WORLDWIDE
wwPDB
PROTEIN DATA BANK

Full wwPDB EM Validation Report (i)

Oct 4, 2025 – 07:13 am BST

PDB ID	:	9GSF / pdb_00009gsf
EMDB ID	:	EMD-51546
Title	:	Mouse PMCA-NPTN complex captured in E1-ATP state without calcium
Authors	:	Vinayagam, D.; Raunser, S.; Sistel, O.; Schulte, U.; Constantin, C.E.; Prumbaum, D.; Zolles, G.; Fakler, B.
Deposited on	:	2024-09-15
Resolution	:	3.35 Å(reported)
Based on initial model	:	6A69

The following versions of software and data (see references (i)) were used in the production of this report:
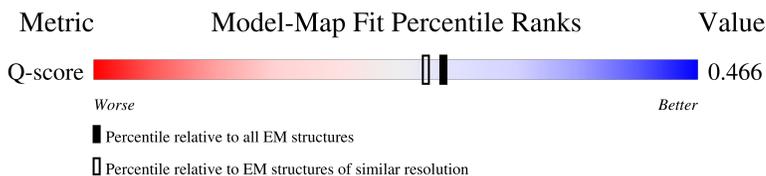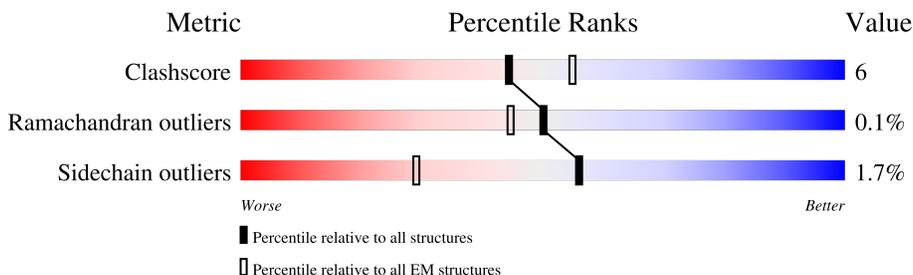
EMDB validation analysis	:	0.0.1.dev129
Mogul	:	1.8.4, CSD as541be (2020)
MolProbity	:	4-5-2 with Phenix2.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
EM percentile statistics	:	202505.v01 (Using data in the EMDB archive up 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)	:	2.46

1 Overall quality at a glance ⓘ

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

The reported resolution of this entry is 3.35 Å.

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

Metric	Percentile Ranks	Value
Clashscore		6
Ramachandran outliers		0.1%
Sidechain outliers		1.7%

Worse · *Better*

▮ Percentile relative to all structures
▯ Percentile relative to all EM structures

Metric	Model-Map Fit Percentile Ranks	Value
Q-score		0.466

Worse · *Better*

▮ Percentile relative to all EM structures
▯ Percentile relative to EM structures of similar resolution

Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	210492	15764	-
Ramachandran outliers	207382	16835	-
Sidechain outliers	206894	16415	-
Q-score	-	25397	14390 (2.85 - 3.85)

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	1214	14% · 65% · 12% · 22%
2	B	413	22% · 42% · 9% · 48%

2 Entry composition ⓘ

There are 6 unique types of molecules in this entry. The entry contains 9195 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 Plasma membrane calcium-transporting ATPase 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	942	Total 7337	C 4705	N 1234	O 1352	S 46	1	0

There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1199	GLU	-	expression tag	UNP Q9R0K7
A	1200	ASN	-	expression tag	UNP Q9R0K7
A	1201	LEU	-	expression tag	UNP Q9R0K7
A	1202	TYR	-	expression tag	UNP Q9R0K7
A	1203	PHE	-	expression tag	UNP Q9R0K7
A	1204	GLN	-	expression tag	UNP Q9R0K7
A	1205	GLY	-	expression tag	UNP Q9R0K7
A	1206	GLY	-	expression tag	UNP Q9R0K7
A	1207	ASP	-	expression tag	UNP Q9R0K7
A	1208	TYR	-	expression tag	UNP Q9R0K7
A	1209	LYS	-	expression tag	UNP Q9R0K7
A	1210	ASP	-	expression tag	UNP Q9R0K7
A	1211	ASP	-	expression tag	UNP Q9R0K7
A	1212	ASP	-	expression tag	UNP Q9R0K7
A	1213	ASP	-	expression tag	UNP Q9R0K7
A	1214	LYS	-	expression tag	UNP Q9R0K7

- Molecule 2 is a protein called Neuroplastin.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	214	Total 1703	C 1077	N 292	O 326	S 8	0	0

There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	398	GLU	-	expression tag	UNP P97300

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Chain	Residue	Modelled	Actual	Comment	Reference
B	399	ASN	-	expression tag	UNP P97300
B	400	LEU	-	expression tag	UNP P97300
B	401	TYR	-	expression tag	UNP P97300
B	402	PHE	-	expression tag	UNP P97300
B	403	GLN	-	expression tag	UNP P97300
B	404	GLY	-	expression tag	UNP P97300
B	405	GLY	-	expression tag	UNP P97300
B	406	HIS	-	expression tag	UNP P97300
B	407	HIS	-	expression tag	UNP P97300
B	408	HIS	-	expression tag	UNP P97300
B	409	HIS	-	expression tag	UNP P97300
B	410	HIS	-	expression tag	UNP P97300
B	411	HIS	-	expression tag	UNP P97300
B	412	HIS	-	expression tag	UNP P97300
B	413	HIS	-	expression tag	UNP P97300

- Molecule 3 is PHOSPHOAMINOPHOSPHONIC ACID-ADENYLATE ESTER (CCD ID: ANP) (formula: $C_{10}H_{17}N_6O_{12}P_3$).
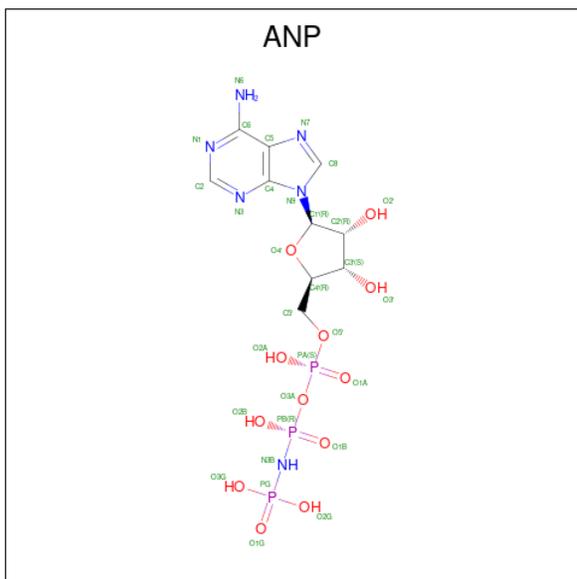
Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
3	A	1	31	10	6	12	3	0

- Molecule 4 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		AltConf
4	A	1	Total 1	Mg 1	0

- Molecule 5 is (2S)-1-{[(R)-hydroxy{[(1R,2R,3S,4R,5R,6S)-2,3,6-trihydroxy-4,5-bis(phosphonooxy)cyclohexyl]oxy}phosphoryl]oxy}-3-(octadecanoyloxy)propan-2-yl icosa-5,8,11,14-tetraenoate (CCD ID: KXP) (formula: $C_{47}H_{85}O_{19}P_3$) (labeled as "Ligand of Interest" by depositor).

KXP
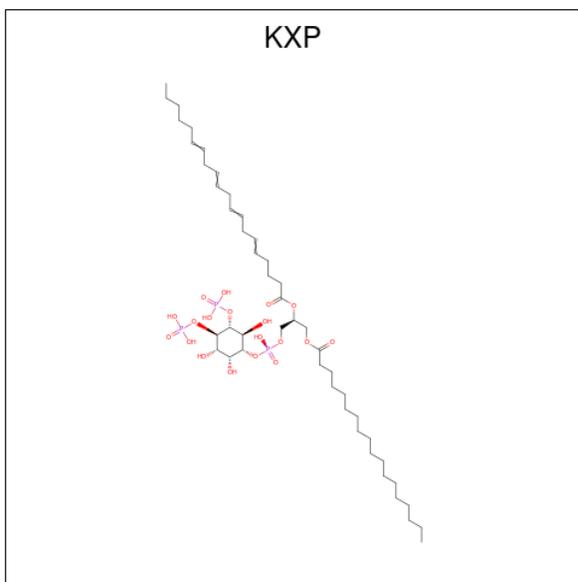
Mol	Chain	Residues	Atoms				AltConf
5	A	1	Total 39	C 17	O 19	P 3	0

- Molecule 6 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: $C_8H_{15}NO_6$).

Mol	Chain	Residues	Atoms				AltConf
6	B	1	Total	C	N	O	0
			14	8	1	5	
6	B	1	Total	C	N	O	0
			14	8	1	5	
6	B	1	Total	C	N	O	0
			14	8	1	5	
6	B	1	Total	C	N	O	0
			14	8	1	5	
6	B	1	Total	C	N	O	0
			14	8	1	5	
6	B	1	Total	C	N	O	0
			14	8	1	5	

3 Residue-property plots ⓘ

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion in map density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red diamond above a residue indicates a poor fit to the EM map for this residue (all-atom inclusion < 40%). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

• Molecule 1: Plasma membrane calcium-transporting ATPase 2

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

ASP ASP THR ASP LEU GLU GLU ASP ALA ALA LEU LYS GLN ASN SER PRO PRO SER SER LEU LYS ASN ASN SER ALA ILE ASP SER GLY ILE ASN LEU THR THR ASP THR THR SER LYS SER ALA THR SER SER SER PRO GLY SER PRO ILE HIS SER LEU GLU THR SER LEU GLU ASN

LEU TYR PHE GLN GLY GLY ASP TYR LYS ASP ASP ASP LYS

● Molecule 2: Neuroplastin

Chain B:

MET SER GLY SER SER LEU PRO GLY ALA LEU ALA LEU LEU LEU LEU VAL SER GLY SER LEU LEU PRO GLY PRO GLY ALA ALA GLN ASN ALA GLY PHE VAL LYS SER PRO MET SER GLU THR LYS LEU THR GLY ASP ALA PHE GLU LEU TYR CYS ASP VAL VAL GLY SER PRO THR PRO

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

ASP PRO LYS ARG ASN ASP LEU ARG GLN ASN PRO SER ILE THR TRP ILE ARG ALA GLN ALA THR ILE SER VAL LEU GLN K147 P148 R149 I150 V151 T152 S153 E154 E155 V156 R159 E160 S161 L162 L163 P164 V165 T166 L167 Q168 C169 N170 L171 T172 S173 S174 S175 H176 T177 L178 M179 Y180 S181

Y182 W183 T184 R185 N186 G187 V188 E189 L190 T191 A192 T193 R194 K195 N196 A197 S198 N199 M200 E201 Y202 R203 I204 N205 K206 P207 R208 A209 E210 G213 E214 Y215 H216 C217 V218 Y219 H220 F221 V222 S223 A224 P225 K226 A227 N228 A229 T230 I231 E232 V233 K234 I239 E246 D253 M256

Y263 P264 W268 E274 N275 G276 E279 S284 E294 N295 Y296 T297 E298 E308 Y313 E314 A317 I321 A324 S325 V326 E360 LYS ARG LYS ARG PRO ASP GLU VAL PRO ASP ASP ASP GLU PRO ALA GLY PRO MET LYS THR ASN SER THR ASN ASN HIS

LYS ASP LYS ASN LEU ARG GLN ARG ASN THR ASN GLU LEU ASN LEU TYR PHE GLN GLY GLY HIS HIS HIS HIS HIS HIS

4 Experimental information ⓘ

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	185466	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose $(e^-/\text{Å}^2)$	59	Depositor
Minimum defocus (nm)	1100	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	105000	Depositor
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	3.657	Depositor
Minimum map value	-2.432	Depositor
Average map value	0.003	Depositor
Map value standard deviation	0.077	Depositor
Recommended contour level	0.56	Depositor
Map size (Å)	273.0, 273.0, 273.0	wwPDB
Map dimensions	300, 300, 300	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.91, 0.91, 0.91	Depositor

5   Model quality ⓘ

5.1   Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: ANP, MG, NAG, KXP

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	0.17	0/7471	0.36	0/10128
2	B	0.16	0/1741	0.41	0/2366
All	All	0.17	0/9212	0.37	0/12494

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2   Too-close contacts ⓘ

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	7337	0	7558	86	0
2	B	1703	0	1672	29	0
3	A	31	0	13	0	0
4	A	1	0	0	0	0
5	A	39	0	0	0	0
6	B	84	0	78	2	0
All	All	9195	0	9321	115	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 6.

All (115) 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:B:185:ARG:HG2	2:B:190:LEU:HD21	1.66	0.77
1:A:485:ILE:HG21	1:A:490:LEU:HD13	1.70	0.71
1:A:500:ASN:HD22	1:A:580:LYS:HG3	1.58	0.69
2:B:184:THR:HG22	2:B:189:GLU:HA	1.77	0.67
1:A:912:GLY:HA3	1:A:1036:ILE:HD12	1.76	0.66
2:B:190:LEU:HD13	2:B:202:TYR:HE1	1.60	0.66
1:A:182:LEU:HD22	1:A:426:VAL:HG11	1.79	0.64
2:B:296:TYR:HE2	2:B:298:GLU:HB2	1.66	0.61
1:A:546:MET:HE3	1:A:568:ILE:HD11	1.83	0.60
1:A:468:GLN:HB3	1:A:619:MET:HE2	1.82	0.60
1:A:28:MET:HA	1:A:32:ARG:HE	1.67	0.60
2:B:324:ALA:HA	6:B:501:NAG:H82	1.84	0.59
1:A:54:GLU:HB2	1:A:58:ARG:HH21	1.66	0.59
1:A:81:ILE:HG13	1:A:82:PHE:N	2.18	0.58
1:A:463:ARG:HH21	1:A:516:LEU:HB3	1.70	0.57
1:A:185:ARG:HG2	1:A:430:MET:SD	2.44	0.57
1:A:235:LYS:HE2	1:A:249:ARG:HD2	1.86	0.57
1:A:449:THR:HG22	1:A:769:VAL:H	1.70	0.57
2:B:246:GLU:HA	2:B:246:GLU:OE1	2.05	0.57
1:A:226:GLY:HA2	1:A:274:THR:HG23	1.87	0.56
1:A:45:LYS:C	1:A:45:LYS:HD3	2.31	0.56
1:A:505:THR:HG22	1:A:521:GLY:HA3	1.88	0.56
1:A:630:ALA:HA	1:A:655:ILE:HG13	1.87	0.56
1:A:29:GLU:HB3	1:A:31:LEU:HD12	1.88	0.56
2:B:214:GLU:HB2	2:B:263:TYR:HE1	1.70	0.56
1:A:234:LEU:HG	1:A:236:ILE:HD11	1.87	0.55
2:B:219:TYR:O	2:B:226:LYS:HA	2.06	0.55
2:B:213:GLY:HA2	2:B:263:TYR:HD1	1.71	0.55
2:B:274:GLU:HG3	2:B:279:GLU:HB2	1.88	0.55
1:A:592:LYS:HB2	1:A:653:THR:HG22	1.89	0.54
1:A:229:ILE:HD11	1:A:272:VAL:HB	1.90	0.54
1:A:512:LYS:HB3	1:A:515:ALA:HB3	1.90	0.54
2:B:256:MET:HE1	2:B:313:TYR:CD1	2.44	0.53
2:B:263:TYR:CD2	2:B:264:PRO:HA	2.43	0.53
1:A:624:LEU:HD23	1:A:659:GLY:HA3	1.91	0.52
2:B:317:ALA:HB3	2:B:324:ALA:O	2.08	0.52
1:A:375:THR:HG22	1:A:376:PHE:CD1	2.44	0.52
1:A:592:LYS:HG2	1:A:602:VAL:HA	1.91	0.52
1:A:593:ILE:HD11	1:A:603:PHE:CD1	2.46	0.51
1:A:570:MET:O	1:A:570:MET:HE3	2.11	0.51
1:A:541:PRO:O	1:A:545:GLN:HG2	2.11	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:183:TRP:HE1	2:B:200:MET:HB3	1.77	0.50
2:B:183:TRP:NE1	2:B:200:MET:HB3	2.27	0.50
2:B:268:TRP:CZ3	2:B:317:ALA:HB2	2.47	0.50
1:A:225:ASP:HB2	1:A:275:ALA:HB3	1.93	0.49
1:A:604:ARG:HD3	1:A:606:ARG:HH21	1.77	0.49
1:A:675:CYS:SG	1:A:817:VAL:HG22	2.52	0.49
2:B:213:GLY:HA2	2:B:263:TYR:CD1	2.47	0.49
1:A:388:THR:N	1:A:389:PRO:HD2	2.27	0.49
1:A:632:ARG:HG2	1:A:633:ASP:N	2.28	0.49
1:A:729:GLU:HB2	1:A:732:ARG:HG3	1.95	0.48
1:A:500:ASN:ND2	1:A:580:LYS:HG3	2.27	0.48
1:A:689:ASN:HB3	1:A:745:ARG:HH21	1.78	0.47
1:A:495:ASN:O	1:A:499:ILE:HG13	2.13	0.47
1:A:1016:LEU:O	1:A:1020:MET:HG2	2.14	0.47
1:A:256:PRO:HG2	1:A:257:MET:HE3	1.97	0.47
1:A:30:GLU:CD	1:A:30:GLU:H	2.22	0.47
2:B:263:TYR:HD2	2:B:264:PRO:HA	1.78	0.47
1:A:908:LYS:HD3	1:A:1041:THR:HG22	1.96	0.47
1:A:461:THR:HG23	1:A:463:ARG:H	1.80	0.46
2:B:232:GLU:OE1	2:B:234:LYS:HG2	2.15	0.46
1:A:385:THR:HA	1:A:388:THR:HB	1.98	0.46
1:A:28:MET:HA	1:A:32:ARG:HH21	1.79	0.46
1:A:389:PRO:O	1:A:392:VAL:HG22	2.16	0.46
1:A:1003:GLN:NE2	1:A:1019:TRP:HE1	2.13	0.46
1:A:929:GLU:HG3	1:A:930:LYS:HG3	1.98	0.45
1:A:568:ILE:CG2	1:A:576:ARG:HB3	2.45	0.45
1:A:37:LEU:HB2	1:A:257:MET:HG3	1.98	0.45
1:A:37:LEU:HD12	1:A:42:ALA:H	1.81	0.45
1:A:1003:GLN:HE21	1:A:1019:TRP:HE1	1.63	0.45
1:A:523:LYS:HD3	1:A:523:LYS:HA	1.78	0.45
1:A:54:GLU:HG2	1:A:55:ALA:N	2.32	0.45
1:A:382:PRO:HB2	1:A:384:LEU:HG	1.99	0.44
1:A:388:THR:HA	1:A:391:TYR:HD2	1.82	0.44
1:A:458:THR:HG22	1:A:813:PHE:HB2	1.99	0.44
1:A:644:ASN:O	1:A:648:ILE:HG12	2.18	0.44
1:A:723:ASN:HB2	1:A:732:ARG:NE	2.33	0.44
1:A:408:VAL:HG21	1:A:865:MET:HG3	2.01	0.43
1:A:737:TRP:CD1	1:A:738:PRO:HD3	2.54	0.43
2:B:216:HIS:CE1	6:B:505:NAG:HN2	2.37	0.43
1:A:75:LEU:HA	1:A:78:ARG:HG2	2.00	0.43
1:A:380:LYS:HA	1:A:380:LYS:HD2	1.86	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:185:ARG:HH12	2:B:186:ASN:ND2	2.17	0.43
1:A:105:ASP:O	1:A:109:ILE:HG12	2.19	0.43
2:B:179:MET:SD	2:B:179:MET:N	2.92	0.43
1:A:79:LYS:HE3	1:A:79:LYS:HB3	1.87	0.42
2:B:179:MET:SD	2:B:222:VAL:HG23	2.59	0.42
2:B:156:VAL:HG11	2:B:165:VAL:HG11	2.01	0.42
1:A:213:ILE:HD13	1:A:272:VAL:HG23	2.01	0.42
1:A:87:ILE:HD13	1:A:187:GLU:OE1	2.20	0.42
1:A:186:ILE:HG12	1:A:435:LEU:HD11	2.01	0.42
1:A:775:ASP:OD1	1:A:775:ASP:C	2.62	0.42
2:B:216:HIS:ND1	2:B:228:ASN:HB3	2.35	0.42
1:A:486:ASN:HD21	1:A:598:GLY:N	2.18	0.41
1:A:37:LEU:HD13	1:A:42:ALA:HB3	2.02	0.41
2:B:239:ILE:HD13	2:B:326:VAL:HG13	2.01	0.41
1:A:610:GLU:O	1:A:614:LYS:HG3	2.20	0.41
1:A:841:ASN:HB3	1:A:872:MET:HE1	2.02	0.41
1:A:228:PHE:HE2	1:A:251:SER:HA	1.86	0.41
1:A:404:THR:HG21	1:A:862:ALA:HA	2.02	0.41
1:A:466:VAL:HB	1:A:531:PHE:HB2	2.02	0.41
1:A:832:LYS:HE2	1:A:832:LYS:HB3	1.83	0.41
1:A:931:MET:HE2	1:A:931:MET:HB3	1.98	0.41
2:B:205:ASN:O	2:B:206:LYS:HD2	2.20	0.41
1:A:927:VAL:O	1:A:931:MET:HG3	2.20	0.41
1:A:96:LEU:HA	1:A:99:VAL:HG12	2.02	0.41
1:A:392:VAL:O	1:A:396:VAL:HG23	2.20	0.41
1:A:445:MET:SD	1:A:788:VAL:HG11	2.61	0.41
1:A:485:ILE:HD12	1:A:485:ILE:HA	1.85	0.41
1:A:841:ASN:OD1	1:A:841:ASN:C	2.64	0.41
2:B:214:GLU:HB2	2:B:263:TYR:CE1	2.52	0.41
1:A:721:ILE:HG13	1:A:722:ARG:HG3	2.03	0.41
2:B:181:SER:HB3	2:B:219:TYR:CD1	2.56	0.41
1:A:1007:LYS:HD2	1:A:1007:LYS:HA	1.80	0.40
1:A:737:TRP:CG	1:A:738:PRO:HD3	2.57	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	937/1214 (77%)	896 (96%)	40 (4%)	1 (0%)	48	77
2	B	212/413 (51%)	203 (96%)	9 (4%)	0	100	100
All	All	1149/1627 (71%)	1099 (96%)	49 (4%)	1 (0%)	50	77

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	36	GLU

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	818/1046 (78%)	803 (98%)	15 (2%)	54	73
2	B	191/361 (53%)	189 (99%)	2 (1%)	73	84
All	All	1009/1407 (72%)	992 (98%)	17 (2%)	56	74

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

Mol	Chain	Res	Type
1	A	36	GLU
1	A	195	VAL
1	A	367	LEU
1	A	369	LEU
1	A	388	THR

Continued on next page...

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Mol	Chain	Res	Type
1	A	401	ILE
1	A	412	GLU
1	A	485	ILE
1	A	533	LEU
1	A	636	SER
1	A	703	ILE
1	A	853	CYS
1	A	907	MET
1	A	920	LEU
1	A	944	SER
2	B	199	ASN
2	B	314	GLU

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

Mol	Chain	Res	Type
1	A	85	ASN
1	A	247	GLN
1	A	434	ASN
1	A	825	ASN
1	A	856	GLN
1	A	1003	GLN
2	B	186	ASN
2	B	242	HIS
2	B	249	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 9 ligands modelled in this entry, 1 is monoatomic - leaving 8 for Mogul analysis.

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	ANP	A	1301	4	29,33,33	1.18	5 (17%)	31,52,52	1.14	3 (9%)
6	NAG	B	504	2	14,14,15	0.69	0	17,19,21	0.82	0
6	NAG	B	505	2	14,14,15	0.71	0	17,19,21	0.93	1 (5%)
6	NAG	B	503	2	14,14,15	0.72	0	17,19,21	0.91	1 (5%)
5	KXP	A	1303	-	39,39,69	0.56	0	51,56,87	0.59	1 (1%)
6	NAG	B	502	2	14,14,15	0.69	0	17,19,21	1.34	1 (5%)
6	NAG	B	501	2	14,14,15	0.89	0	17,19,21	1.47	3 (17%)
6	NAG	B	506	2	14,14,15	0.72	0	17,19,21	0.88	0

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	ANP	A	1301	4	-	5/14/38/38	0/3/3/3
6	NAG	B	504	2	-	0/6/23/26	0/1/1/1
6	NAG	B	505	2	-	1/6/23/26	0/1/1/1
6	NAG	B	503	2	-	1/6/23/26	0/1/1/1
5	KXP	A	1303	-	-	8/35/59/90	0/1/1/1
6	NAG	B	502	2	-	3/6/23/26	0/1/1/1
6	NAG	B	501	2	-	2/6/23/26	0/1/1/1
6	NAG	B	506	2	-	2/6/23/26	0/1/1/1

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	1301	ANP	PG-O1G	2.98	1.50	1.46
3	A	1301	ANP	PB-O1B	2.87	1.50	1.46

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	1301	ANP	PB-O2B	-2.23	1.50	1.56
3	A	1301	ANP	PG-O2G	-2.21	1.50	1.56
3	A	1301	ANP	PG-O3G	-2.15	1.51	1.56

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	A	1301	ANP	O2B-PB-O1B	4.03	118.37	109.92
6	B	502	NAG	C2-N2-C7	3.66	128.12	122.90
6	B	501	NAG	C4-C3-C2	2.76	115.07	111.02
6	B	501	NAG	O5-C5-C4	-2.56	104.60	110.83
5	A	1303	KXP	O48-C49-O50	-2.51	122.38	125.57
6	B	501	NAG	C2-N2-C7	2.33	126.22	122.90
3	A	1301	ANP	C5-C6-N6	2.31	123.87	120.35
3	A	1301	ANP	O2G-PG-O1G	-2.31	107.65	113.45
6	B	503	NAG	O5-C1-C2	-2.04	108.06	111.29
6	B	505	NAG	C1-O5-C5	2.00	114.91	112.19

There are no chirality outliers.

All (22) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	1301	ANP	PB-N3B-PG-O1G
5	A	1303	KXP	C21-C22-O48-C49
5	A	1303	KXP	C23-C22-O48-C49
5	A	1303	KXP	O50-C49-O48-C22
5	A	1303	KXP	C32-O41-P42-O45
3	A	1301	ANP	O4'-C4'-C5'-O5'
6	B	506	NAG	C8-C7-N2-C2
6	B	506	NAG	O7-C7-N2-C2
5	A	1303	KXP	C23-O24-P25-O28
6	B	501	NAG	C1-C2-N2-C7
6	B	505	NAG	O5-C5-C6-O6
6	B	502	NAG	O5-C5-C6-O6
6	B	503	NAG	O5-C5-C6-O6
6	B	502	NAG	C1-C2-N2-C7
3	A	1301	ANP	PB-O3A-PA-O5'
5	A	1303	KXP	C23-O24-P25-O26
6	B	501	NAG	C3-C2-N2-C7
3	A	1301	ANP	C3'-C4'-C5'-O5'
5	A	1303	KXP	C30-C29-O28-P25
6	B	502	NAG	C3-C2-N2-C7

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Mol	Chain	Res	Type	Atoms
3	A	1301	ANP	C5'-O5'-PA-O1A
5	A	1303	KXP	C2-C1-C18-O20

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	B	505	NAG	1	0
6	B	501	NAG	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 then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

Ligand ANP A 1301

Bond lengths

Bond angles

Torsions

Rings

Ligand KXP A 1303
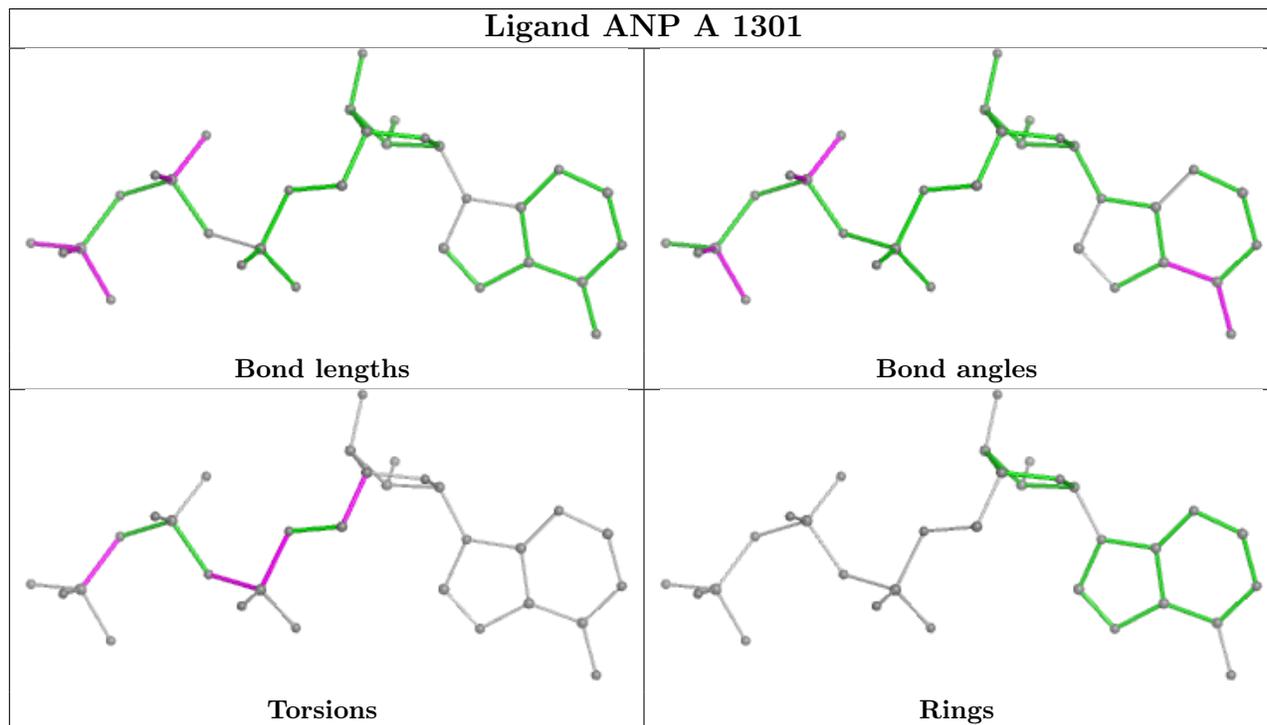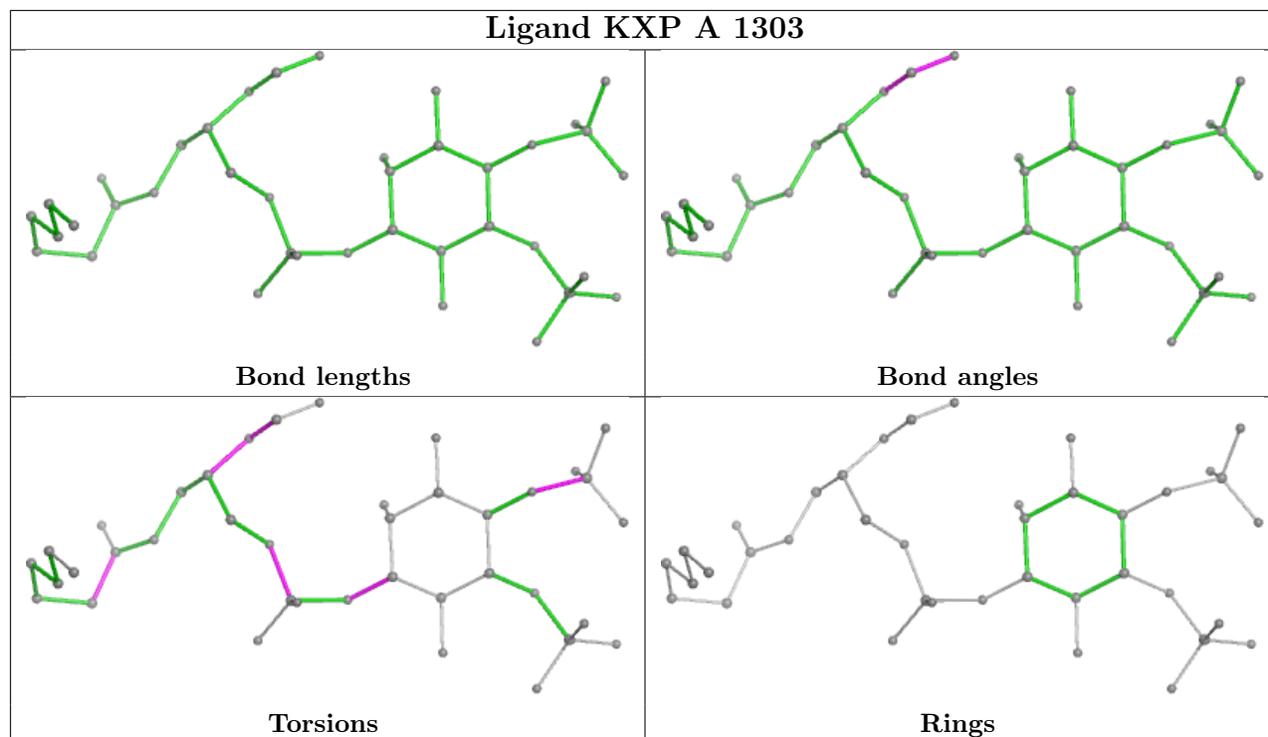
5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6   Map visualisation   ⓘ

This section contains visualisations of the EMDB entry EMD-51546. 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   ⓘ
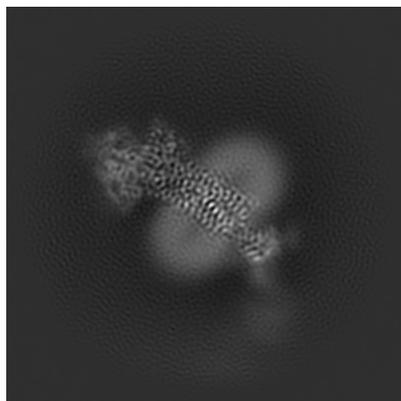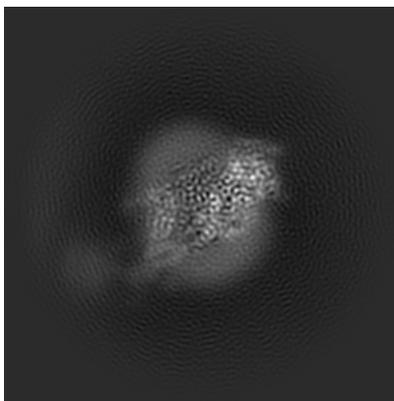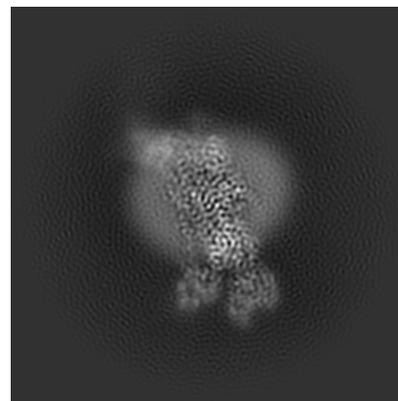
6.1.1   Primary map

X   Y   Z

6.1.2   Raw map

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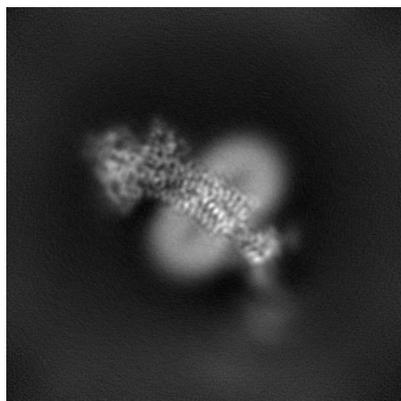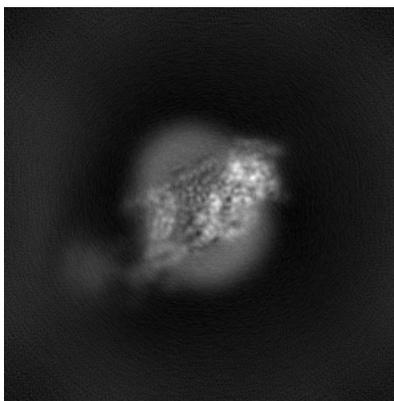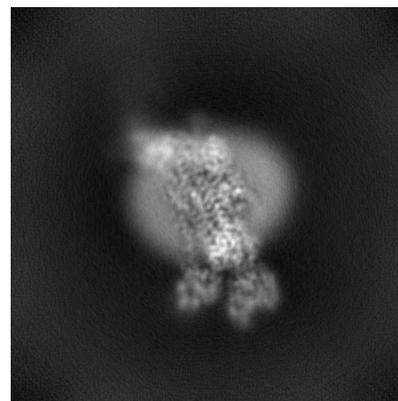
The images above show the map projected in three orthogonal directions.

6.2 Central slices (i)

6.2.1 Primary map
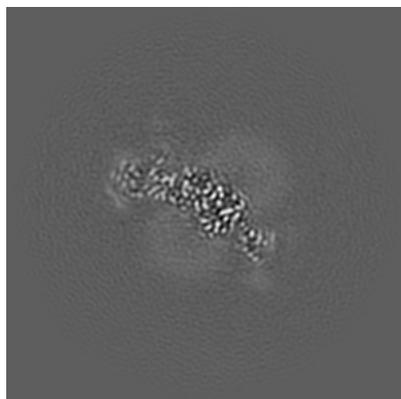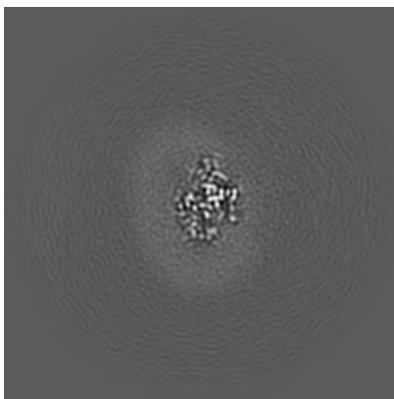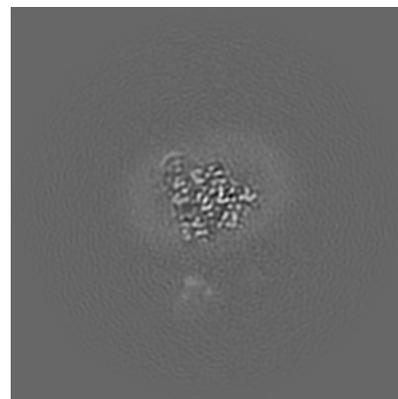
X Index: 150   Y Index: 150   Z Index: 150

6.2.2 Raw map
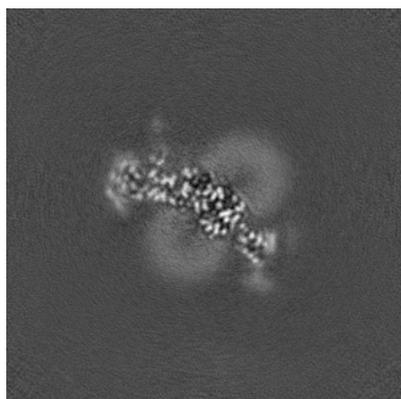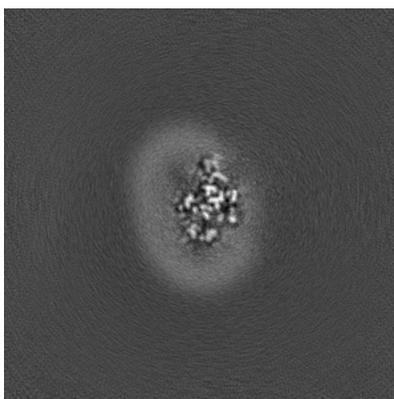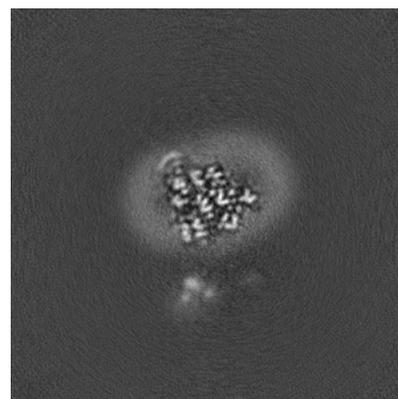
X Index: 150   Y Index: 150   Z Index: 150

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

6.3　Largest variance slices　ⓘ

6.3.1　Primary map
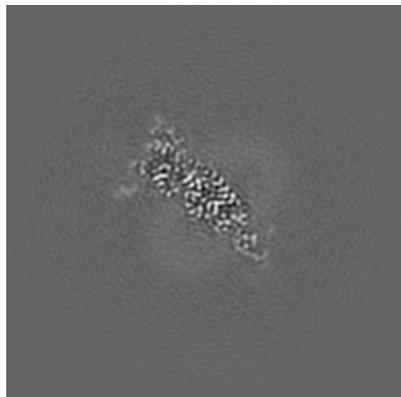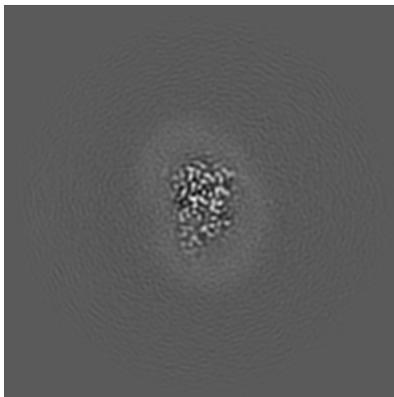
X Index: 158	Y Index: 161	Z Index: 156
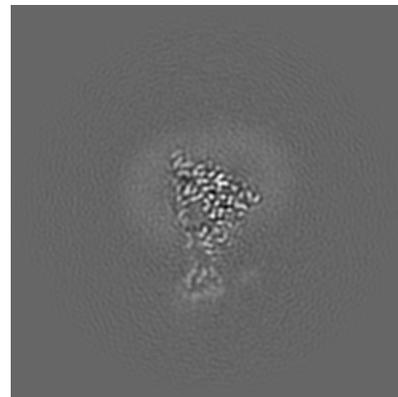
6.3.2　Raw map
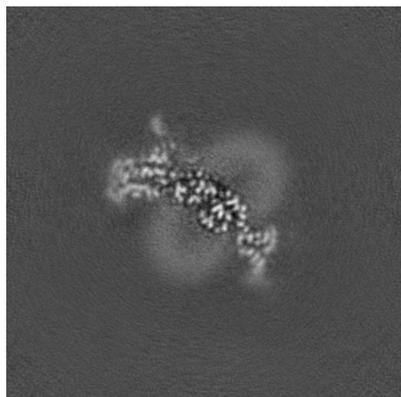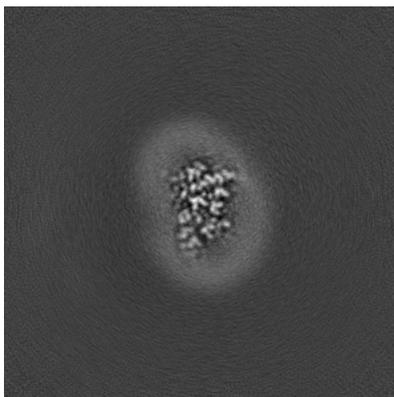
X Index: 153	Y Index: 161	Z Index: 157
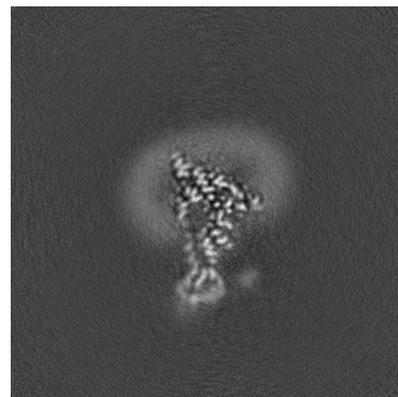
The images above show the largest variance slices of the map in three orthogonal directions.

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

6.4.1 Primary map
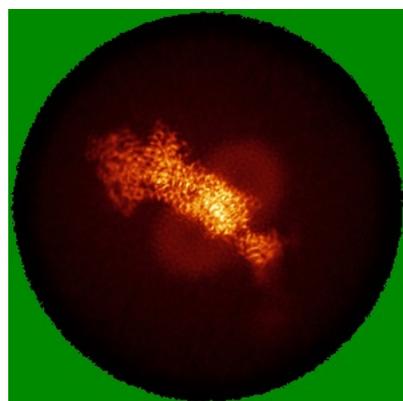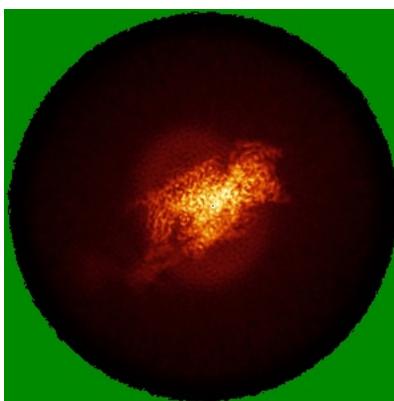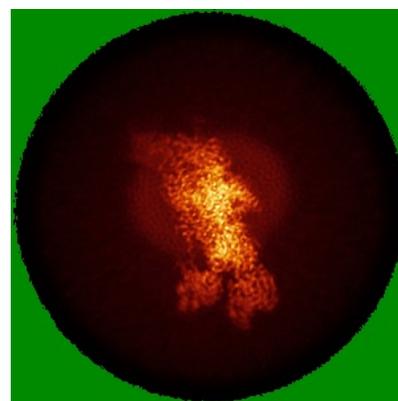
| X | Y | Z |

6.4.2 Raw map

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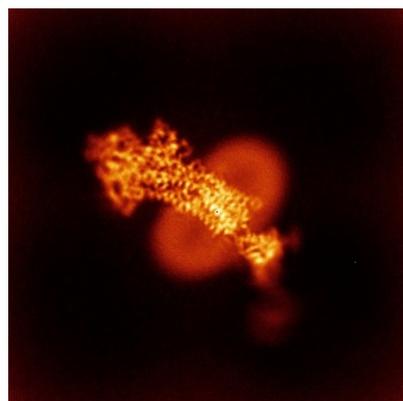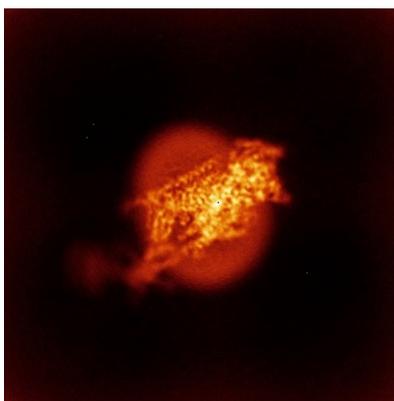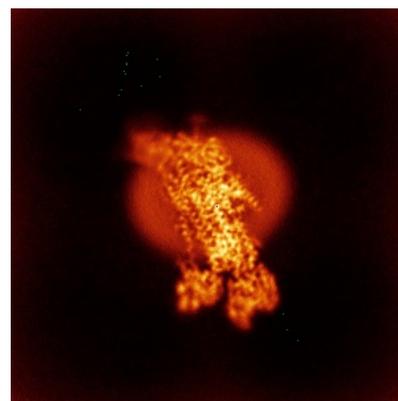
The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

6.5 Orthogonal surface views ⓘ

6.5.1 Primary map

X   Y   Z

The images above show the 3D surface view of the map at the recommended contour level 0.56. 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
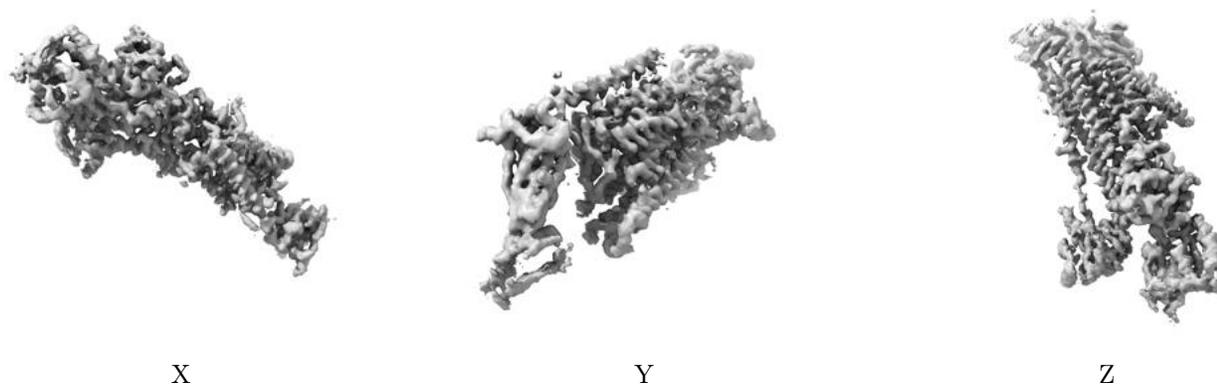
These images show the 3D surface of the raw map. The raw map's contour level was selected so that its surface encloses the same volume as the primary map does at its recommended contour level.

6.6 Mask visualisation ⓘ

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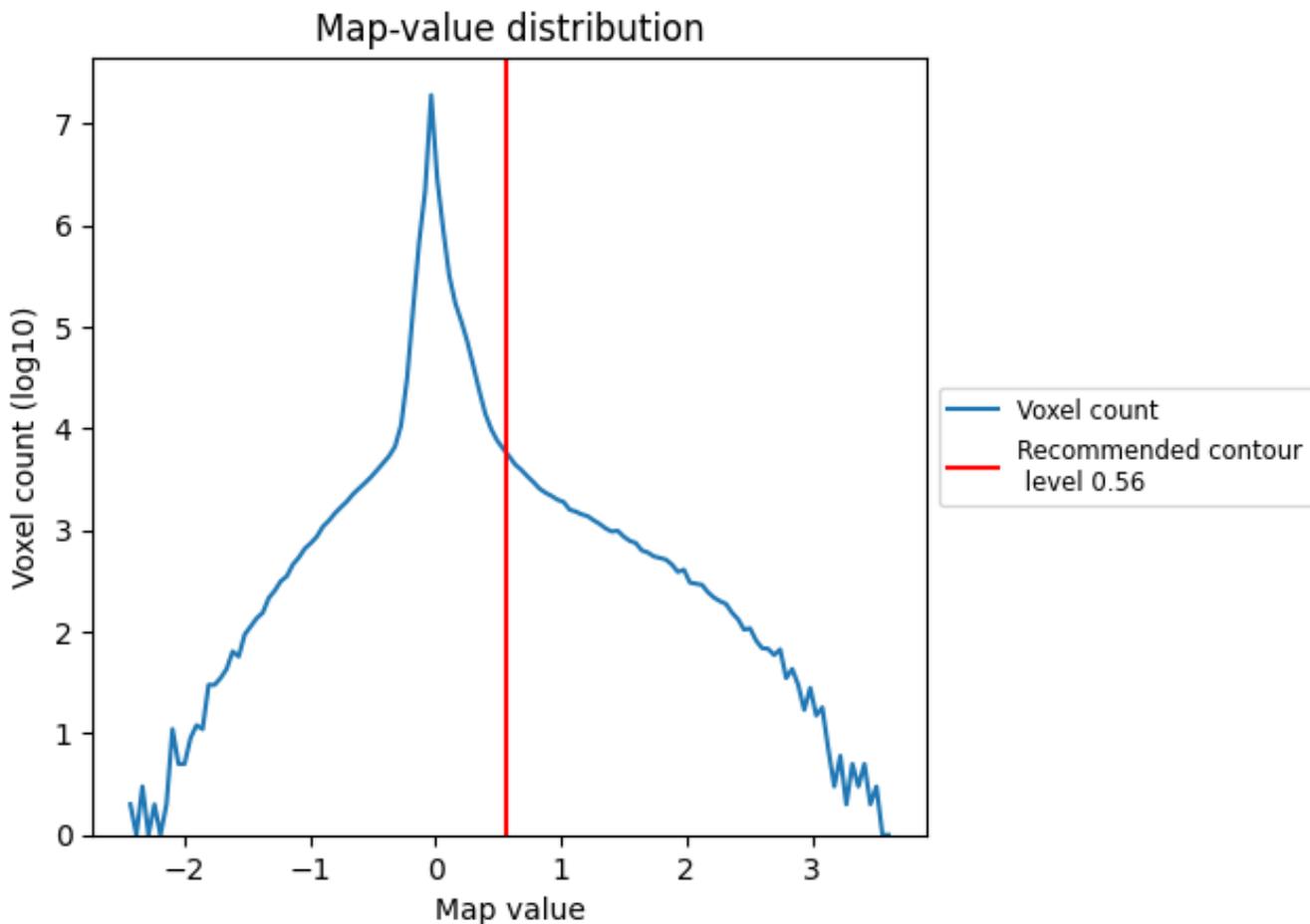
The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

7.2 Volume estimate ⓘ
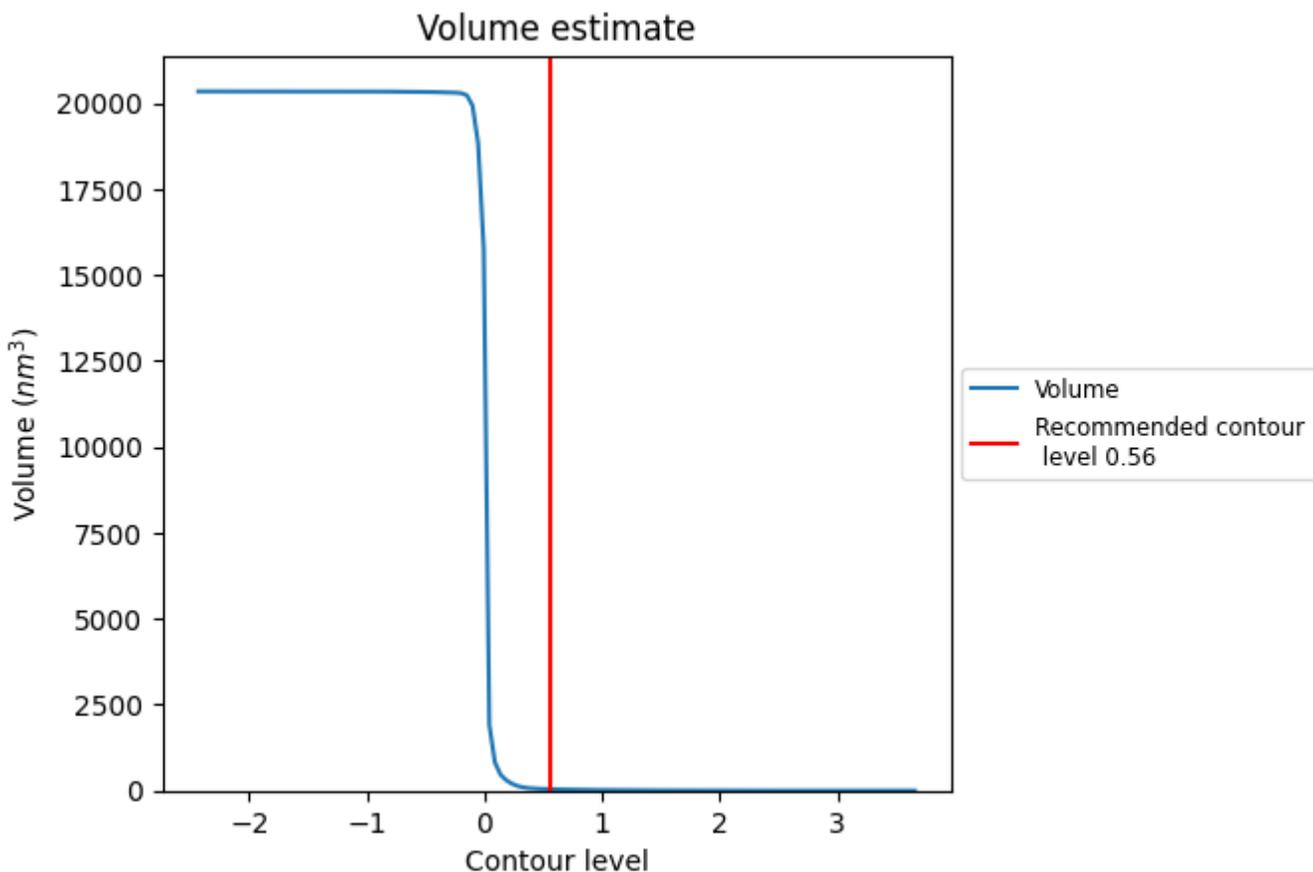
The volume at the recommended contour level is 42 nm^3; this corresponds to an approximate mass of 38 kDa.

The volume estimate graph shows how the enclosed volume varies with the contour level. The recommended contour level is shown as a vertical line and the intersection between the line and the curve gives the volume of the enclosed surface at the given level.

7.3　Rotationally averaged power spectrum　ⓘ
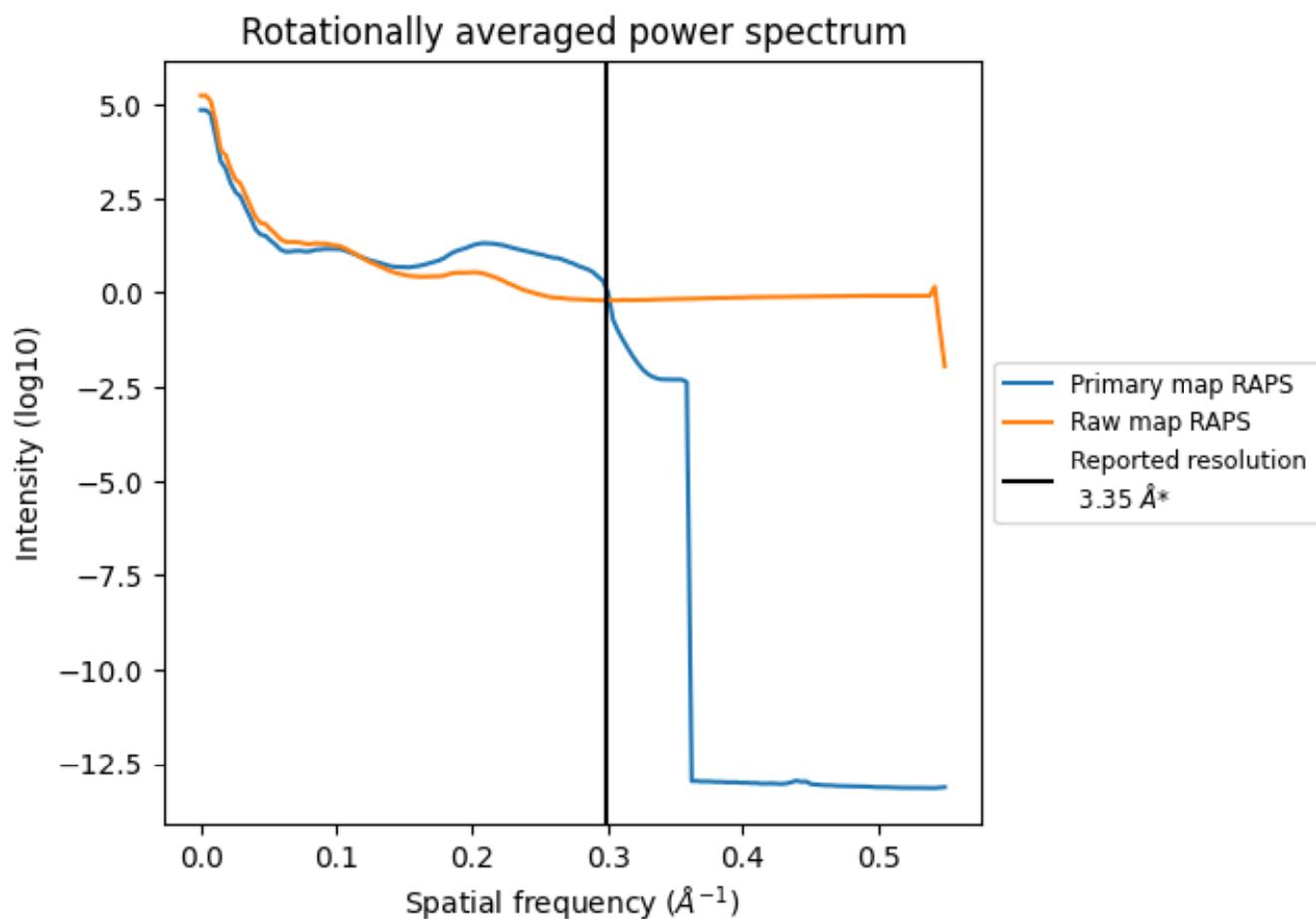
*Reported resolution corresponds to spatial frequency of 0.299 Å^{-1}

8 Fourier-Shell correlation ⓘ

Fourier-Shell Correlation (FSC) is the most commonly used method to estimate the resolution of single-particle and subtomogram-averaged maps. The shape of the curve depends on the imposed symmetry, mask and whether or not the two 3D reconstructions used were processed from a common reference. The reported resolution is shown as a black line. A curve is displayed for the half-bit criterion in addition to lines showing the 0.143 gold standard cut-off and 0.5 cut-off.

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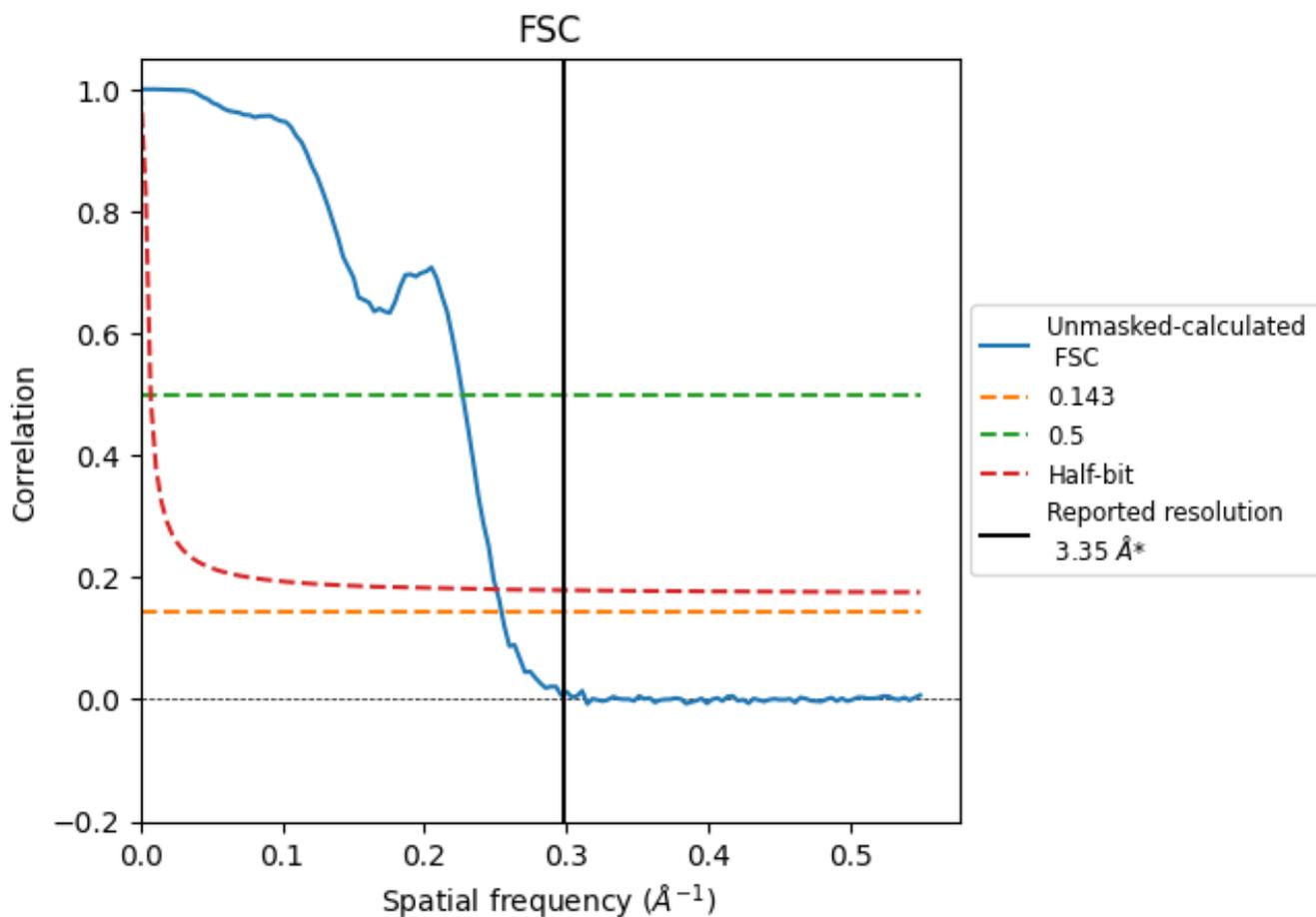
*Reported resolution corresponds to spatial frequency of 0.299 Å^{-1}

8.2 Resolution estimates ⓘ

Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.35	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	3.93	4.40	3.99

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

9 Map-model fit ⓘ

This section contains information regarding the fit between EMDB map EMD-51546 and PDB model 9GSF. Per-residue inclusion information can be found in section 3 on page 7.

## 9.1 Map-model overlay ⓘ

| X | Y | Z |
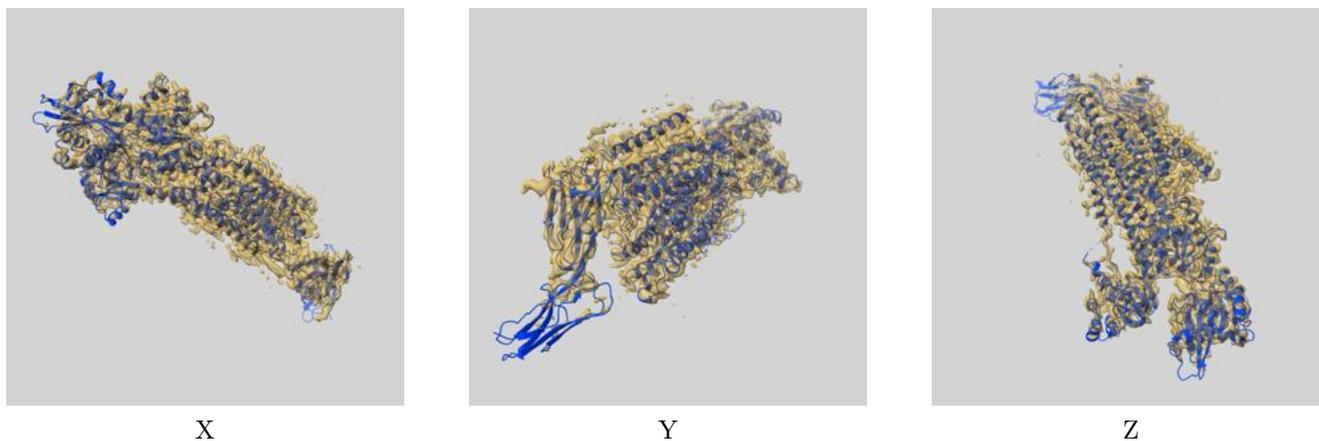
The images above show the 3D surface view of the map at the recommended contour level 0.56 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

9.2   Q-score mapped to coordinate model ⓘ

X   Y   Z
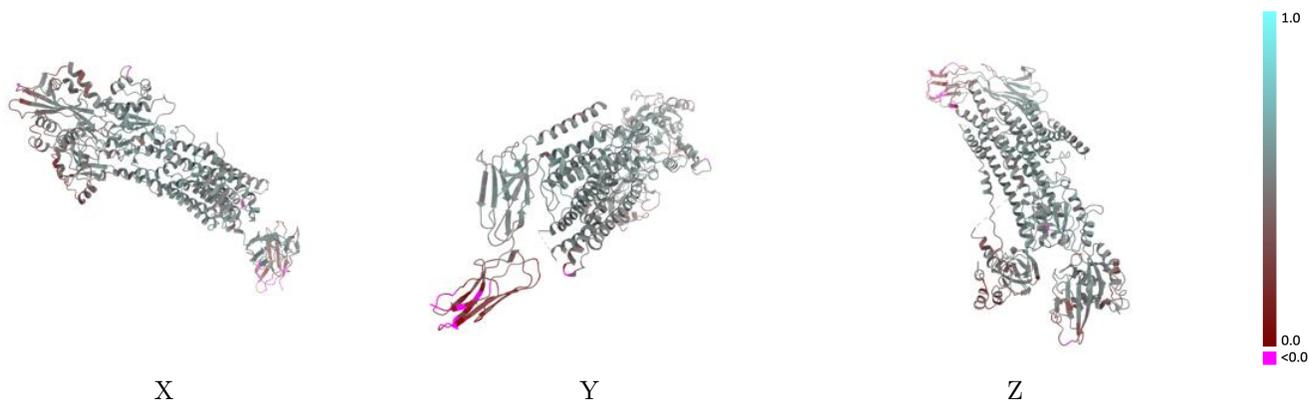
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions at which atoms can be resolved. Low Q-score values may therefore be expected for many entries.

9.3   Atom inclusion mapped to coordinate model ⓘ

X   Y   Z
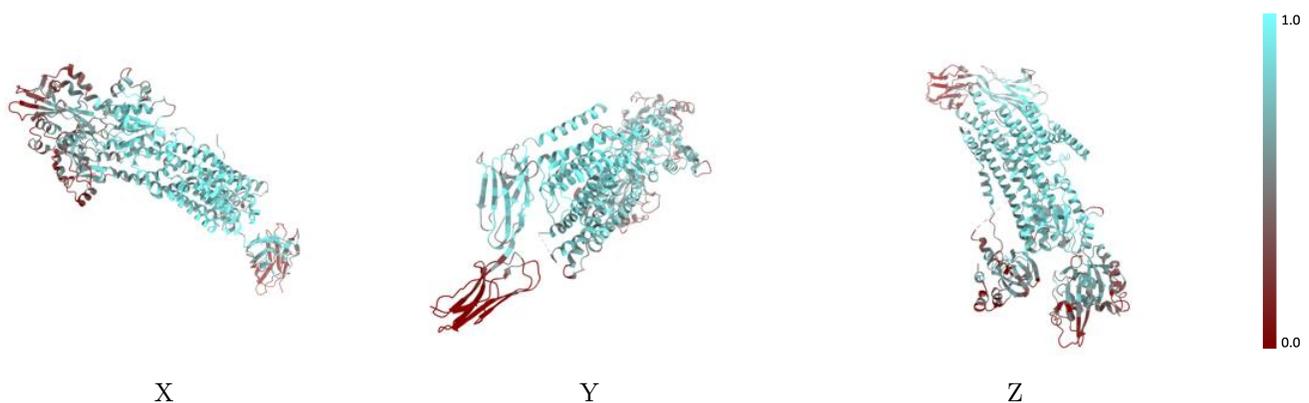
The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.56).

9.4   Atom inclusion (i)
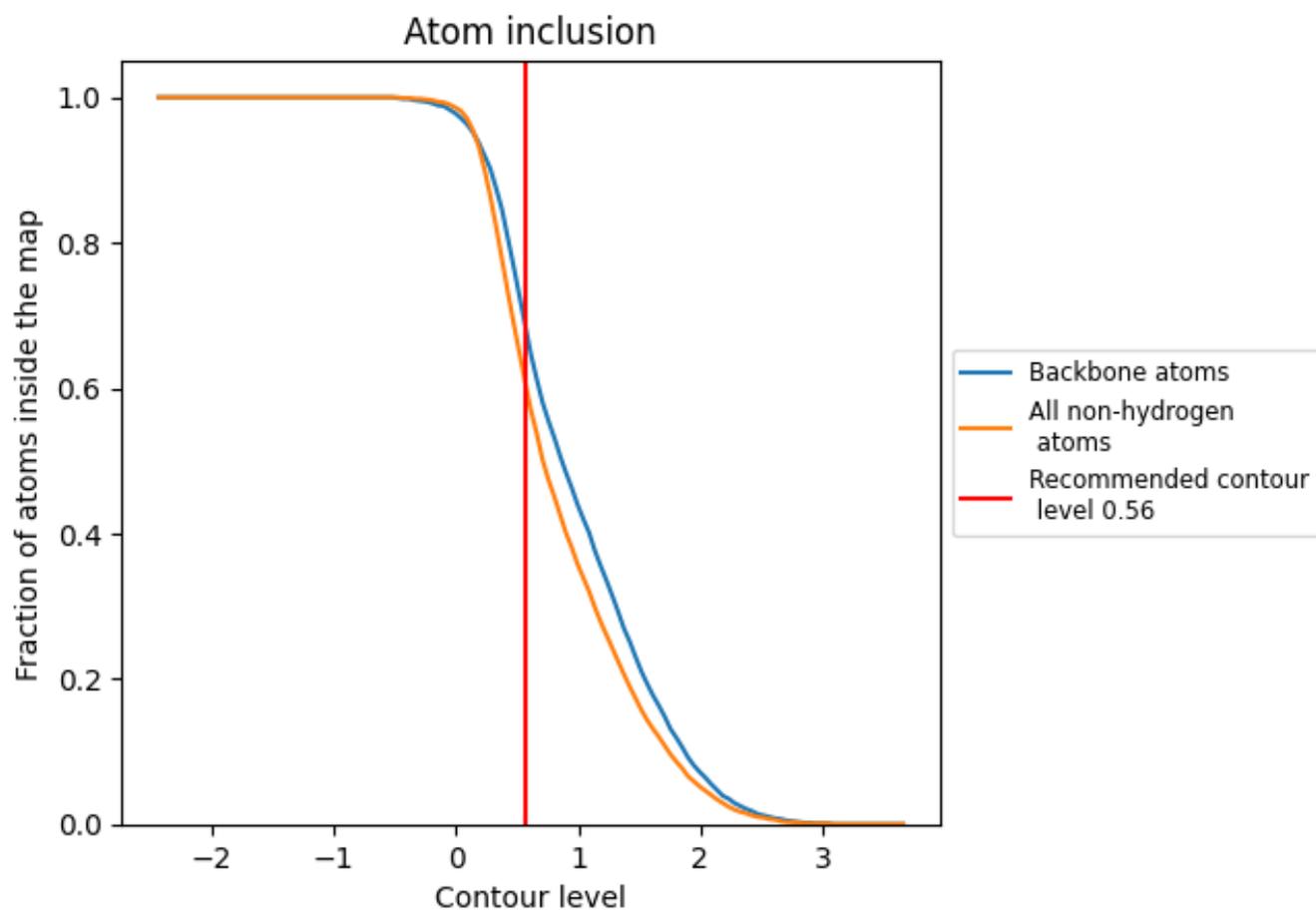
At the recommended contour level, 69% of all backbone atoms, 61% of all non-hydrogen atoms, are inside the map.

9.5　Map-model fit summary ⓘ

The table lists the average atom inclusion at the recommended contour level (0.56) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.6120	0.4660
A	0.6510	0.4880
B	0.4510	0.3740

1.0

0.0
<0.0