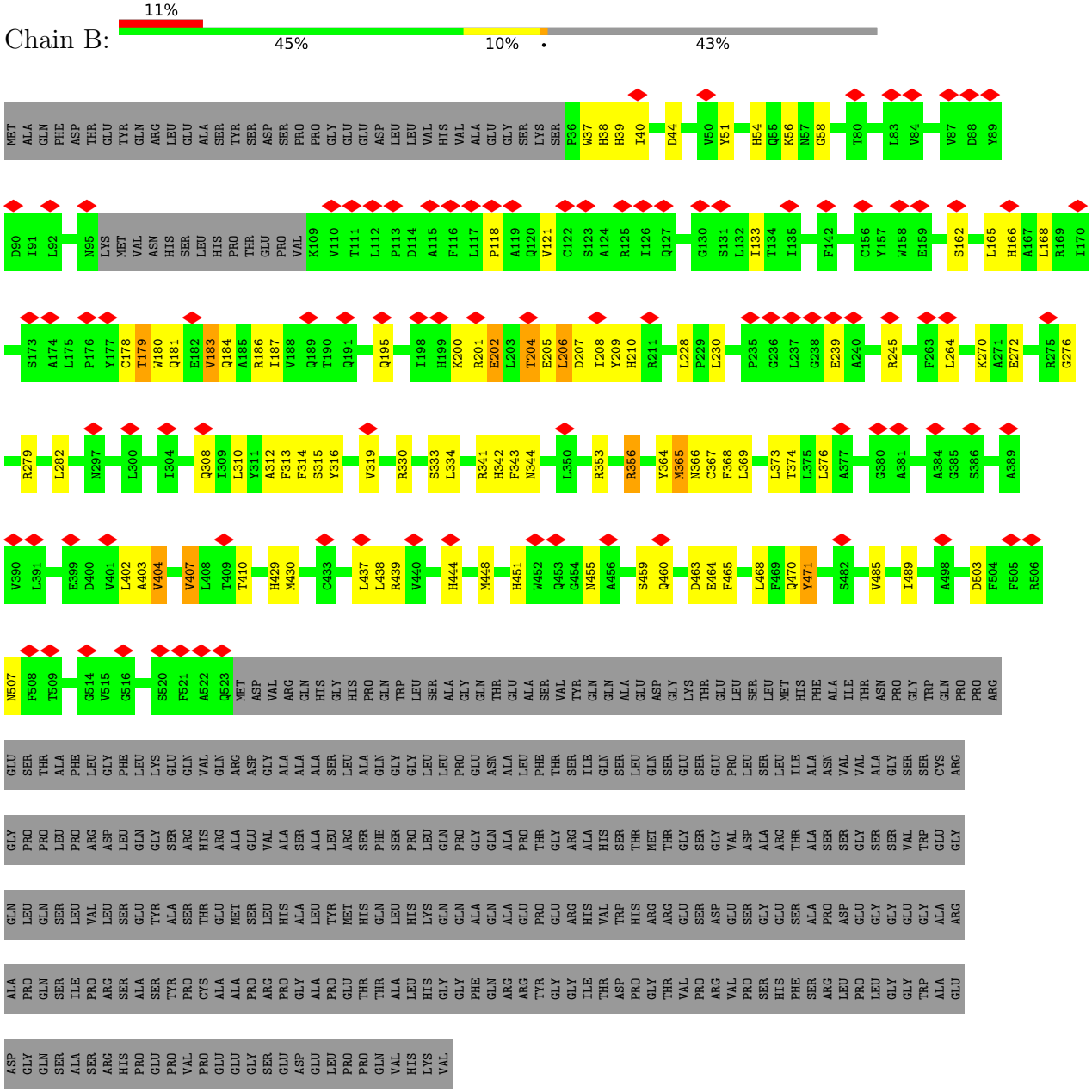
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion 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: Autophagy-related protein 9A



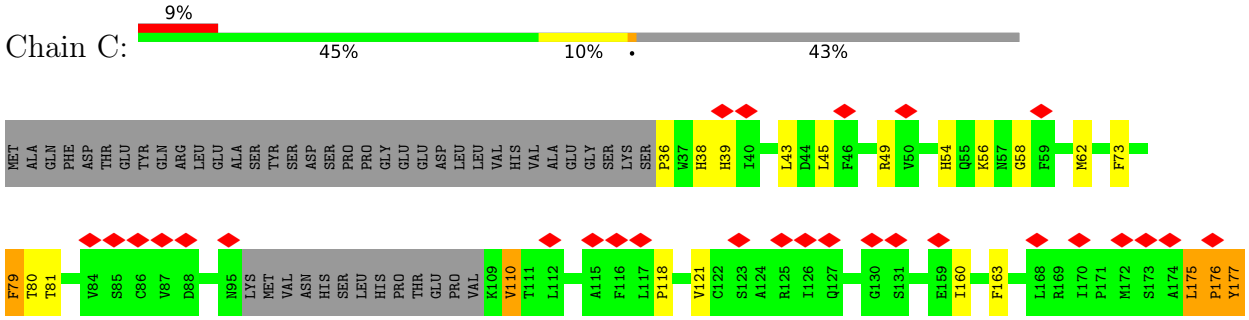
• Molecule 1: Autophagy-related protein 9A

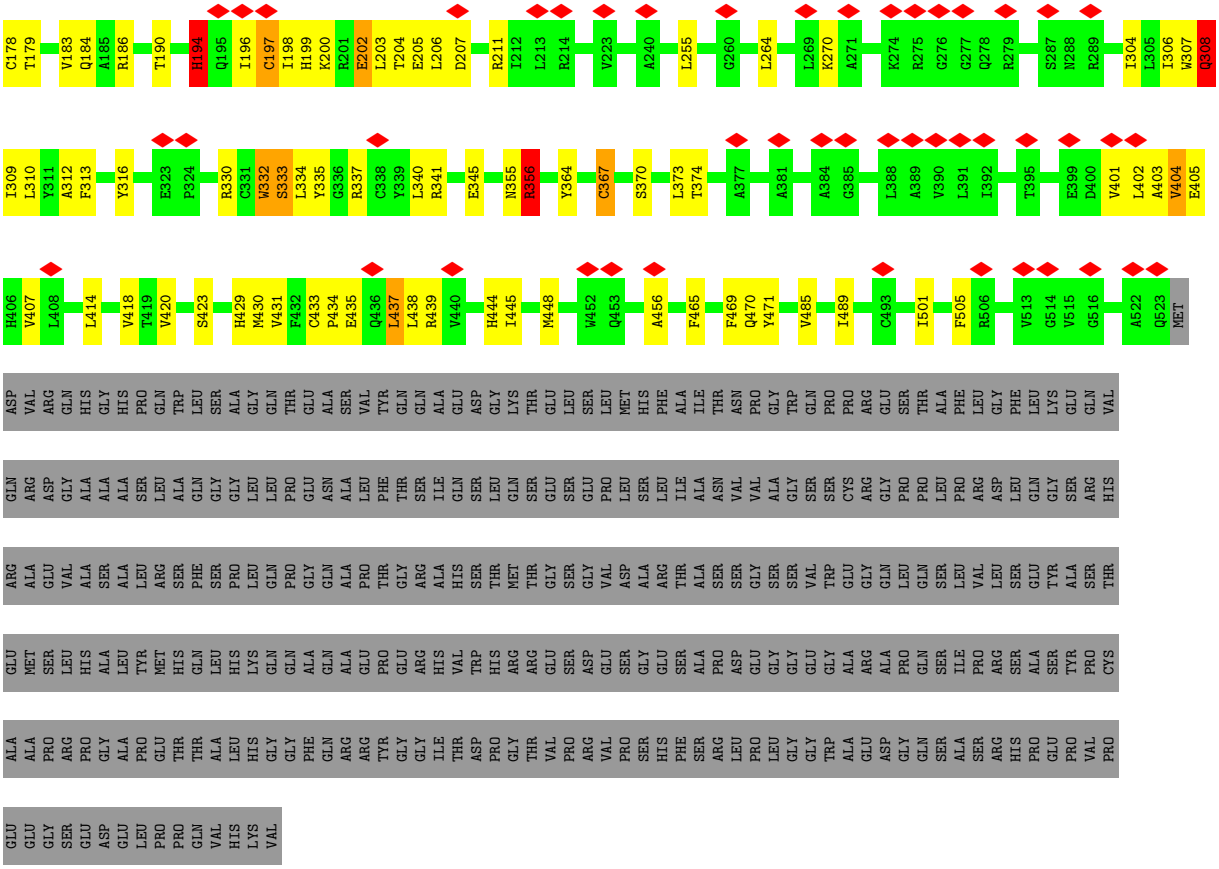
Chain B:



• Molecule 1: Autophagy-related protein 9A

Chain C:




C178 T179 V183 Q184 A185 R186 T190 H194 Q195 I196 C197 I198 H199 K200 R201 E202 L203 T204 E205 L206 D207 R211 I212 L213 R214 V223 A240 L255 G260 L264 L269 K270 A271 K274 R275 G276 G277 Q278 R279 S287 N288 R289 I304 L305 I306 W307 Q308
I309 L310 Y311 A312 F313 Y316 E323 P324 R330 C331 W332 S333 L334 Y335 G336 R337 C338 Y339 L340 R341 E345 N355 R356 Y364 C367 S370 L373 T374 A377 A381 A384 G385 L388 A389 V390 L391 I392 T395 E399 D400 V401 L402 A403 V404 E405
H406 V407 L408 L414 V418 T419 V420 S423 H429 M430 V431 F432 C433 P434 E435 Q436 L437 L438 R439 V440 H444 I445 M448 W452 Q453 A456 F465 F469 Q470 Y471 V485 I489 C493 I501 F505 R506 V513 G514 V515 G516 A522 Q523 MET
ASP VAL ARG GLN HIS GLY HIS PRO GLN TRP LEU SER ALA GLY GLN THR GLU ALA SER VAL TYR GLN GLN ALA GLU ASP GLY LYS THR GLU LEU SER LEU MET HIS PHE ALA ILE THR ASN PRO GLY TRP GLN PRO PRO ARG GLU SER THR ALA PHE LEU GLY PHE LEU LYS GLU GLN VAL
GLN ARG ASP GLY ALA ALA ALA SER LEU ALA GLN GLY GLY LEU LEU PRO GLU ASN ALA LEU PHE THR SER ILE GLN SER LEU GLN SER GLU SER GLU PRO LEU ILE ALA ASN VAL VAL ALA GLY SER SER CYS ARG GLY PRO PRO LEU PRO ARG ASP LEU GLN GLY SER ARG HIS
ARG ALA GLU VAL ALA SER ALA LEU ARG SER PHE SER PRO LEU GLN PRO GLY GLN ALA ALA PRO THR GLY ARG ALA HIS SER THR MET THR GLY SER GLY VAL ASP ALA ARG THR ALA SER SER GLY SER SER VAL TRP GLU GLY GLN LEU GLN SER LEU VAL LEU SER GLU TYR ALA SER THR
GLU MET SER LEU HIS ALA LEU TYR MET HIS GLN LEU HIS LYS GLN GLN ALA GLN ALA GLU PRO GLU ARG HIS VAL TRP HIS ARG ARG GLU SER ASP GLU SER GLY GLU SER ALA PRO ASP GLU GLY GLY GLY GLY ALA ARG ALA PRO GLN SER ILE PRO ARG SER ALA SER TYR PRO CYS
ALA ALA PRO ARG PRO GLY ALA PRO GLU THR THR ALA LEU HIS GLY GLY PHE GLN ARG ARG TYR GLY GLY ILE THR ASP PRO GLY THR VAL PRO ARG VAL PRO SER HIS PHE SER ARG LEU PRO LEU GLY GLY TRP ALA GLU ASP GLY GLN SER ALA SER ARG HIS PRO GLU PRO VAL PRO
GLU GLU GLY SER GLU ASP GLU LEU PRO PRO GLN VAL HIS LYS VAL

4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	224219	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/Å^2$)	65.17	Depositor
Minimum defocus (nm)	1400	Depositor
Maximum defocus (nm)	1900	Depositor
Magnification	105000	Depositor
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	2.472	Depositor
Minimum map value	-0.002	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.013	Depositor
Recommended contour level	0.18	Depositor
Map size (Å)	510.0, 510.0, 510.0	wwPDB
Map dimensions	600, 600, 600	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.85, 0.85, 0.85	Depositor

5 Model quality

5.1 Standard geometry

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	0.67	0/3061	1.01	19/4225 (0.4%)
1	B	0.63	0/2983	1.03	25/4119 (0.6%)
1	C	0.68	0/3005	1.05	34/4157 (0.8%)
All	All	0.66	0/9049	1.03	78/12501 (0.6%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand.A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	B	0	1

There are no bond length outliers.

All (78) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	369	LEU	N-CA-C	17.75	130.62	111.28
1	B	367	CYS	N-CA-C	17.20	130.03	111.28
1	A	465	PHE	N-CA-C	-14.36	95.84	113.50
1	A	40	ILE	N-CA-C	13.19	124.07	110.62
1	C	465	PHE	N-CA-C	-12.85	97.69	113.50
1	C	206	LEU	N-CA-C	-11.56	101.45	114.62
1	C	407	VAL	N-CA-C	11.37	122.22	110.62
1	B	206	LEU	N-CA-C	-11.29	98.98	111.28
1	A	404	VAL	N-CA-C	-11.25	92.01	109.78
1	A	435	GLU	N-CA-C	-10.96	99.34	111.28
1	A	401	VAL	N-CA-C	-10.76	97.57	113.39
1	A	470	GLN	N-CA-C	10.10	125.18	111.24
1	B	465	PHE	N-CA-C	-9.86	101.37	113.50
1	C	448	MET	N-CA-C	9.31	116.60	108.22
1	A	200	LYS	N-CA-C	-9.17	101.26	111.07

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	404	VAL	N-CA-C	-9.05	97.91	109.58
1	C	202	GLU	N-CA-C	-8.93	99.42	110.41
1	B	204	THR	N-CA-C	-8.72	101.68	111.71
1	C	176	PRO	N-CA-C	-8.60	101.34	113.81
1	C	367	CYS	N-CA-C	8.54	123.26	113.01
1	B	470	GLN	N-CA-C	8.10	121.97	110.23
1	C	404	VAL	N-CA-C	-7.79	95.97	108.90
1	C	407	VAL	CB-CA-C	-7.61	101.87	112.14
1	A	432	PHE	N-CA-C	7.51	119.10	111.07
1	A	407	VAL	N-CA-C	7.50	118.27	110.62
1	A	472	LYS	N-CA-C	7.23	119.17	111.28
1	C	470	GLN	N-CA-C	7.23	120.71	110.23
1	B	200	LYS	N-CA-C	7.22	120.67	108.90
1	B	366	ASN	N-CA-C	7.09	119.01	111.28
1	C	310	LEU	N-CA-C	7.04	118.61	111.07
1	A	184	GLN	N-CA-C	-7.00	103.65	111.28
1	A	405	GLU	N-CA-C	-6.89	103.79	111.71
1	A	43	LEU	N-CA-C	6.83	118.73	111.28
1	B	44	ASP	N-CA-C	6.77	118.66	111.28
1	B	356	ARG	N-CA-C	-6.72	103.95	111.28
1	A	180	TRP	N-CA-C	6.65	118.61	111.36
1	C	356	ARG	N-CA-C	-6.65	104.03	111.28
1	A	356	ARG	N-CA-C	-6.61	104.07	111.28
1	B	368	PHE	N-CA-C	6.52	119.68	110.23
1	A	434	PRO	N-CA-C	6.46	121.11	111.41
1	B	471	TYR	N-CA-C	6.45	119.59	110.23
1	C	433	CYS	N-CA-C	-6.40	96.87	109.10
1	C	334	LEU	N-CA-C	-6.34	104.36	111.28
1	B	202	GLU	N-CA-C	-6.34	101.04	110.23
1	C	316	TYR	N-CA-C	6.19	118.03	111.28
1	C	196	ILE	N-CA-C	6.16	117.28	107.98
1	C	308	GLN	N-CA-C	-6.07	104.67	111.28
1	C	370	SER	CA-C-N	-6.00	112.31	118.85
1	C	370	SER	C-N-CA	-6.00	112.31	118.85
1	C	335	TYR	N-CA-C	-5.98	102.64	110.53
1	B	195	GLN	N-CA-C	5.94	118.84	110.23
1	C	437	LEU	N-CA-C	5.89	117.70	111.28
1	B	365	MET	N-CA-C	-5.87	104.23	111.33
1	C	430	MET	CA-C-N	-5.81	115.47	122.90
1	C	430	MET	C-N-CA	-5.81	115.47	122.90
1	C	469	PHE	N-CA-C	5.80	119.66	112.59
1	B	430	MET	N-CA-C	-5.69	99.45	108.73

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	C	177	TYR	N-CA-CB	-5.69	102.07	110.49
1	C	175	LEU	CA-C-N	-5.57	113.01	119.47
1	C	175	LEU	C-N-CA	-5.57	113.01	119.47
1	A	37	TRP	N-CA-C	5.55	117.86	110.53
1	C	186	ARG	N-CA-C	-5.39	105.76	112.93
1	C	197	CYS	CB-CA-C	-5.37	110.40	116.63
1	C	332	TRP	N-CA-C	5.36	119.54	112.89
1	B	178	CYS	N-CA-C	-5.32	105.48	111.28
1	A	183	VAL	N-CA-C	-5.27	105.25	110.62
1	C	205	GLU	N-CA-C	-5.26	102.57	113.31
1	B	369	LEU	CA-C-N	-5.26	118.05	123.10
1	B	369	LEU	C-N-CA	-5.26	118.05	123.10
1	C	184	GLN	N-CA-C	-5.24	105.57	111.28
1	C	198	ILE	N-CA-C	-5.19	105.32	110.62
1	B	187	ILE	N-CA-C	-5.13	105.39	110.62
1	B	448	MET	N-CA-C	5.08	117.41	108.82
1	A	445	ILE	N-CA-C	5.08	115.80	110.62
1	B	186	ARG	N-CA-C	5.03	116.76	111.28
1	B	310	LEU	N-CA-C	5.02	116.75	111.28
1	B	438	LEU	N-CA-C	-5.02	107.65	112.97
1	C	194	HIS	N-CA-C	-5.01	99.17	107.99

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	308	GLN	Mainchain

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	A	2998	0	2145	97	0
1	B	2926	0	2016	63	0
1	C	2936	0	1987	88	0
All	All	8860	0	6148	241	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 16.

All (241) 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)
1:C:340:LEU:HD22	1:C:445:ILE:CG2	1.67	1.23
1:C:364:TYR:CE1	1:C:438:LEU:HD21	1.83	1.12
1:A:368:PHE:CZ	1:A:433:CYS:HB3	1.92	1.05
1:C:45:LEU:HD23	1:C:45:LEU:O	1.63	0.98
1:A:438:LEU:HD12	1:A:456:ALA:CB	1.95	0.96
1:C:340:LEU:HD22	1:C:445:ILE:HG21	1.47	0.96
1:C:330:ARG:HA	1:C:471:TYR:HA	1.47	0.95
1:A:438:LEU:HD12	1:A:456:ALA:HB1	1.43	0.95
1:A:438:LEU:CD1	1:A:456:ALA:HB1	1.96	0.95
1:A:45:LEU:HD21	1:A:49:ARG:NH2	1.83	0.93
1:A:333:SER:HB2	1:A:470:GLN:HB2	1.52	0.90
1:B:38:HIS:CD2	1:B:39:HIS:NE2	2.39	0.90
1:A:39:HIS:HB3	1:A:197:CYS:N	1.86	0.90
1:B:38:HIS:CD2	1:B:39:HIS:CD2	2.60	0.90
1:A:332:TRP:CH2	1:A:445:ILE:HD11	2.07	0.89
1:B:38:HIS:HD2	1:B:39:HIS:CD2	1.92	0.88
1:C:438:LEU:HD12	1:C:456:ALA:HB1	1.55	0.88
1:C:333:SER:O	1:C:337:ARG:HG3	1.74	0.86
1:B:276:GLY:O	1:B:279:ARG:HG3	1.76	0.85
1:C:438:LEU:HD12	1:C:456:ALA:CB	2.06	0.85
1:A:429:HIS:CG	1:A:430:MET:H	1.93	0.85
1:C:45:LEU:HD21	1:C:49:ARG:HH21	1.41	0.84
1:A:280:LEU:HD12	1:A:281:GLU:N	1.93	0.84
1:C:364:TYR:CD1	1:C:438:LEU:HD21	2.12	0.82
1:A:52:ASN:ND2	1:A:62:MET:CE	2.42	0.81
1:C:364:TYR:CE1	1:C:438:LEU:CD2	2.62	0.81
1:A:42:ASN:O	1:A:42:ASN:OD1	2.00	0.79
1:C:364:TYR:CZ	1:C:438:LEU:HD21	2.19	0.78
1:A:44:ASP:CG	1:A:214:ARG:HH11	1.91	0.78
1:B:330:ARG:HA	1:B:471:TYR:HA	1.66	0.77
1:A:429:HIS:CG	1:A:430:MET:N	2.51	0.76
1:A:52:ASN:ND2	1:A:62:MET:HE1	2.00	0.76
1:C:438:LEU:CD1	1:C:456:ALA:HB1	2.16	0.76
1:A:438:LEU:CD1	1:A:456:ALA:CB	2.62	0.75
1:C:364:TYR:CD1	1:C:438:LEU:CD2	2.70	0.75
1:B:38:HIS:O	1:B:39:HIS:CG	2.41	0.74
1:A:331:CYS:O	1:A:470:GLN:HB3	1.89	0.73

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:368:PHE:CZ	1:A:457:HIS:HA	2.23	0.72
1:B:165:LEU:HD12	1:B:166:HIS:N	2.06	0.71
1:B:451:HIS:NE2	1:B:464:GLU:OE2	2.22	0.71
1:A:470:GLN:O	1:A:470:GLN:HG3	1.89	0.70
1:A:368:PHE:HZ	1:A:457:HIS:HA	1.54	0.70
1:A:451:HIS:NE2	1:A:464:GLU:OE2	2.22	0.69
1:C:340:LEU:HD22	1:C:445:ILE:HG23	1.70	0.69
1:C:175:LEU:C	1:C:177:TYR:N	2.43	0.68
1:C:501:ILE:O	1:C:505:PHE:HD2	1.75	0.67
1:B:503:ASP:O	1:B:507:ASN:ND2	2.27	0.67
1:C:178:CYS:SG	1:C:183:VAL:HG23	2.35	0.67
1:A:503:ASP:O	1:A:507:ASN:ND2	2.27	0.66
1:C:340:LEU:CD2	1:C:445:ILE:HG21	2.24	0.66
1:A:368:PHE:CE1	1:A:433:CYS:SG	2.89	0.66
1:C:401:VAL:O	1:C:404:VAL:HG23	1.95	0.66
1:A:308:GLN:CG	1:A:480:LEU:HA	2.26	0.65
1:C:401:VAL:O	1:C:404:VAL:CG2	2.44	0.65
1:C:435:GLU:HA	1:C:456:ALA:HB3	1.78	0.65
1:A:45:LEU:HD21	1:A:49:ARG:HH21	1.62	0.65
1:A:449:PRO:HD2	1:A:452:TRP:CE3	2.32	0.65
1:C:190:THR:HG23	1:C:194:HIS:HD2	1.62	0.65
1:A:368:PHE:CE1	1:A:433:CYS:HB3	2.31	0.64
1:A:438:LEU:HD11	1:A:456:ALA:HB1	1.79	0.64
1:C:340:LEU:HD22	1:C:445:ILE:HG22	1.73	0.64
1:B:245:ARG:HD2	1:B:334:LEU:CD1	2.29	0.63
1:A:438:LEU:HD12	1:A:456:ALA:HB2	1.76	0.63
1:C:79:PHE:C	1:C:81:THR:N	2.52	0.63
1:C:431:VAL:HG13	1:C:431:VAL:O	1.99	0.63
1:A:111:THR:HA	1:C:405:GLU:CB	2.30	0.61
1:B:404:VAL:HA	1:C:110:VAL:O	2.00	0.61
1:B:245:ARG:HD2	1:B:334:LEU:HD11	1.81	0.61
1:A:364:TYR:CE1	1:A:438:LEU:HD21	2.36	0.61
1:C:501:ILE:O	1:C:505:PHE:CD2	2.53	0.60
1:C:39:HIS:CA	1:C:197:CYS:HA	2.32	0.60
1:C:414:LEU:O	1:C:418:VAL:HG23	2.02	0.59
1:A:341:ARG:NH2	1:A:345:GLU:O	2.36	0.59
1:A:330:ARG:HA	1:A:471:TYR:HA	1.83	0.59
1:A:472:LYS:O	1:A:473:ALA:C	2.41	0.59
1:C:190:THR:HG23	1:C:194:HIS:CD2	2.37	0.58
1:C:341:ARG:NH2	1:C:345:GLU:O	2.36	0.58
1:A:333:SER:HB2	1:A:470:GLN:CB	2.31	0.58

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:449:PRO:HG2	1:A:452:TRP:CE2	2.38	0.57
1:C:367:CYS:SG	1:C:434:PRO:HG3	2.44	0.57
1:A:308:GLN:HG2	1:A:480:LEU:HA	1.86	0.57
1:B:207:ASP:O	1:B:210:HIS:HB2	2.04	0.57
1:B:353:ARG:HG3	1:B:444:HIS:O	2.04	0.57
1:C:204:THR:CB	1:C:207:ASP:H	2.18	0.57
1:A:38:HIS:HA	1:A:195:GLN:O	2.04	0.56
1:A:280:LEU:HD12	1:A:280:LEU:C	2.30	0.56
1:B:429:HIS:HA	1:C:355:ASN:HB2	1.88	0.56
1:B:38:HIS:O	1:B:39:HIS:CD2	2.60	0.55
1:A:44:ASP:OD1	1:A:214:ARG:NH1	2.39	0.55
1:C:45:LEU:O	1:C:45:LEU:CD2	2.48	0.55
1:A:37:TRP:HA	1:A:37:TRP:CE3	2.42	0.55
1:C:175:LEU:O	1:C:176:PRO:C	2.46	0.55
1:A:368:PHE:CZ	1:A:433:CYS:CB	2.81	0.54
1:B:37:TRP:HB2	1:B:40:ILE:CB	2.37	0.54
1:A:330:ARG:HG2	1:A:471:TYR:HA	1.89	0.54
1:A:332:TRP:CH2	1:A:445:ILE:CD1	2.85	0.54
1:A:368:PHE:CE1	1:A:433:CYS:CB	2.89	0.54
1:B:205:GLU:C	1:B:208:ILE:H	2.15	0.54
1:C:255:LEU:CD2	1:C:505:PHE:HZ	2.21	0.53
1:A:52:ASN:HD22	1:A:62:MET:HE1	1.73	0.53
1:B:162:SER:HA	1:B:165:LEU:HG	1.90	0.53
1:C:39:HIS:N	1:C:197:CYS:HA	2.23	0.52
1:C:43:LEU:CB	1:C:211:ARG:HD2	2.39	0.52
1:C:79:PHE:O	1:C:80:THR:C	2.53	0.52
1:C:118:PRO:HG2	1:C:121:VAL:HG23	1.92	0.52
1:B:118:PRO:HG2	1:B:121:VAL:HG23	1.92	0.52
1:C:38:HIS:O	1:C:38:HIS:ND1	2.43	0.52
1:B:204:THR:C	1:B:206:LEU:H	2.18	0.51
1:A:43:LEU:O	1:A:44:ASP:C	2.50	0.51
1:A:52:ASN:ND2	1:A:62:MET:HE2	2.25	0.51
1:B:181:GLN:NE2	1:B:184:GLN:HE21	2.09	0.51
1:C:79:PHE:C	1:C:81:THR:H	2.16	0.51
1:C:437:LEU:C	1:C:439:ARG:N	2.66	0.51
1:A:39:HIS:HB3	1:A:197:CYS:H	1.71	0.51
1:C:73:PHE:HA	1:C:307:TRP:HH2	1.75	0.51
1:B:407:VAL:O	1:B:410:THR:N	2.44	0.51
1:A:404:VAL:O	1:A:405:GLU:C	2.48	0.50
1:B:353:ARG:CG	1:B:444:HIS:O	2.59	0.50
1:C:306:ILE:O	1:C:309:ILE:HB	2.11	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:452:TRP:CZ3	1:A:465:PHE:HD2	2.30	0.50
1:A:217:ASN:ND2	1:A:343:PHE:O	2.44	0.49
1:C:312:ALA:O	1:C:313:PHE:C	2.54	0.49
1:B:429:HIS:HA	1:C:355:ASN:CB	2.41	0.49
1:B:205:GLU:HA	1:B:208:ILE:CB	2.42	0.49
1:A:37:TRP:HA	1:A:37:TRP:HE3	1.78	0.49
1:C:160:ILE:O	1:C:163:PHE:HB3	2.12	0.49
1:A:460:GLN:O	1:A:464:GLU:HG2	2.13	0.49
1:A:355:ASN:CB	1:C:429:HIS:HA	2.43	0.49
1:B:460:GLN:O	1:B:464:GLU:HG2	2.13	0.49
1:C:255:LEU:HD23	1:C:505:PHE:HZ	1.78	0.49
1:B:38:HIS:HD2	1:B:39:HIS:NE2	1.92	0.48
1:A:371:PRO:O	1:A:374:THR:HB	2.13	0.48
1:B:364:TYR:O	1:B:365:MET:C	2.52	0.48
1:B:373:LEU:O	1:B:376:LEU:N	2.45	0.48
1:C:332:TRP:O	1:C:333:SER:HB3	2.14	0.48
1:C:79:PHE:O	1:C:81:THR:N	2.46	0.48
1:B:343:PHE:O	1:B:344:ASN:C	2.57	0.48
1:C:175:LEU:C	1:C:177:TYR:H	2.17	0.48
1:B:54:HIS:ND1	1:B:54:HIS:C	2.72	0.48
1:C:401:VAL:O	1:C:404:VAL:HG21	2.13	0.48
1:A:152:TYR:O	1:A:153:ASN:C	2.56	0.47
1:B:239:GLU:HG3	1:B:239:GLU:O	2.15	0.47
1:C:364:TYR:CE1	1:C:438:LEU:CG	2.97	0.47
1:C:373:LEU:O	1:C:374:THR:C	2.54	0.47
1:A:42:ASN:OD1	1:A:45:LEU:HB3	2.14	0.47
1:A:333:SER:CB	1:A:470:GLN:HB2	2.33	0.47
1:A:356:ARG:HB3	1:A:444:HIS:CD2	2.49	0.47
1:B:272:GLU:HG3	1:B:282:LEU:HD21	1.97	0.47
1:C:54:HIS:ND1	1:C:54:HIS:C	2.72	0.47
1:C:437:LEU:O	1:C:438:LEU:C	2.57	0.47
1:C:437:LEU:O	1:C:439:ARG:N	2.48	0.47
1:A:54:HIS:ND1	1:A:54:HIS:C	2.72	0.47
1:B:54:HIS:NE2	1:B:179:THR:C	2.72	0.47
1:B:208:ILE:O	1:B:209:TYR:C	2.57	0.47
1:A:330:ARG:HG2	1:A:471:TYR:CA	2.44	0.46
1:B:373:LEU:O	1:B:374:THR:C	2.57	0.46
1:C:332:TRP:CH2	1:C:445:ILE:HD11	2.50	0.46
1:B:38:HIS:C	1:B:39:HIS:CG	2.93	0.46
1:B:118:PRO:HG2	1:B:121:VAL:CG2	2.46	0.46
1:B:56:LYS:O	1:B:58:GLY:N	2.48	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:367:CYS:SG	1:C:367:CYS:O	2.74	0.46
1:A:432:PHE:O	1:A:433:CYS:C	2.57	0.46
1:A:470:GLN:O	1:A:471:TYR:C	2.57	0.46
1:B:168:LEU:HD13	1:B:183:VAL:HG22	1.98	0.46
1:A:42:ASN:OD1	1:A:42:ASN:C	2.59	0.46
1:A:56:LYS:O	1:A:58:GLY:N	2.49	0.46
1:A:449:PRO:HG2	1:A:452:TRP:CZ2	2.50	0.46
1:C:56:LYS:O	1:C:58:GLY:N	2.48	0.46
1:C:402:LEU:O	1:C:403:ALA:HB3	2.16	0.46
1:C:39:HIS:CB	1:C:197:CYS:HA	2.46	0.45
1:C:118:PRO:HG2	1:C:121:VAL:CG2	2.46	0.45
1:C:420:VAL:O	1:C:423:SER:OG	2.28	0.45
1:B:333:SER:HB3	1:B:468:LEU:O	2.16	0.45
1:B:402:LEU:O	1:B:403:ALA:HB3	2.16	0.45
1:B:165:LEU:HD12	1:B:165:LEU:C	2.42	0.45
1:A:452:TRP:CZ2	1:A:464:GLU:HG3	2.51	0.45
1:B:264:LEU:HD23	1:B:270:LYS:HA	1.99	0.45
1:C:202:GLU:O	1:C:203:LEU:C	2.57	0.45
1:A:39:HIS:HB3	1:A:197:CYS:CA	2.44	0.44
1:A:310:LEU:O	1:A:311:TYR:C	2.60	0.44
1:A:442:LEU:O	1:A:446:HIS:N	2.48	0.44
1:B:201:ARG:O	1:B:202:GLU:C	2.59	0.44
1:B:316:TYR:O	1:B:319:VAL:N	2.51	0.44
1:C:264:LEU:HD23	1:C:270:LYS:HA	1.99	0.44
1:A:449:PRO:HD2	1:A:452:TRP:CZ3	2.53	0.44
1:A:472:LYS:C	1:A:474:VAL:N	2.76	0.44
1:A:474:VAL:O	1:A:478:GLU:N	2.44	0.44
1:B:54:HIS:C	1:B:54:HIS:HD1	2.26	0.44
1:A:41:GLU:O	1:A:42:ASN:C	2.61	0.43
1:A:452:TRP:CH2	1:A:465:PHE:HA	2.53	0.43
1:B:429:HIS:CA	1:C:355:ASN:HB2	2.48	0.43
1:A:44:ASP:OD2	1:A:214:ARG:NH1	2.47	0.43
1:A:264:LEU:HD23	1:A:270:LYS:HA	1.99	0.43
1:A:330:ARG:HG2	1:A:471:TYR:CB	2.48	0.43
1:C:199:HIS:O	1:C:200:LYS:C	2.61	0.43
1:A:42:ASN:HB2	1:A:267:TRP:CZ3	2.54	0.43
1:A:469:PHE:HD1	1:A:469:PHE:HA	1.71	0.43
1:A:449:PRO:HD2	1:A:452:TRP:CD2	2.53	0.43
1:B:313:PHE:CG	1:B:314:PHE:N	2.86	0.43
1:C:438:LEU:HD12	1:C:456:ALA:HB2	1.95	0.42
1:A:312:ALA:HA	1:A:315:SER:OG	2.18	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:485:VAL:O	1:B:489:ILE:HG22	2.19	0.42
1:B:54:HIS:ND1	1:B:54:HIS:O	2.53	0.42
1:B:342:HIS:O	1:B:343:PHE:C	2.62	0.42
1:A:429:HIS:CD2	1:A:430:MET:H	2.33	0.42
1:A:54:HIS:ND1	1:A:54:HIS:O	2.53	0.42
1:A:439:ARG:O	1:A:439:ARG:HG2	2.20	0.42
1:A:455:ASN:OD1	1:A:455:ASN:N	2.46	0.42
1:A:474:VAL:O	1:A:475:PHE:C	2.61	0.42
1:B:51:TYR:HD1	1:B:180:TRP:CZ2	2.37	0.42
1:C:485:VAL:O	1:C:489:ILE:HG22	2.19	0.42
1:B:165:LEU:HD12	1:B:166:HIS:CA	2.50	0.42
1:A:38:HIS:O	1:A:39:HIS:CG	2.73	0.41
1:A:228:LEU:O	1:A:230:LEU:HG	2.20	0.41
1:B:459:SER:O	1:B:463:ASP:HB2	2.20	0.41
1:C:36:PRO:HA	1:C:163:PHE:HD1	1.85	0.41
1:A:355:ASN:HB3	1:C:429:HIS:HA	2.01	0.41
1:B:312:ALA:HA	1:B:315:SER:OG	2.19	0.41
1:A:462:ARG:O	1:A:466:ALA:HB2	2.21	0.41
1:B:228:LEU:O	1:B:230:LEU:HG	2.20	0.41
1:C:54:HIS:ND1	1:C:54:HIS:O	2.53	0.41
1:C:194:HIS:CD2	1:C:194:HIS:H	2.38	0.41
1:C:431:VAL:O	1:C:431:VAL:CG1	2.67	0.41
1:A:463:ASP:O	1:A:466:ALA:HB3	2.21	0.41
1:C:45:LEU:HD21	1:C:49:ARG:NH2	2.21	0.41
1:A:133:ILE:HD13	1:A:133:ILE:HA	1.94	0.41
1:A:204:THR:C	1:A:206:LEU:H	2.29	0.41
1:C:255:LEU:CD2	1:C:505:PHE:CZ	3.02	0.41
1:B:455:ASN:OD1	1:B:455:ASN:N	2.46	0.41
1:C:178:CYS:SG	1:C:183:VAL:CG2	3.06	0.41
1:C:255:LEU:HD23	1:C:505:PHE:CZ	2.56	0.41
1:A:36:PRO:HA	1:A:163:PHE:HD1	1.85	0.41
1:B:133:ILE:HD13	1:B:133:ILE:HA	1.94	0.41
1:C:304:ILE:O	1:C:308:GLN:HB2	2.20	0.41
1:B:437:LEU:C	1:B:439:ARG:H	2.29	0.41
1:C:356:ARG:HD2	1:C:444:HIS:CE1	2.55	0.41
1:B:402:LEU:O	1:B:403:ALA:CB	2.69	0.40
1:C:207:ASP:O	1:C:211:ARG:HG2	2.21	0.40
1:C:438:LEU:CD1	1:C:456:ALA:CB	2.84	0.40
1:A:429:HIS:CD2	1:A:430:MET:N	2.88	0.40
1:B:204:THR:C	1:B:206:LEU:N	2.79	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	471/839 (56%)	436 (93%)	34 (7%)	1 (0%)	43	75
1	B	471/839 (56%)	431 (92%)	38 (8%)	2 (0%)	30	65
1	C	471/839 (56%)	432 (92%)	37 (8%)	2 (0%)	30	65
All	All	1413/2517 (56%)	1299 (92%)	109 (8%)	5 (0%)	31	65

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	407	VAL
1	B	179	THR
1	A	179	THR
1	C	179	THR
1	C	333	SER

5.3.2 Protein sidechains

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	165/717 (23%)	162 (98%)	3 (2%)	51	67
1	B	142/717 (20%)	139 (98%)	3 (2%)	47	65
1	C	147/717 (20%)	141 (96%)	6 (4%)	27	49
All	All	454/2151 (21%)	442 (97%)	12 (3%)	41	61

All (12) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	315	SER
1	A	356	ARG
1	A	469	PHE
1	B	183	VAL
1	B	341	ARG
1	B	356	ARG
1	C	62	MET
1	C	79	PHE
1	C	110	VAL
1	C	194	HIS
1	C	308	GLN
1	C	356	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (16) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	52	ASN
1	A	217	ASN
1	A	366	ASN
1	A	444	HIS
1	A	457	HIS
1	B	38	HIS
1	B	55	GLN
1	B	181	GLN
1	B	210	HIS
1	B	217	ASN
1	B	366	ASN
1	C	57	ASN
1	C	194	HIS
1	C	342	HIS
1	C	366	ASN
1	C	406	HIS

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)

There are no ligands in this entry.

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.

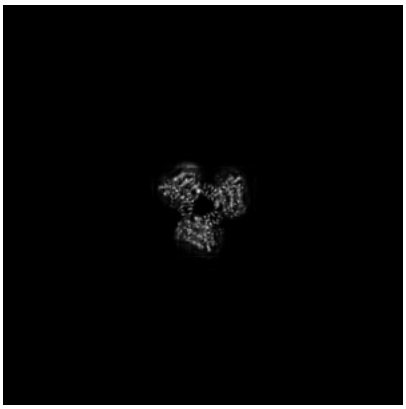
6 Map visualisation

This section contains visualisations of the EMDB entry EMD-37088. These allow visual inspection of the internal detail of the map and identification of artifacts.

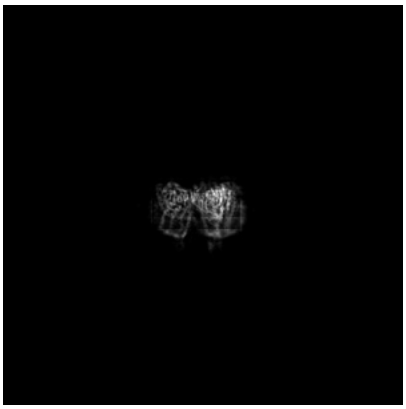
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections

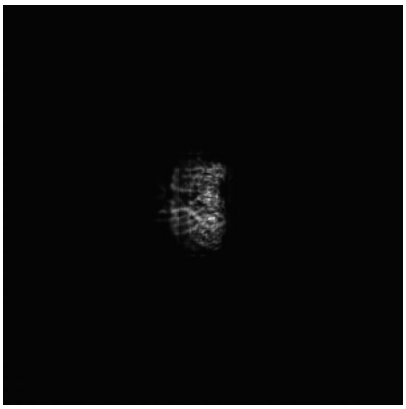
6.1.1 Primary map



X

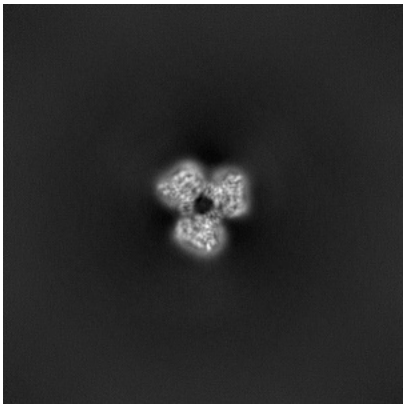


Y

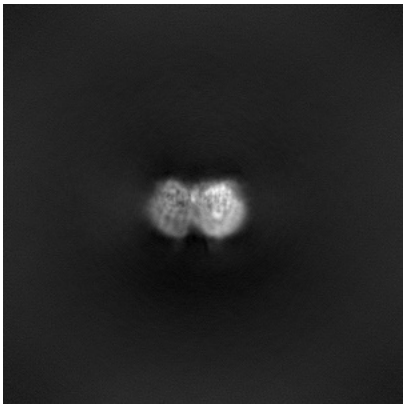


Z

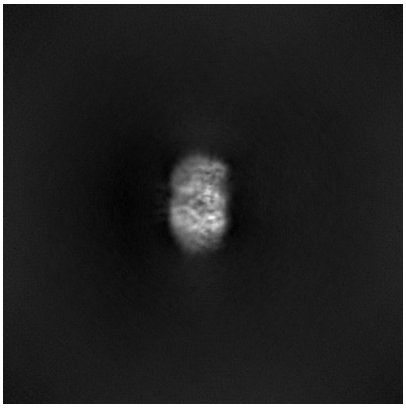
6.1.2 Raw map



X



Y

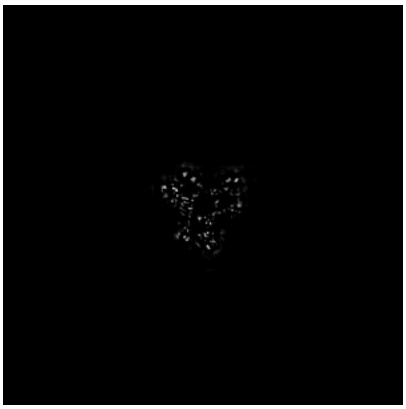


Z

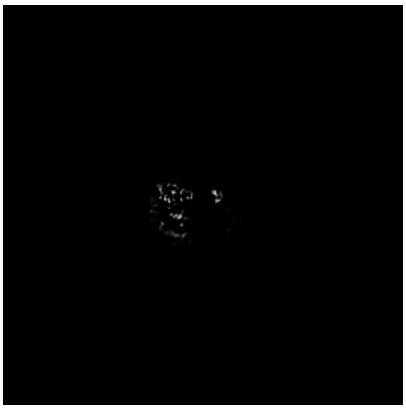
The images above show the map projected in three orthogonal directions.

6.2 Central slices (i)

6.2.1 Primary map



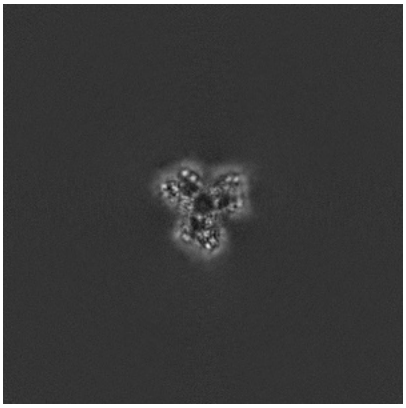
X Index: 300



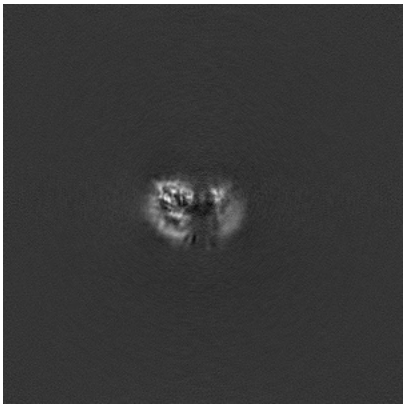
Y Index: 300

Z Index: 300

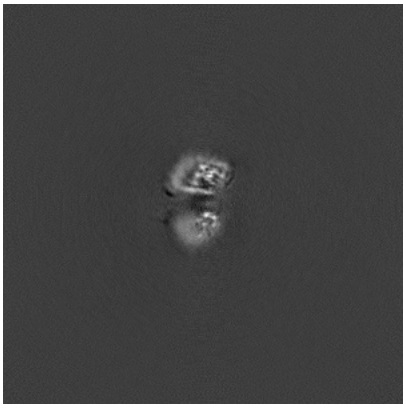
6.2.2 Raw map



X Index: 300



Y Index: 300

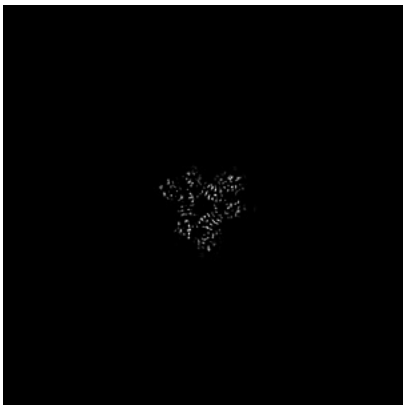


Z Index: 300

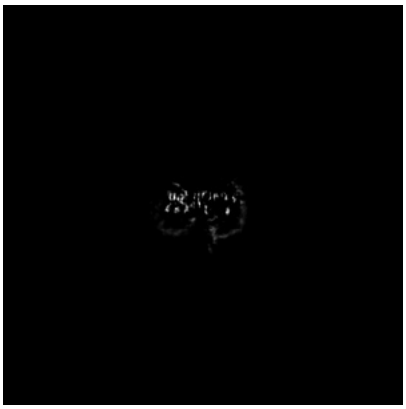
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices (i)

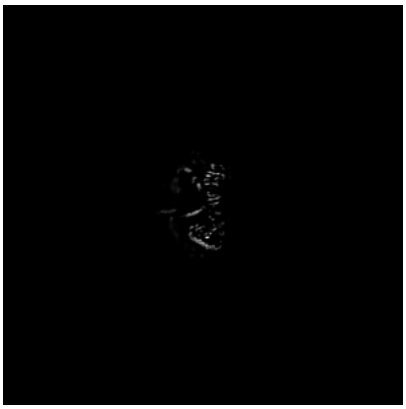
6.3.1 Primary map



X Index: 309

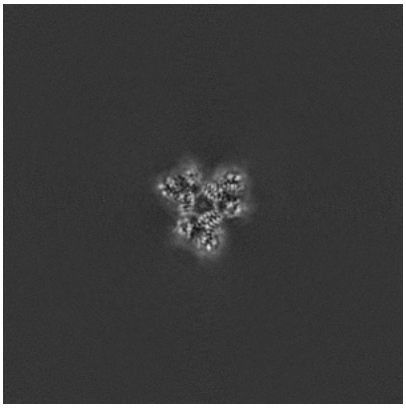


Y Index: 279

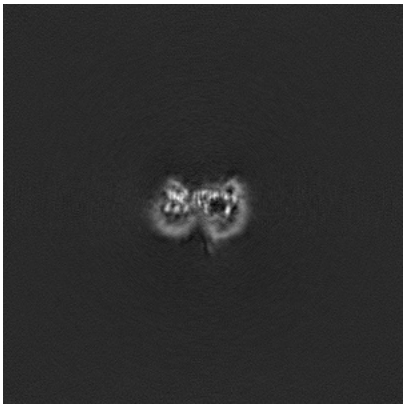


Z Index: 327

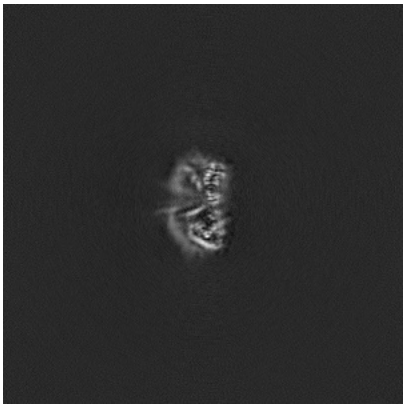
6.3.2 Raw map



X Index: 308



Y Index: 279

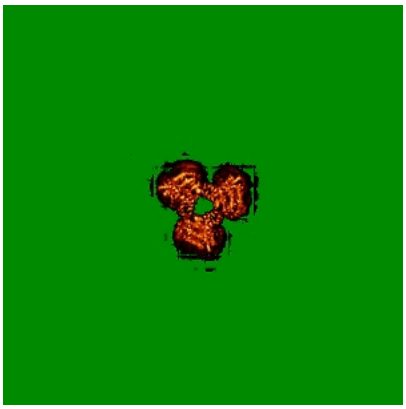


Z Index: 327

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

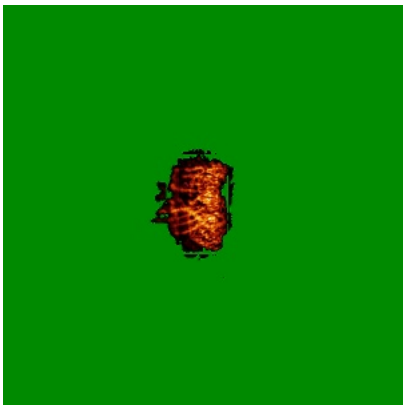
6.4 Orthogonal standard-deviation projections (False-color) (i)

6.4.1 Primary map



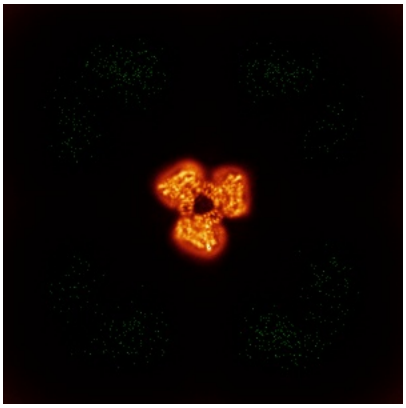
X

Y

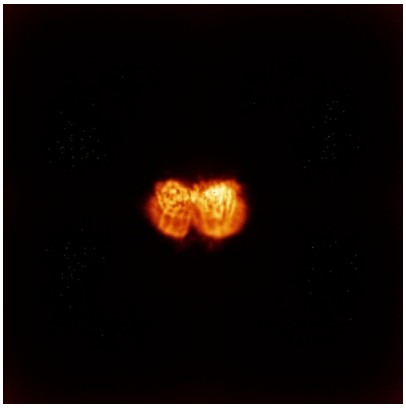


Z

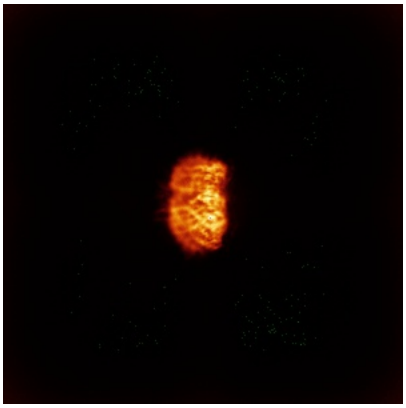
6.4.2 Raw map



X



Y

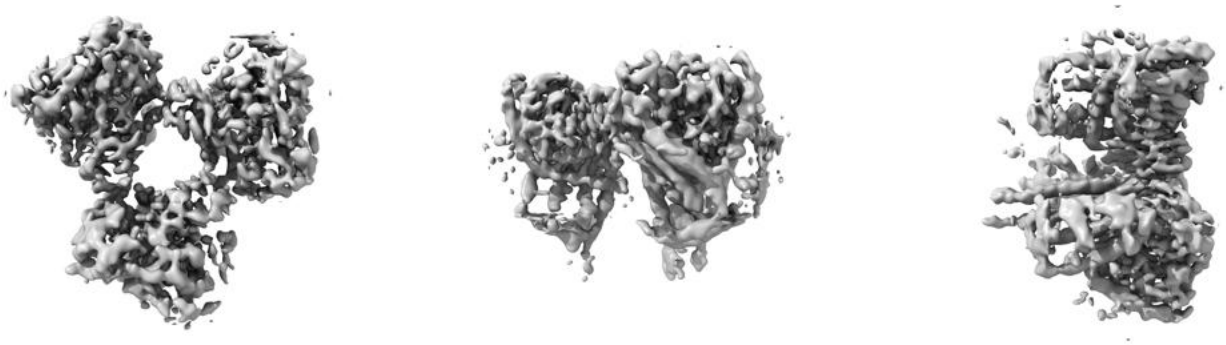


Z

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)

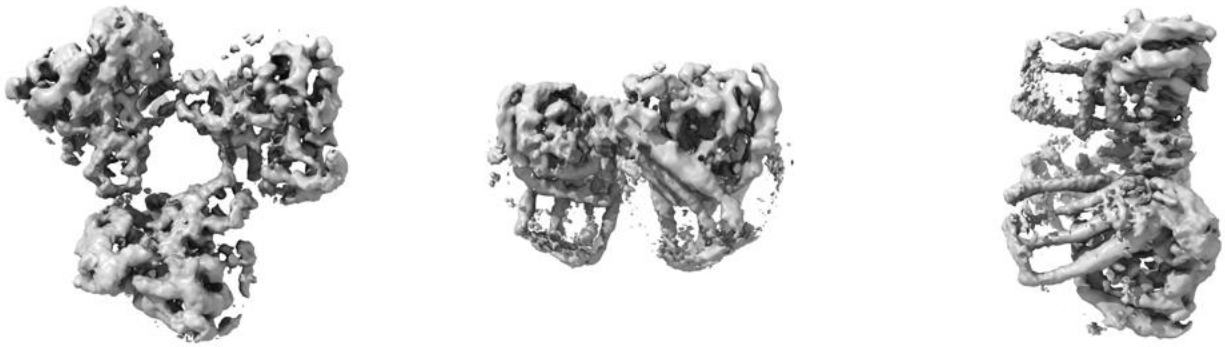
6.5.1 Primary map



X Y Z

The images above show the 3D surface view of the map at the recommended contour level 0.18. 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.

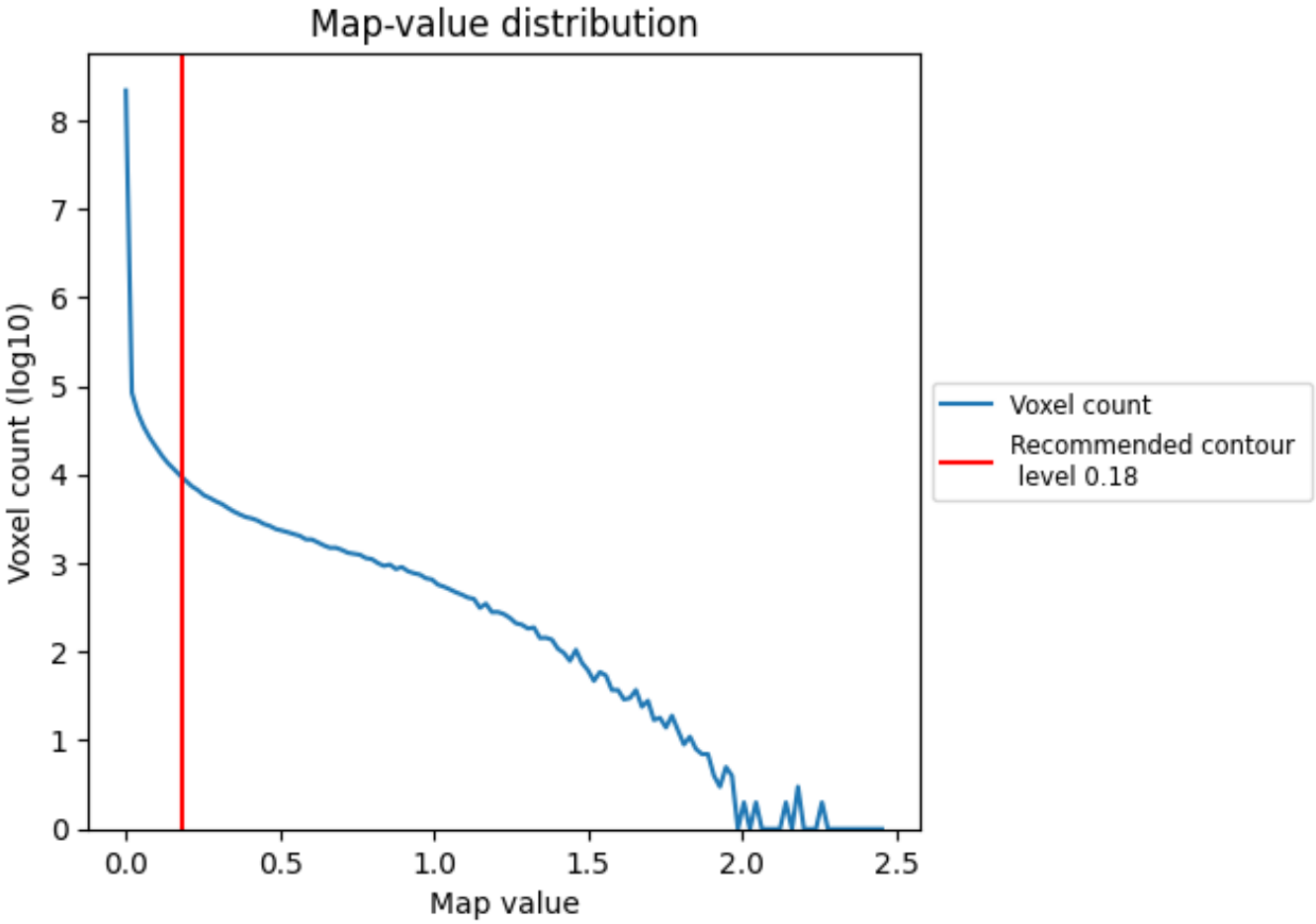
6.6 Mask visualisation (i)

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

7 Map analysis

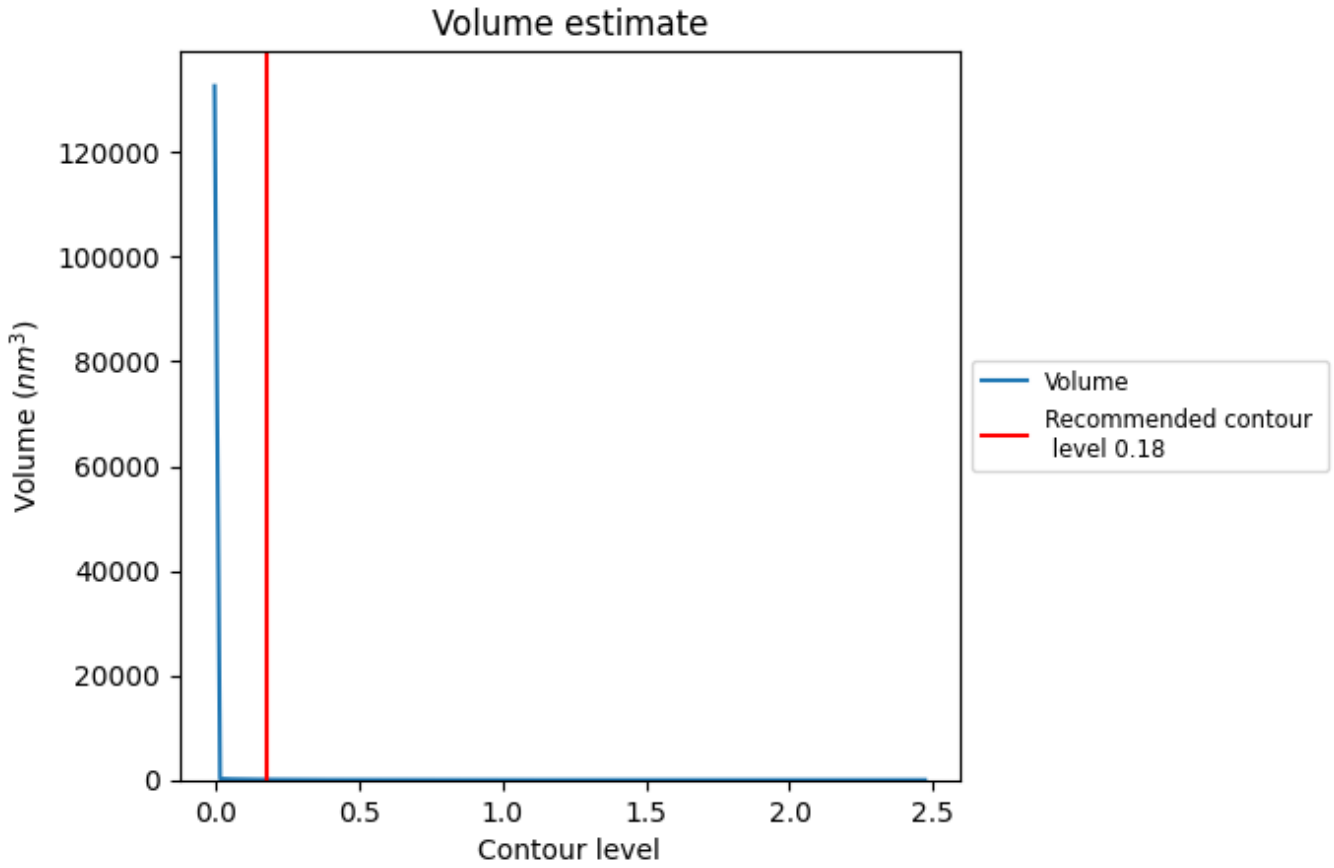
This section contains the results of statistical analysis of the map.

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.

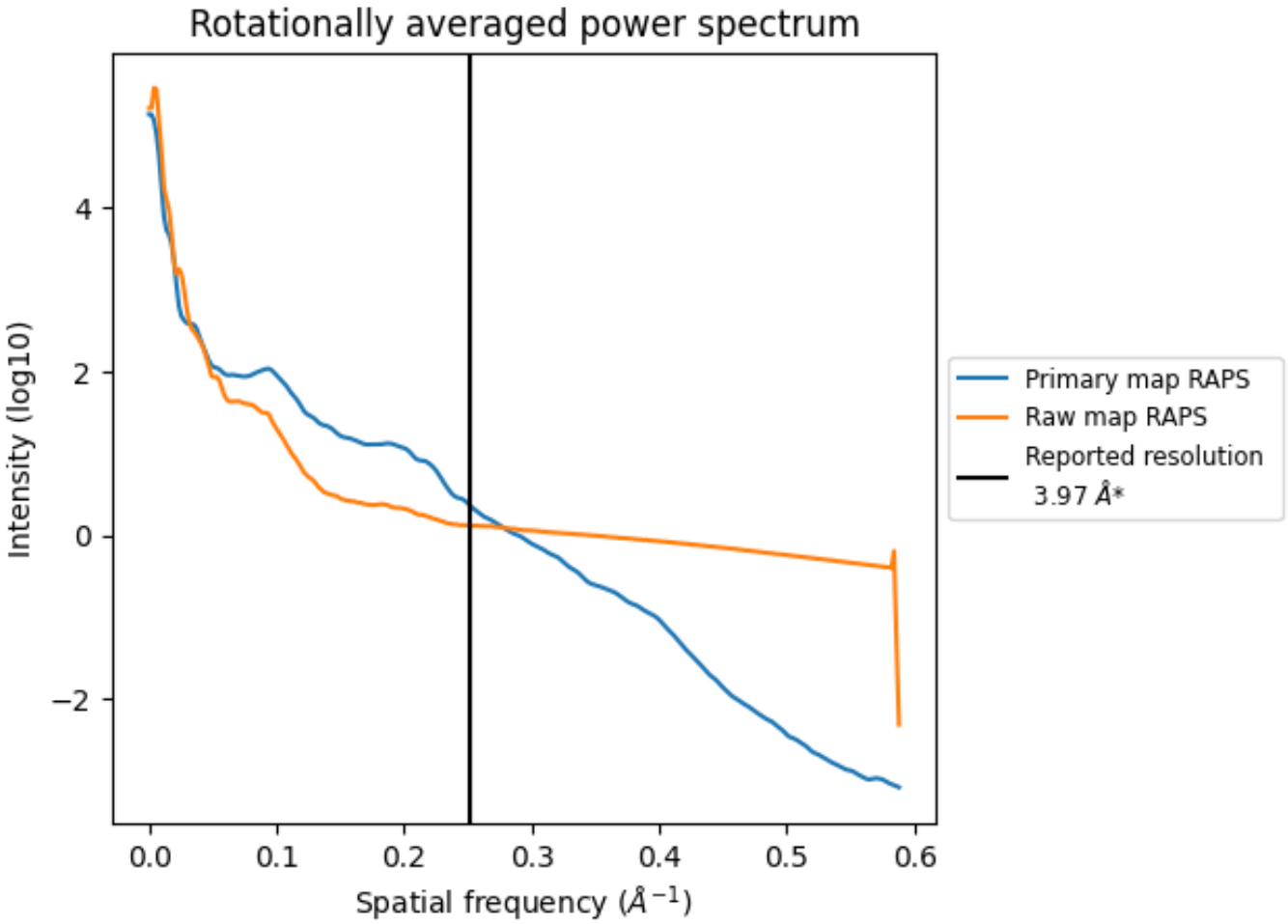
7.2 Volume estimate



The volume at the recommended contour level is 74 nm^3; this corresponds to an approximate mass of 67 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 (i)

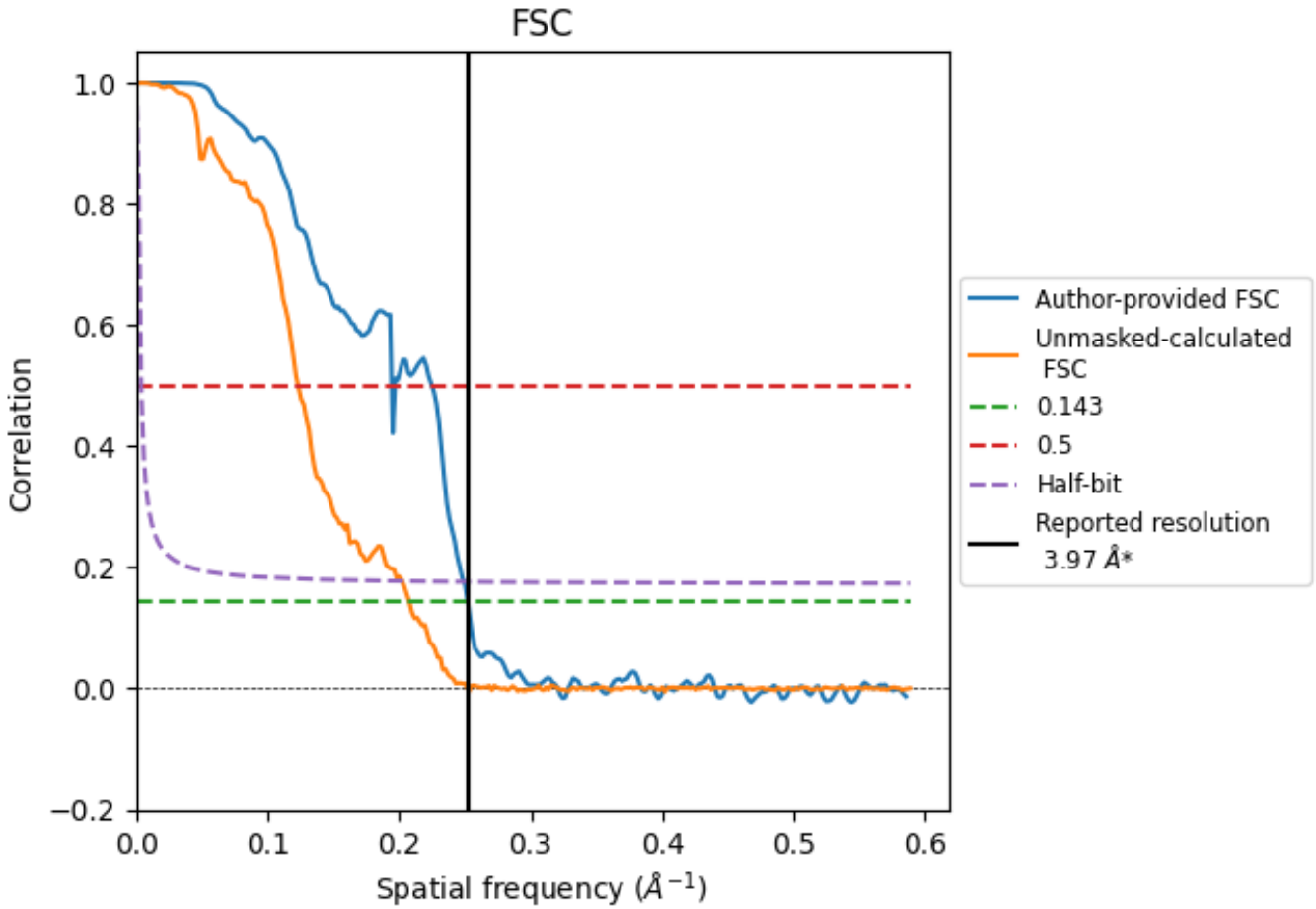


*Reported resolution corresponds to spatial frequency of 0.252 Å^{-1}

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 0.252 Å^{-1}

8.2 Resolution estimates (i)

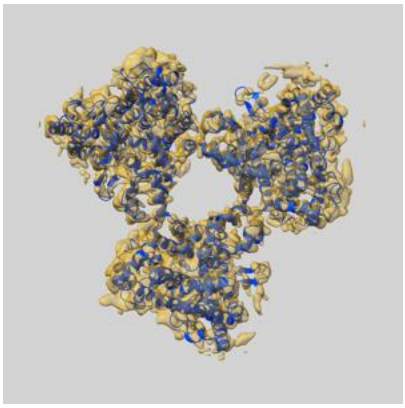
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.97	-	-
Author-provided FSC curve	3.97	5.15	4.01
Unmasked-calculated*	4.81	8.12	4.94

*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 4.81 differs from the reported value 3.97 by more than 10 %

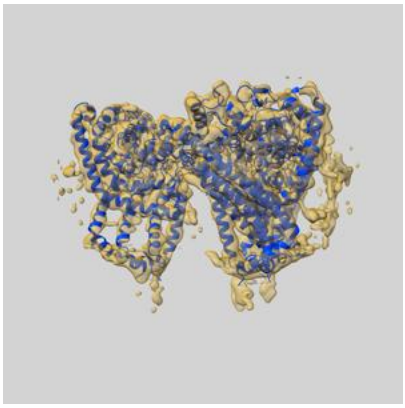
9 Map-model fit

This section contains information regarding the fit between EMDB map EMD-37088 and PDB model 8KBZ. Per-residue inclusion information can be found in section 3 on page 4.

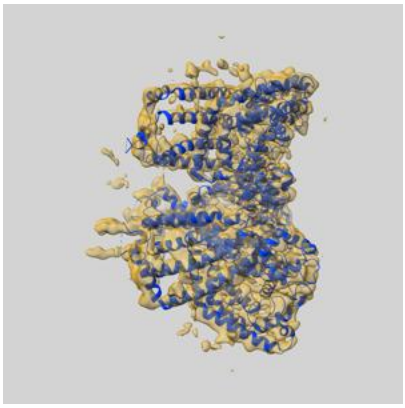
9.1 Map-model overlay



X



Y



Z

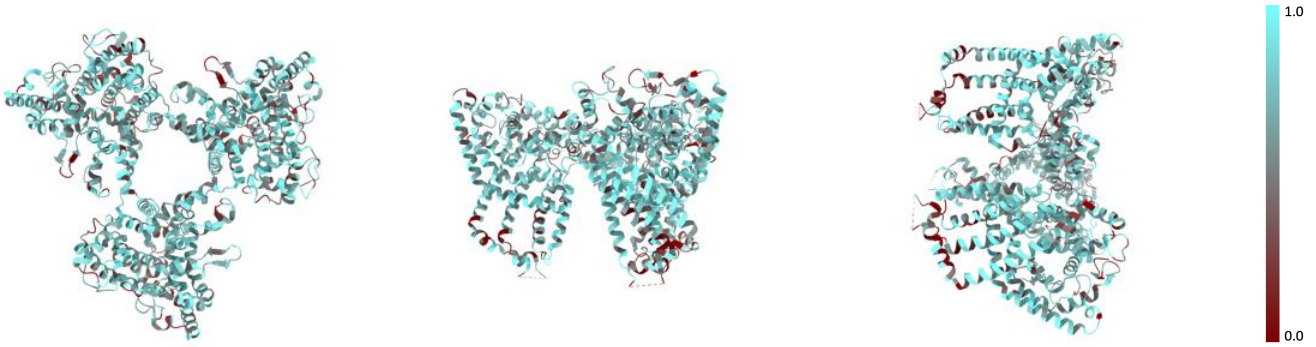
The images above show the 3D surface view of the map at the recommended contour level 0.18 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

9.2 Q-score mapped to coordinate model (i)

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.

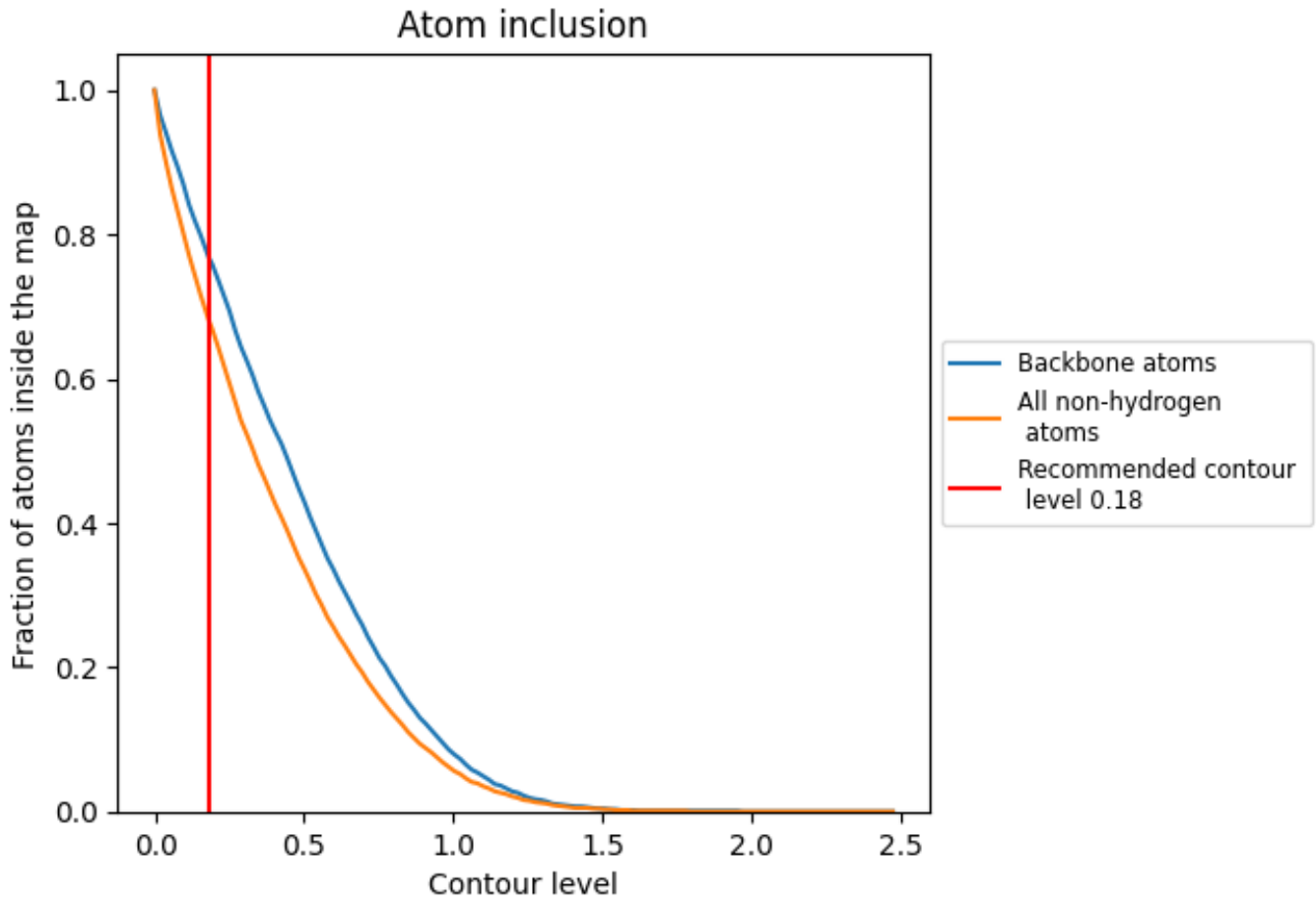
9.3 Atom inclusion mapped to coordinate model (i)



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 (0.18).

9.4 Atom inclusion (i)



At the recommended contour level, 77% of all backbone atoms, 68% 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 (0.18) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.6810	0.2240
A	0.6660	0.2180
B	0.6800	0.2150
C	0.6970	0.2390