



wwPDB EM Validation Summary Report ⓘ

Aug 24, 2026 – 06:14 PM JST

PDB ID : 25EX / pdb_000025ex
EMDB ID : EMD-80068
Title : Cryo-EM structure of the Arabidopsis thaliana potassium transporter 5 in apo state
Authors : Wang, C.; Wang, X.H.; Qu, Y.N.; Shen, H.Z.
Deposited on : 2026-03-31
Resolution : 2.66 Å(reported)

This is a wwPDB EM Validation Summary 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
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.50

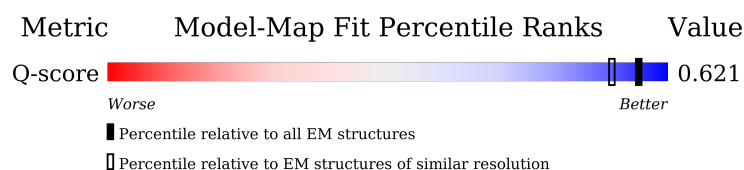
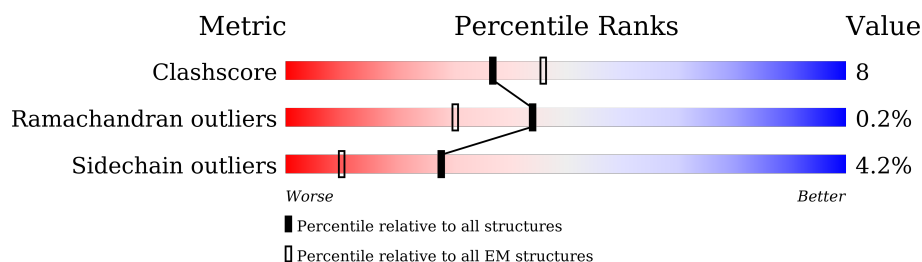
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 2.66 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	9119 (2.16 - 3.16)

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	A	1153	5% 46% 11% 42%
1	B	1153	5% 45% 12% 42%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 10617 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 Green fluorescent protein, Potassium transporter 5.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	664	Total	C	N	O	S	1	0
			5270	3468	843	929	30		
1	B	664	Total	C	N	O	S	2	0
			5279	3476	843	930	30		

There are 272 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-367	MET	-	initiating methionine	UNP P42212
A	-366	GLY	-	expression tag	UNP P42212
A	-365	GLY	-	expression tag	UNP P42212
A	-364	GLU	-	expression tag	UNP P42212
A	-363	GLY	-	expression tag	UNP P42212
A	-362	LEU	-	expression tag	UNP P42212
A	-361	ARG	-	expression tag	UNP P42212
A	-360	ALA	-	expression tag	UNP P42212
A	-359	SER	-	expression tag	UNP P42212
A	-358	PRO	-	expression tag	UNP P42212
A	-357	ARG	-	expression tag	UNP P42212
A	-356	ARG	-	expression tag	UNP P42212
A	-355	ARG	-	expression tag	UNP P42212
A	-354	PRO	-	expression tag	UNP P42212
A	-353	LEU	-	expression tag	UNP P42212
A	-352	LEU	-	expression tag	UNP P42212
A	-351	PRO	-	expression tag	UNP P42212
A	-350	LEU	-	expression tag	UNP P42212
A	-349	GLN	-	expression tag	UNP P42212
A	-348	PRO	-	expression tag	UNP P42212
A	-347	ARG	-	expression tag	UNP P42212
A	-346	GLY	-	expression tag	UNP P42212
A	-345	CYS	-	expression tag	UNP P42212
A	-344	PRO	-	expression tag	UNP P42212
A	-343	ARG	-	expression tag	UNP P42212
A	-342	GLY	-	expression tag	UNP P42212

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Chain	Residue	Modelled	Actual	Comment	Reference
A	-341	ASP	-	expression tag	UNP P42212
A	-340	GLY	-	expression tag	UNP P42212
A	-339	CYS	-	expression tag	UNP P42212
A	-338	LEU	-	expression tag	UNP P42212
A	-337	ARG	-	expression tag	UNP P42212
A	-336	GLY	-	expression tag	UNP P42212
A	-335	GLY	-	expression tag	UNP P42212
A	-334	ARG	-	expression tag	UNP P42212
A	-333	GLY	-	expression tag	UNP P42212
A	-332	ARG	-	expression tag	UNP P42212
A	-331	ALA	-	expression tag	UNP P42212
A	-330	GLY	-	expression tag	UNP P42212
A	-329	PHE	-	expression tag	UNP P42212
A	-328	GLY	-	expression tag	UNP P42212
A	-327	PHE	-	expression tag	UNP P42212
A	-326	TRP	-	expression tag	UNP P42212
A	-325	ARG	-	expression tag	UNP P42212
A	-324	VAL	-	expression tag	UNP P42212
A	-323	THR	-	expression tag	UNP P42212
A	-322	GLY	-	expression tag	UNP P42212
A	-321	GLY	-	expression tag	UNP P42212
A	-320	SER	-	expression tag	UNP P42212
A	-319	ARG	-	expression tag	UNP P42212
A	-318	ALA	-	expression tag	UNP P42212
A	-317	SER	-	expression tag	UNP P42212
A	-316	ALA	-	expression tag	UNP P42212
A	-315	ASN	-	expression tag	UNP P42212
A	-314	HIS	-	expression tag	UNP P42212
A	-313	VAL	-	expression tag	UNP P42212
A	-312	HIS	-	expression tag	UNP P42212
A	-311	ALA	-	expression tag	UNP P42212
A	-310	PHE	-	expression tag	UNP P42212
A	-309	PHE	-	expression tag	UNP P42212
A	-308	PHE	-	expression tag	UNP P42212
A	-307	PHE	-	expression tag	UNP P42212
A	-306	LEU	-	expression tag	UNP P42212
A	-305	GLN	-	expression tag	UNP P42212
A	-304	LEU	-	expression tag	UNP P42212
A	-303	LEU	-	expression tag	UNP P42212
A	-302	GLY	-	expression tag	UNP P42212
A	-301	ASN	-	expression tag	UNP P42212
A	-300	VAL	-	expression tag	UNP P42212

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Chain	Residue	Modelled	Actual	Comment	Reference
A	-299	LEU	-	expression tag	UNP P42212
A	-298	VAL	-	expression tag	UNP P42212
A	-297	ILE	-	expression tag	UNP P42212
A	-296	VAL	-	expression tag	UNP P42212
A	-295	LEU	-	expression tag	UNP P42212
A	-294	SER	-	expression tag	UNP P42212
A	-293	HIS	-	expression tag	UNP P42212
A	-292	HIS	-	expression tag	UNP P42212
A	-291	PHE	-	expression tag	UNP P42212
A	-290	GLY	-	expression tag	UNP P42212
A	-289	LYS	-	expression tag	UNP P42212
A	-288	GLU	-	expression tag	UNP P42212
A	-287	PHE	-	expression tag	UNP P42212
A	-286	ALA	-	expression tag	UNP P42212
A	-285	THR	-	expression tag	UNP P42212
A	-284	MET	-	expression tag	UNP P42212
A	-283	ALA	-	expression tag	UNP P42212
A	-282	HIS	-	expression tag	UNP P42212
A	-281	HIS	-	expression tag	UNP P42212
A	-280	HIS	-	expression tag	UNP P42212
A	-279	HIS	-	expression tag	UNP P42212
A	-278	HIS	-	expression tag	UNP P42212
A	-277	HIS	-	expression tag	UNP P42212
A	-276	HIS	-	expression tag	UNP P42212
A	-275	HIS	-	expression tag	UNP P42212
A	-274	ALA	-	expression tag	UNP P42212
A	-273	ALA	-	expression tag	UNP P42212
A	-272	ASP	-	expression tag	UNP P42212
A	-271	TYR	-	expression tag	UNP P42212
A	-270	LYS	-	expression tag	UNP P42212
A	-269	ASP	-	expression tag	UNP P42212
A	-268	HIS	-	expression tag	UNP P42212
A	-267	ASP	-	expression tag	UNP P42212
A	-266	ILE	-	expression tag	UNP P42212
A	-265	ASP	-	expression tag	UNP P42212
A	-264	TYR	-	expression tag	UNP P42212
A	-263	LYS	-	expression tag	UNP P42212
A	-262	ASP	-	expression tag	UNP P42212
A	-261	ASP	-	expression tag	UNP P42212
A	-260	ASP	-	expression tag	UNP P42212
A	-259	ASP	-	expression tag	UNP P42212
A	-258	LYS	-	expression tag	UNP P42212

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Chain	Residue	Modelled	Actual	Comment	Reference
A	-257	SER	-	expression tag	UNP P42212
A	-256	ALA	-	expression tag	UNP P42212
A	-255	MET	-	expression tag	UNP P42212
A	-254	VAL	-	expression tag	UNP P42212
A	-191	LEU	PHE	conflict	UNP P42212
A	-190	THR	SER	conflict	UNP P42212
A	-148	THR	LYS	conflict	UNP P42212
A	-49	LYS	ALA	conflict	UNP P42212
A	-24	LEU	HIS	conflict	UNP P42212
A	-16	SER	-	linker	UNP P42212
A	-15	GLY	-	linker	UNP P42212
A	-14	LEU	-	linker	UNP P42212
A	-13	ARG	-	linker	UNP P42212
A	-12	SER	-	linker	UNP P42212
A	-11	GLY	-	linker	UNP P42212
A	-10	LEU	-	linker	UNP P42212
A	-9	GLU	-	linker	UNP P42212
A	-8	VAL	-	linker	UNP P42212
A	-7	LEU	-	linker	UNP P42212
A	-6	PHE	-	linker	UNP P42212
A	-5	GLN	-	linker	UNP P42212
A	-4	GLY	-	linker	UNP P42212
A	-3	PRO	-	linker	UNP P42212
A	-2	GLY	-	linker	UNP P42212
A	-1	GLY	-	linker	UNP P42212
A	0	ARG	-	linker	UNP P42212
B	-367	MET	-	initiating methionine	UNP P42212
B	-366	GLY	-	expression tag	UNP P42212
B	-365	GLY	-	expression tag	UNP P42212
B	-364	GLU	-	expression tag	UNP P42212
B	-363	GLY	-	expression tag	UNP P42212
B	-362	LEU	-	expression tag	UNP P42212
B	-361	ARG	-	expression tag	UNP P42212
B	-360	ALA	-	expression tag	UNP P42212
B	-359	SER	-	expression tag	UNP P42212
B	-358	PRO	-	expression tag	UNP P42212
B	-357	ARG	-	expression tag	UNP P42212
B	-356	ARG	-	expression tag	UNP P42212
B	-355	ARG	-	expression tag	UNP P42212
B	-354	PRO	-	expression tag	UNP P42212
B	-353	LEU	-	expression tag	UNP P42212
B	-352	LEU	-	expression tag	UNP P42212

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-351	PRO	-	expression tag	UNP P42212
B	-350	LEU	-	expression tag	UNP P42212
B	-349	GLN	-	expression tag	UNP P42212
B	-348	PRO	-	expression tag	UNP P42212
B	-347	ARG	-	expression tag	UNP P42212
B	-346	GLY	-	expression tag	UNP P42212
B	-345	CYS	-	expression tag	UNP P42212
B	-344	PRO	-	expression tag	UNP P42212
B	-343	ARG	-	expression tag	UNP P42212
B	-342	GLY	-	expression tag	UNP P42212
B	-341	ASP	-	expression tag	UNP P42212
B	-340	GLY	-	expression tag	UNP P42212
B	-339	CYS	-	expression tag	UNP P42212
B	-338	LEU	-	expression tag	UNP P42212
B	-337	ARG	-	expression tag	UNP P42212
B	-336	GLY	-	expression tag	UNP P42212
B	-335	GLY	-	expression tag	UNP P42212
B	-334	ARG	-	expression tag	UNP P42212
B	-333	GLY	-	expression tag	UNP P42212
B	-332	ARG	-	expression tag	UNP P42212
B	-331	ALA	-	expression tag	UNP P42212
B	-330	GLY	-	expression tag	UNP P42212
B	-329	PHE	-	expression tag	UNP P42212
B	-328	GLY	-	expression tag	UNP P42212
B	-327	PHE	-	expression tag	UNP P42212
B	-326	TRP	-	expression tag	UNP P42212
B	-325	ARG	-	expression tag	UNP P42212
B	-324	VAL	-	expression tag	UNP P42212
B	-323	THR	-	expression tag	UNP P42212
B	-322	GLY	-	expression tag	UNP P42212
B	-321	GLY	-	expression tag	UNP P42212
B	-320	SER	-	expression tag	UNP P42212
B	-319	ARG	-	expression tag	UNP P42212
B	-318	ALA	-	expression tag	UNP P42212
B	-317	SER	-	expression tag	UNP P42212
B	-316	ALA	-	expression tag	UNP P42212
B	-315	ASN	-	expression tag	UNP P42212
B	-314	HIS	-	expression tag	UNP P42212
B	-313	VAL	-	expression tag	UNP P42212
B	-312	HIS	-	expression tag	UNP P42212
B	-311	ALA	-	expression tag	UNP P42212
B	-310	PHE	-	expression tag	UNP P42212

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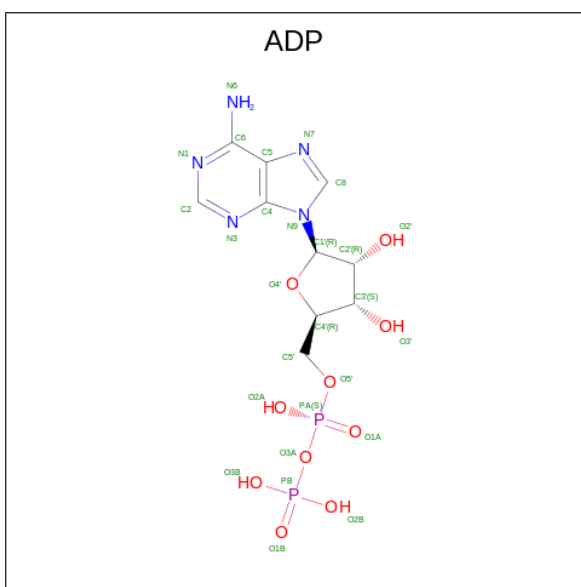
Chain	Residue	Modelled	Actual	Comment	Reference
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B	-308	PHE	-	expression tag	UNP P42212
B	-307	PHE	-	expression tag	UNP P42212
B	-306	LEU	-	expression tag	UNP P42212
B	-305	GLN	-	expression tag	UNP P42212
B	-304	LEU	-	expression tag	UNP P42212
B	-303	LEU	-	expression tag	UNP P42212
B	-302	GLY	-	expression tag	UNP P42212
B	-301	ASN	-	expression tag	UNP P42212
B	-300	VAL	-	expression tag	UNP P42212
B	-299	LEU	-	expression tag	UNP P42212
B	-298	VAL	-	expression tag	UNP P42212
B	-297	ILE	-	expression tag	UNP P42212
B	-296	VAL	-	expression tag	UNP P42212
B	-295	LEU	-	expression tag	UNP P42212
B	-294	SER	-	expression tag	UNP P42212
B	-293	HIS	-	expression tag	UNP P42212
B	-292	HIS	-	expression tag	UNP P42212
B	-291	PHE	-	expression tag	UNP P42212
B	-290	GLY	-	expression tag	UNP P42212
B	-289	LYS	-	expression tag	UNP P42212
B	-288	GLU	-	expression tag	UNP P42212
B	-287	PHE	-	expression tag	UNP P42212
B	-286	ALA	-	expression tag	UNP P42212
B	-285	THR	-	expression tag	UNP P42212
B	-284	MET	-	expression tag	UNP P42212
B	-283	ALA	-	expression tag	UNP P42212
B	-282	HIS	-	expression tag	UNP P42212
B	-281	HIS	-	expression tag	UNP P42212
B	-280	HIS	-	expression tag	UNP P42212
B	-279	HIS	-	expression tag	UNP P42212
B	-278	HIS	-	expression tag	UNP P42212
B	-277	HIS	-	expression tag	UNP P42212
B	-276	HIS	-	expression tag	UNP P42212
B	-275	HIS	-	expression tag	UNP P42212
B	-274	ALA	-	expression tag	UNP P42212
B	-273	ALA	-	expression tag	UNP P42212
B	-272	ASP	-	expression tag	UNP P42212
B	-271	TYR	-	expression tag	UNP P42212
B	-270	LYS	-	expression tag	UNP P42212
B	-269	ASP	-	expression tag	UNP P42212
B	-268	HIS	-	expression tag	UNP P42212

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-267	ASP	-	expression tag	UNP P42212
B	-266	ILE	-	expression tag	UNP P42212
B	-265	ASP	-	expression tag	UNP P42212
B	-264	TYR	-	expression tag	UNP P42212
B	-263	LYS	-	expression tag	UNP P42212
B	-262	ASP	-	expression tag	UNP P42212
B	-261	ASP	-	expression tag	UNP P42212
B	-260	ASP	-	expression tag	UNP P42212
B	-259	ASP	-	expression tag	UNP P42212
B	-258	LYS	-	expression tag	UNP P42212
B	-257	SER	-	expression tag	UNP P42212
B	-256	ALA	-	expression tag	UNP P42212
B	-255	MET	-	expression tag	UNP P42212
B	-254	VAL	-	expression tag	UNP P42212
B	-191	LEU	PHE	conflict	UNP P42212
B	-190	THR	SER	conflict	UNP P42212
B	-148	THR	LYS	conflict	UNP P42212
B	-49	LYS	ALA	conflict	UNP P42212
B	-24	LEU	HIS	conflict	UNP P42212
B	-16	SER	-	linker	UNP P42212
B	-15	GLY	-	linker	UNP P42212
B	-14	LEU	-	linker	UNP P42212
B	-13	ARG	-	linker	UNP P42212
B	-12	SER	-	linker	UNP P42212
B	-11	GLY	-	linker	UNP P42212
B	-10	LEU	-	linker	UNP P42212
B	-9	GLU	-	linker	UNP P42212
B	-8	VAL	-	linker	UNP P42212
B	-7	LEU	-	linker	UNP P42212
B	-6	PHE	-	linker	UNP P42212
B	-5	GLN	-	linker	UNP P42212
B	-4	GLY	-	linker	UNP P42212
B	-3	PRO	-	linker	UNP P42212
B	-2	GLY	-	linker	UNP P42212
B	-1	GLY	-	linker	UNP P42212
B	0	ARG	-	linker	UNP P42212

- Molecule 2 is ADENOSINE-5'-DIPHOSPHATE (CCD ID: ADP) (formula: $C_{10}H_{15}N_5O_{10}P_2$) (labeled as "Ligand of Interest" by depositor).



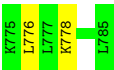
Mol	Chain	Residues	Atoms					AltConf
2	A	1	Total 27	C 10	N 5	O 10	P 2	0
2	B	1	Total 27	C 10	N 5	O 10	P 2	0

- Molecule 3 is POTASSIUM ION (CCD ID: K) (formula: K) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms	AltConf
3	A	1	Total K 1 1	0
3	B	1	Total K 1 1	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms	AltConf
4	A	6	Total O 6 6	0
4	B	6	Total O 6 6	0



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	905665	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 ($e^-/\text{\AA}^2$)	50	Depositor
Minimum defocus (nm)	1500	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	9.750	Depositor
Minimum map value	-6.627	Depositor
Average map value	0.004	Depositor
Map value standard deviation	0.216	Depositor
Recommended contour level	1.31	Depositor
Map size (Å)	258.552, 258.552, 258.552	wwPDB
Map dimensions	240, 240, 240	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.0773, 1.0773, 1.0773	Depositor

5 Model quality

5.1 Standard geometry

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

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	0.33	0/5396	0.45	0/7320
1	B	0.26	0/5409	0.42	0/7338
All	All	0.29	0/10805	0.44	0/14658

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	5270	0	5405	77	0
1	B	5279	0	5414	89	0
2	A	27	0	12	1	0
2	B	27	0	12	1	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
4	A	6	0	0	0	0
4	B	6	0	0	0	0
All	All	10617	0	10843	163	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.

The worst 5 of 163 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:B:226:VAL:HG21	1:B:441:ARG:HB3	1.60	0.83
1:A:471:VAL:HG23	1:A:472:ILE:HG13	1.68	0.75
1:B:471:VAL:HG23	1:B:472:ILE:HG13	1.68	0.73
1:A:526:VAL:HG12	1:A:530[A]:LYS:HE3	1.75	0.67
1:B:94:ASP:OD1	1:B:292:ARG:NH1	2.31	0.64

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	A	659/1153 (57%)	617 (94%)	41 (6%)	1 (0%)	43	60
1	B	660/1153 (57%)	614 (93%)	44 (7%)	2 (0%)	36	52
All	All	1319/2306 (57%)	1231 (93%)	85 (6%)	3 (0%)	44	60

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	474	LYS
1	B	474	LYS
1	B	443	THR

5.3.2 Protein sidechains [i](#)

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	579/993 (58%)	557 (96%)	22 (4%)	29	49
1	B	580/993 (58%)	553 (95%)	27 (5%)	23	40
All	All	1159/1986 (58%)	1110 (96%)	49 (4%)	28	45

5 of 49 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	159	THR
1	B	475	THR
1	B	190	VAL
1	B	293	THR
1	B	512	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 26 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	223	ASN
1	B	282	ASN
1	B	716	GLN
1	B	273	HIS
1	B	320	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](#)

Of 4 ligands modelled in this entry, 2 are monoatomic - leaving 2 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	$\# Z > 2$
2	ADP	B	901	-	27,29,29	1.35	4 (14%)	42,45,45	1.96	10 (23%)
2	ADP	A	901	-	27,29,29	1.35	4 (14%)	42,45,45	1.97	10 (23%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	ADP	B	901	-	-	6/16/32/32	0/3/3/3
2	ADP	A	901	-	-	0/16/32/32	0/3/3/3

The worst 5 of 8 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	901	ADP	C5-C4	4.31	1.47	1.39
2	A	901	ADP	C5-C4	4.29	1.47	1.39
2	A	901	ADP	C5-C6	2.80	1.48	1.41
2	B	901	ADP	C5-C6	2.71	1.48	1.41
2	B	901	ADP	C5-N7	-2.32	1.34	1.39

The worst 5 of 20 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	901	ADP	C5-C4-N3	-6.70	118.01	126.75
2	B	901	ADP	C5-C4-N3	-6.64	118.09	126.75
2	B	901	ADP	N3-C4-N9	5.01	135.34	127.08
2	A	901	ADP	N3-C4-N9	4.98	135.28	127.08
2	A	901	ADP	C2-N3-C4	4.20	121.67	111.75

There are no chirality outliers.

5 of 6 torsion outliers are listed below:

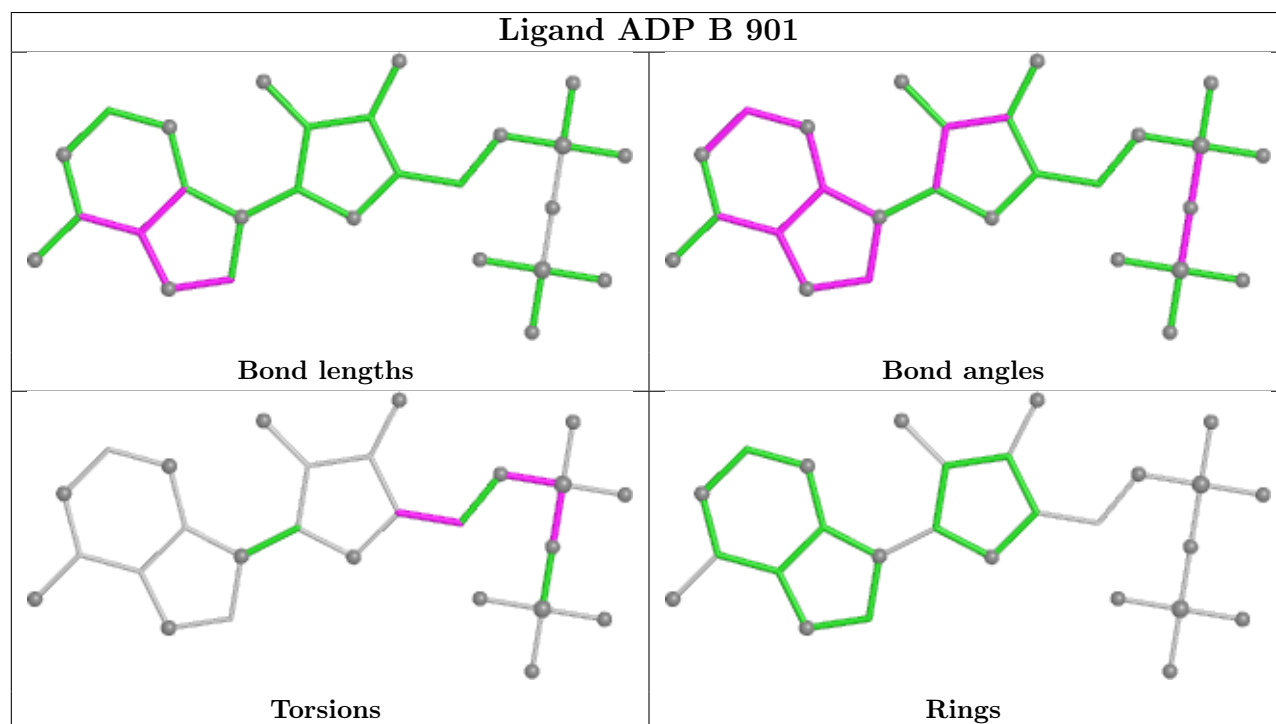
Mol	Chain	Res	Type	Atoms
2	B	901	ADP	C5'-O5'-PA-O3A
2	B	901	ADP	C3'-C4'-C5'-O5'
2	B	901	ADP	O4'-C4'-C5'-O5'
2	B	901	ADP	C5'-O5'-PA-O1A
2	B	901	ADP	C5'-O5'-PA-O2A

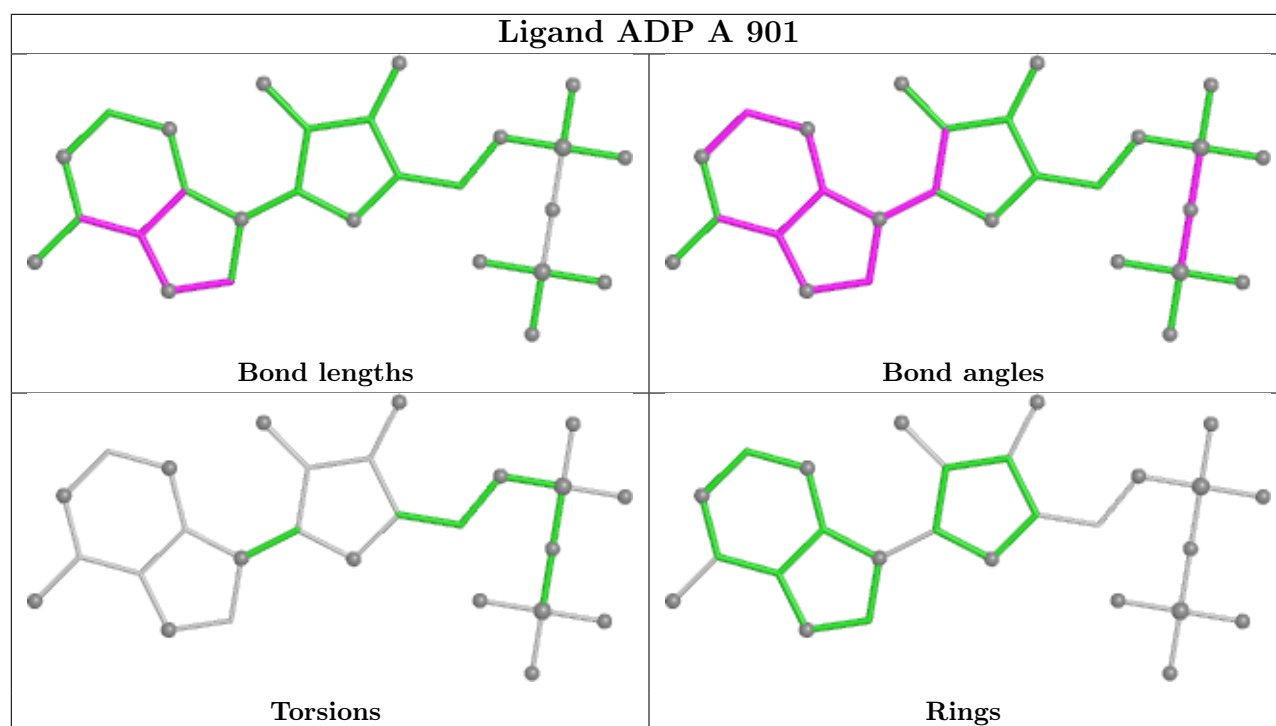
There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	901	ADP	1	0
2	A	901	ADP	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.





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.

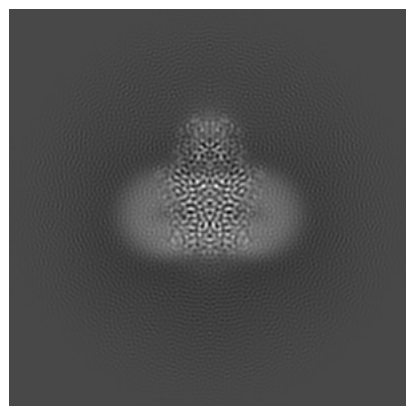
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-80068. These allow visual inspection of the internal detail of the map and identification of artifacts.

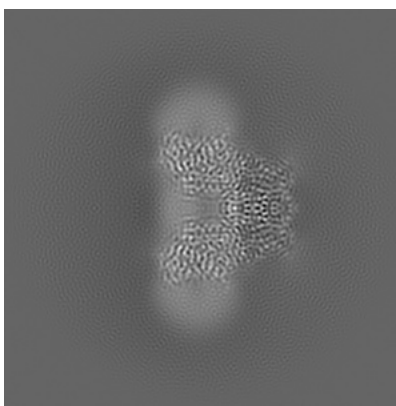
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

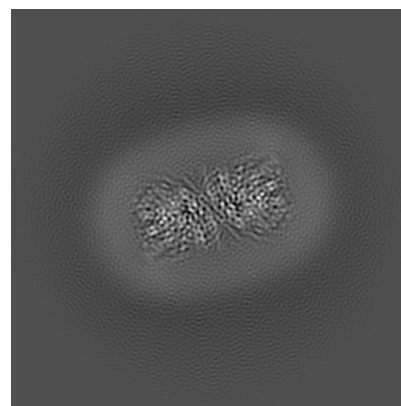
6.1.1 Primary map



X

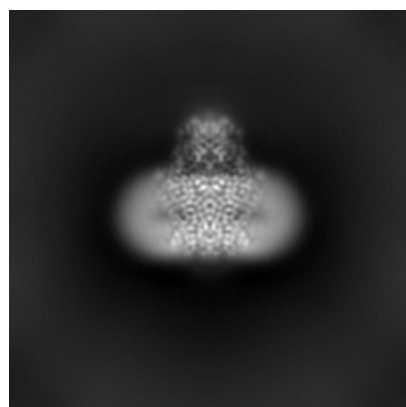


Y

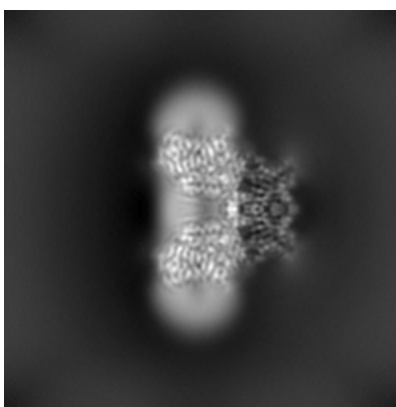


Z

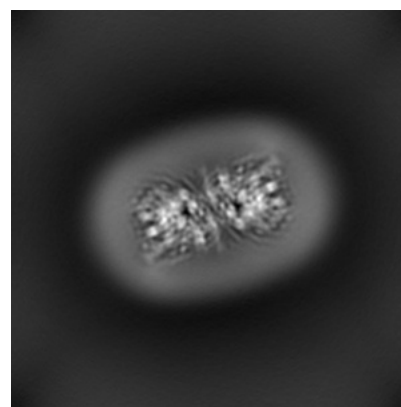
6.1.2 Raw map



X



Y

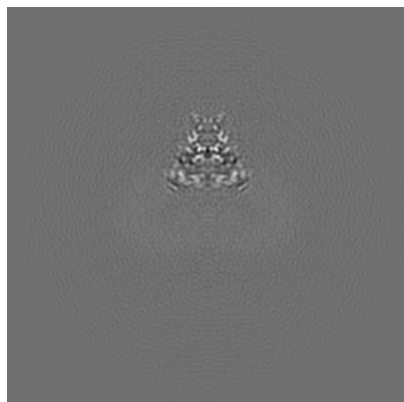


Z

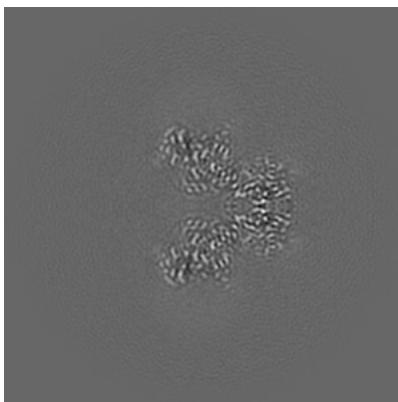
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

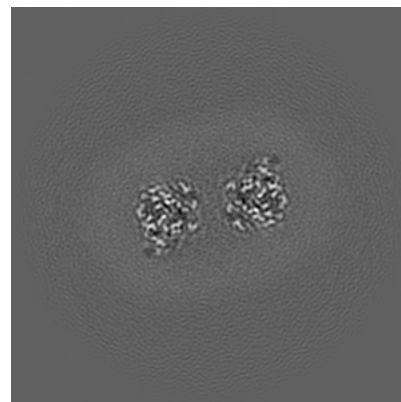
6.2.1 Primary map



X Index: 120

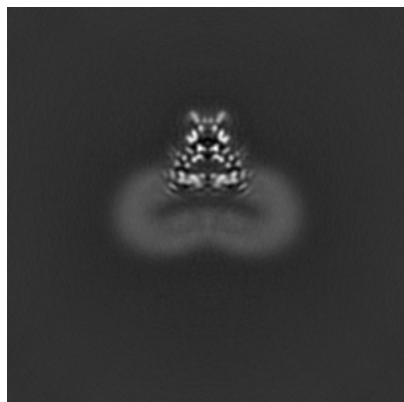


Y Index: 120

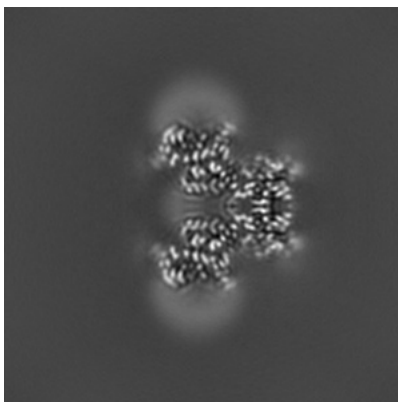


Z Index: 120

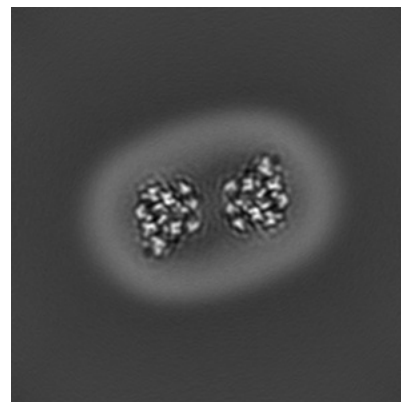
6.2.2 Raw map



X Index: 120



Y Index: 120

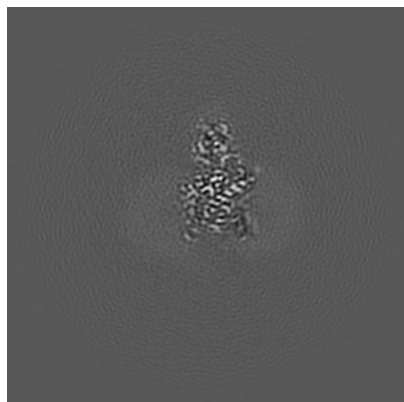


Z Index: 120

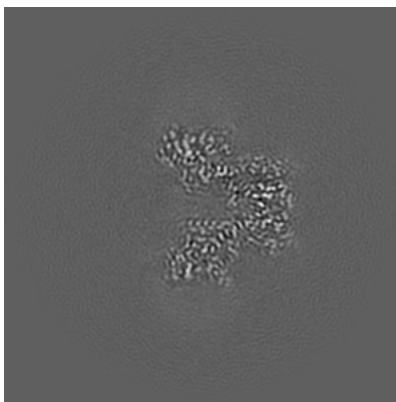
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

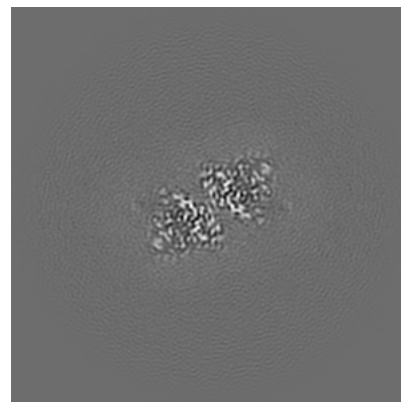
6.3.1 Primary map



X Index: 139

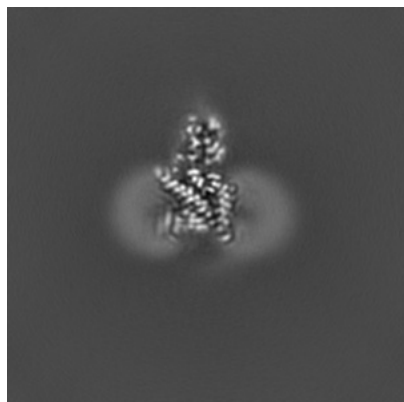


Y Index: 122

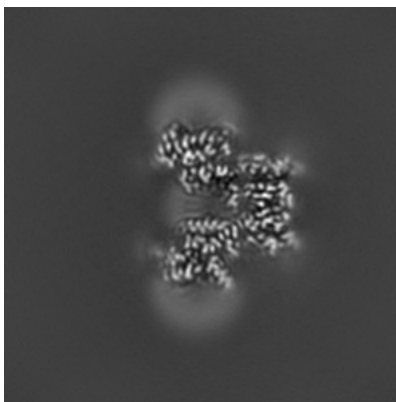


Z Index: 138

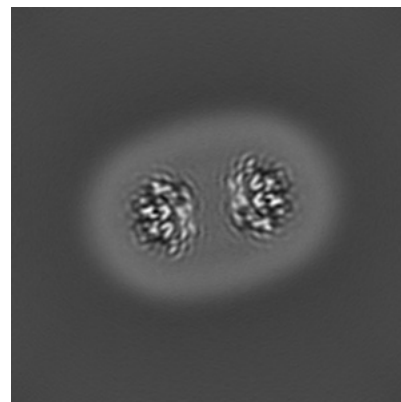
6.3.2 Raw map



X Index: 102



Y Index: 122

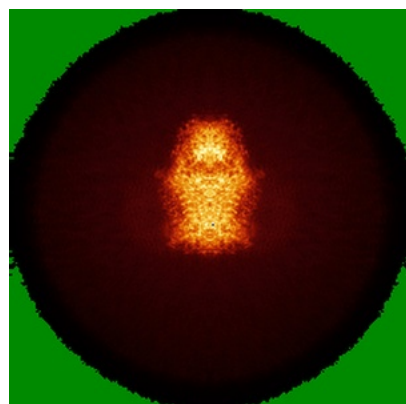


Z Index: 108

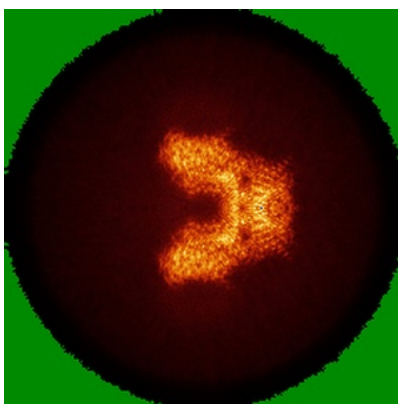
The images above show the largest variance slices of the map in three orthogonal directions.

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

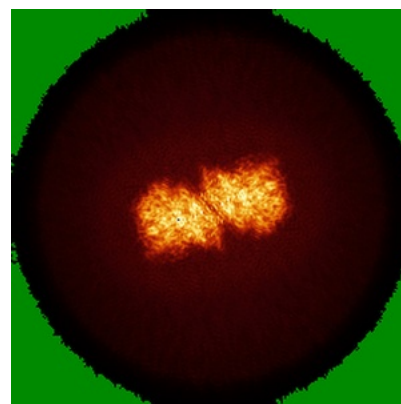
6.4.1 Primary map



X

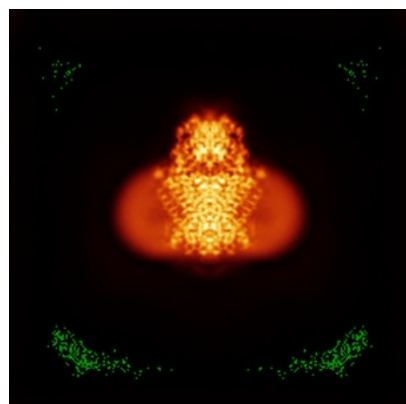


Y

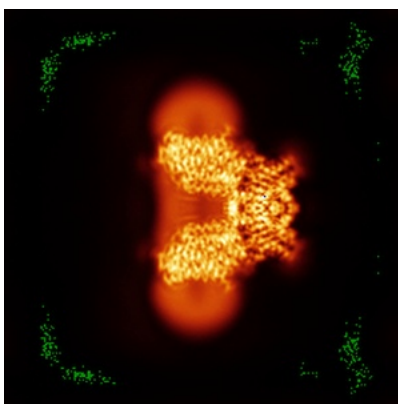


Z

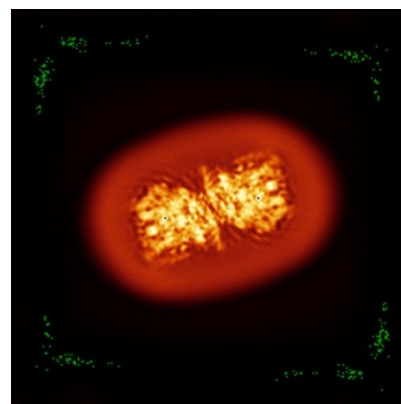
6.4.2 Raw map



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.

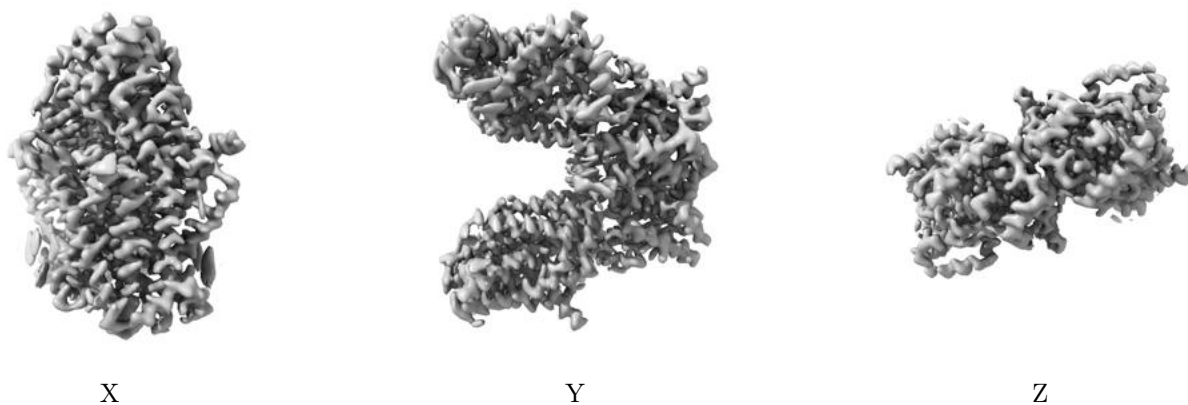
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 1.31. 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.

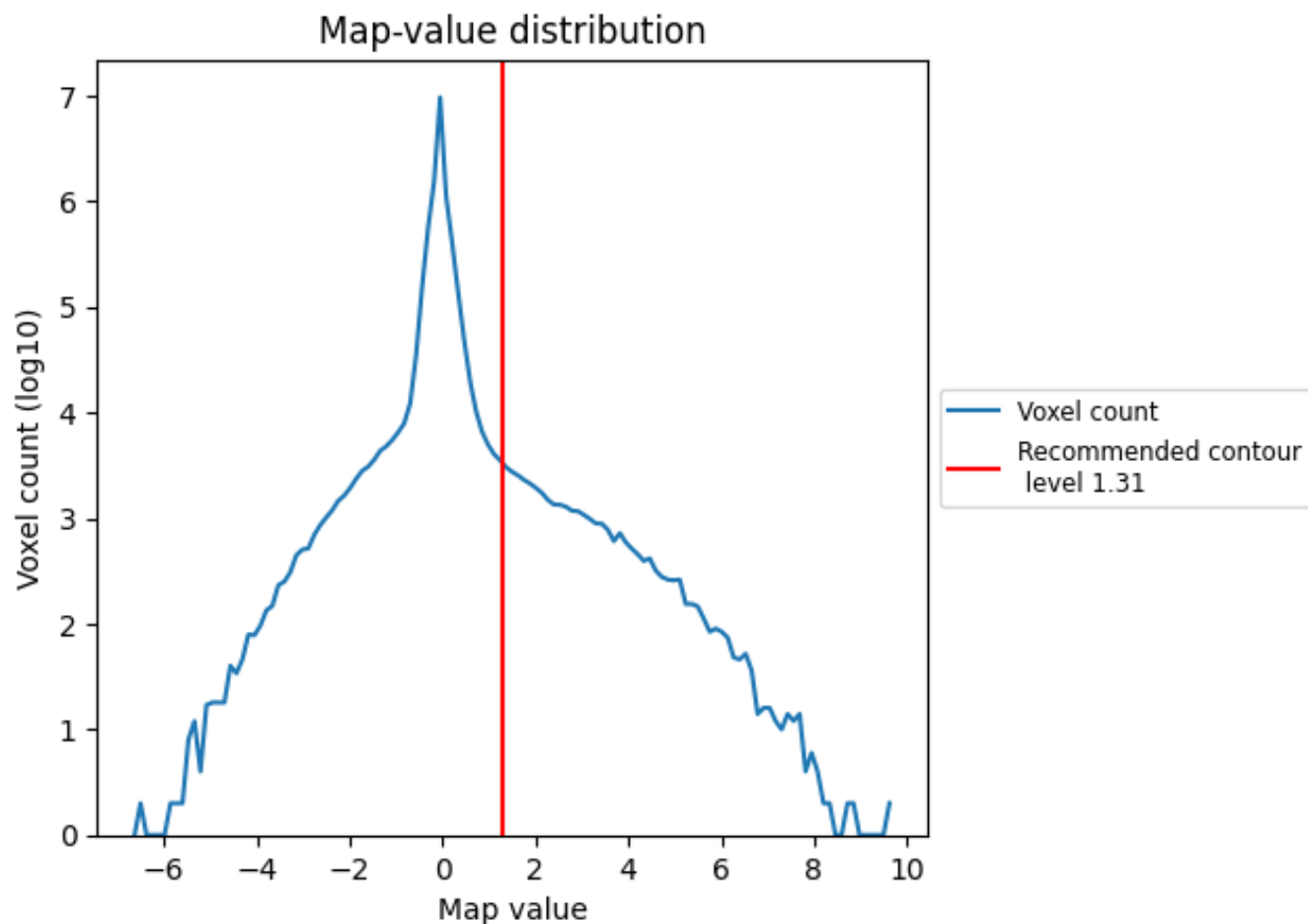
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

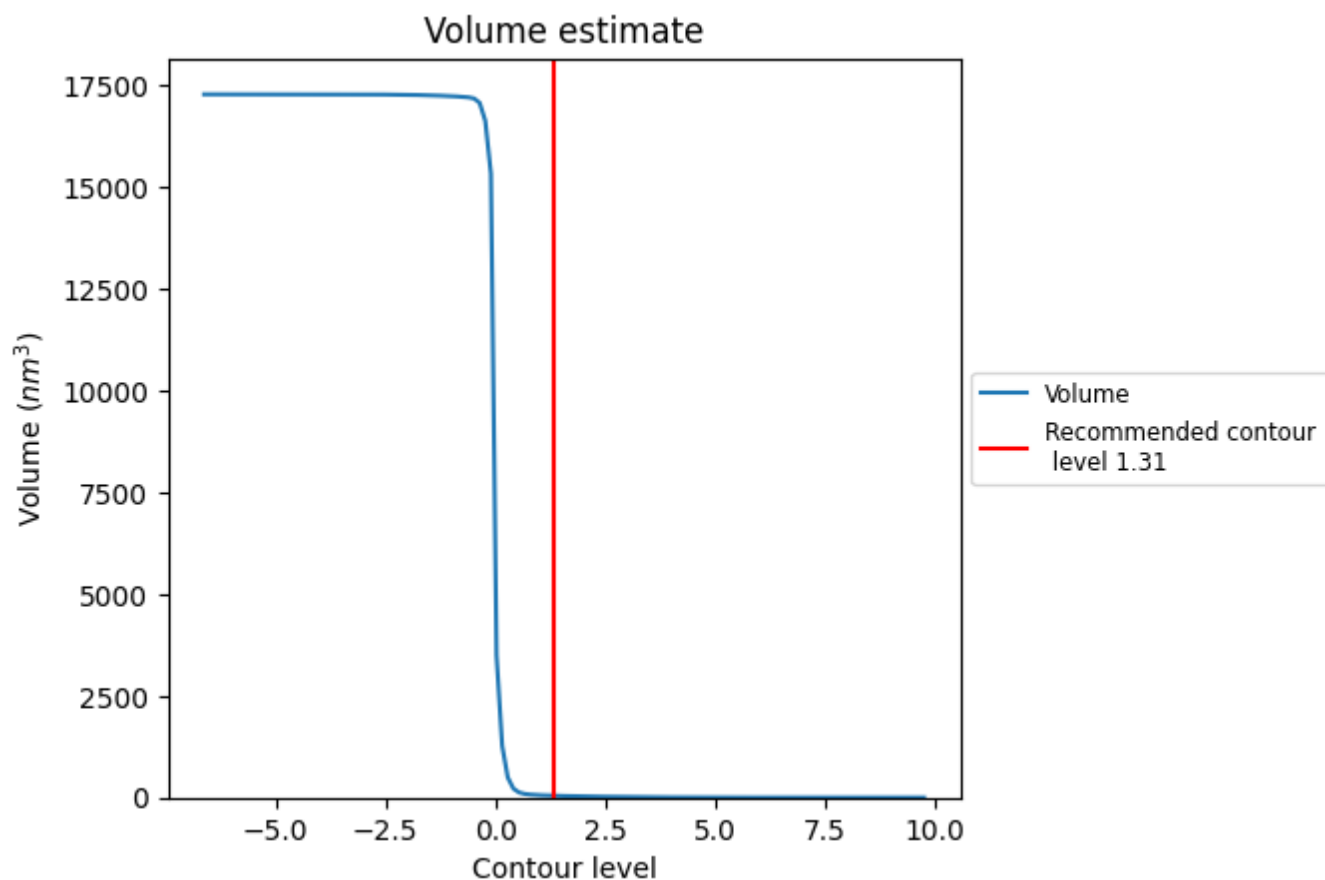
This section contains the results of statistical analysis of the map.

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.

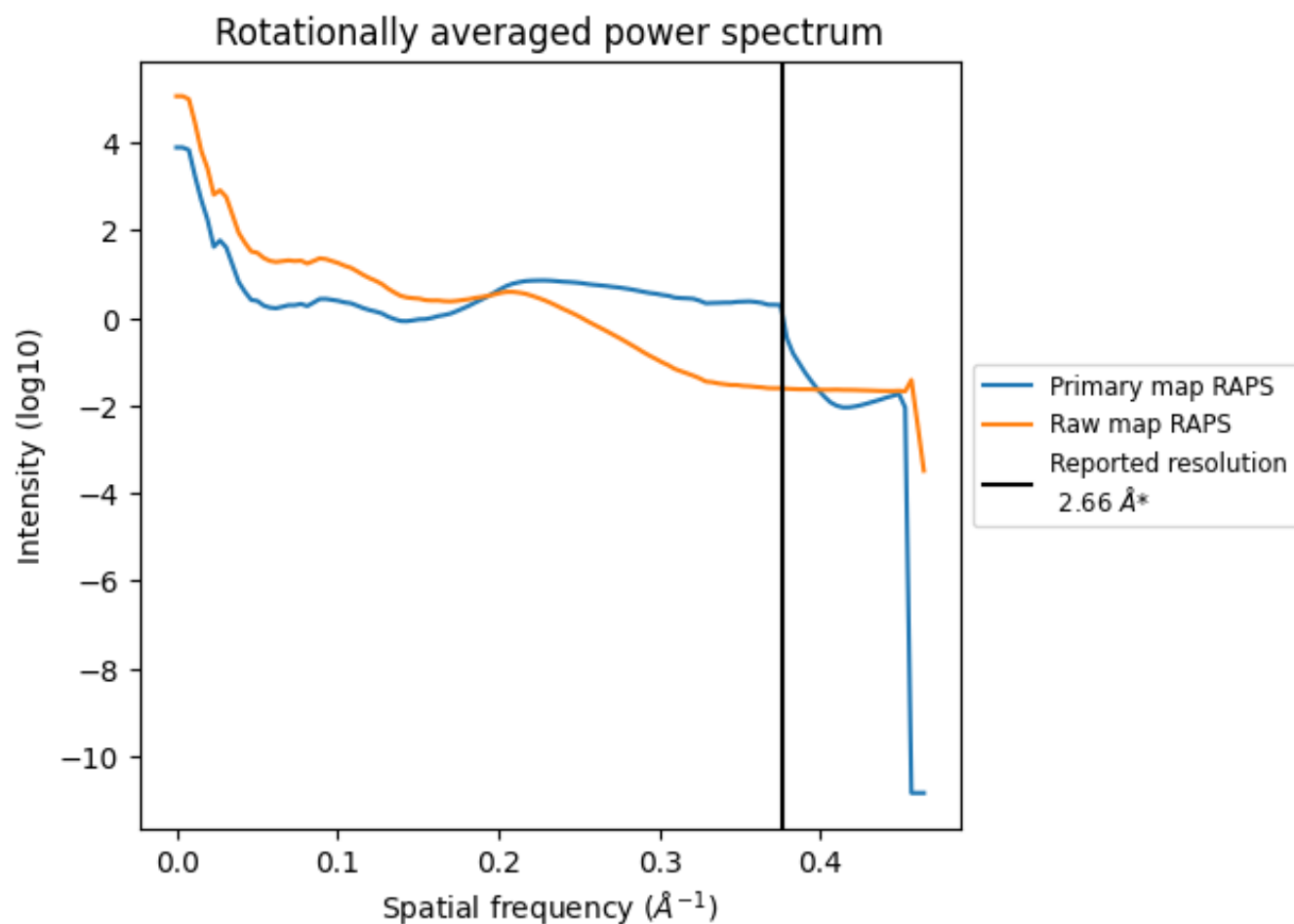
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 46 nm³; this corresponds to an approximate mass of 41 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 ⓘ

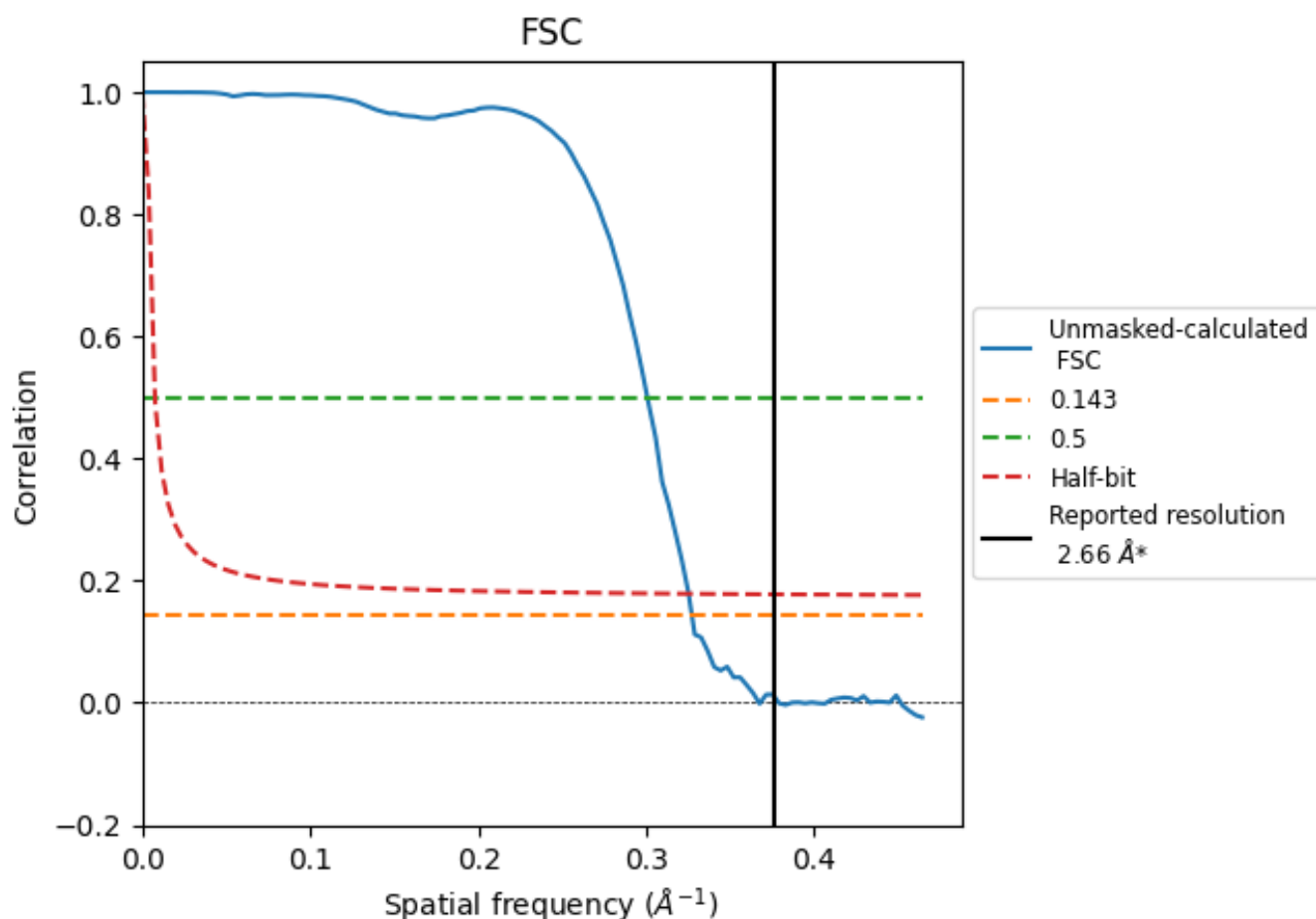


*Reported resolution corresponds to spatial frequency of 0.376 Å⁻¹

8 Fourier-Shell correlation [i](#)

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

8.1 FSC [i](#)



*Reported resolution corresponds to spatial frequency of 0.376 Å⁻¹

8.2 Resolution estimates [i](#)

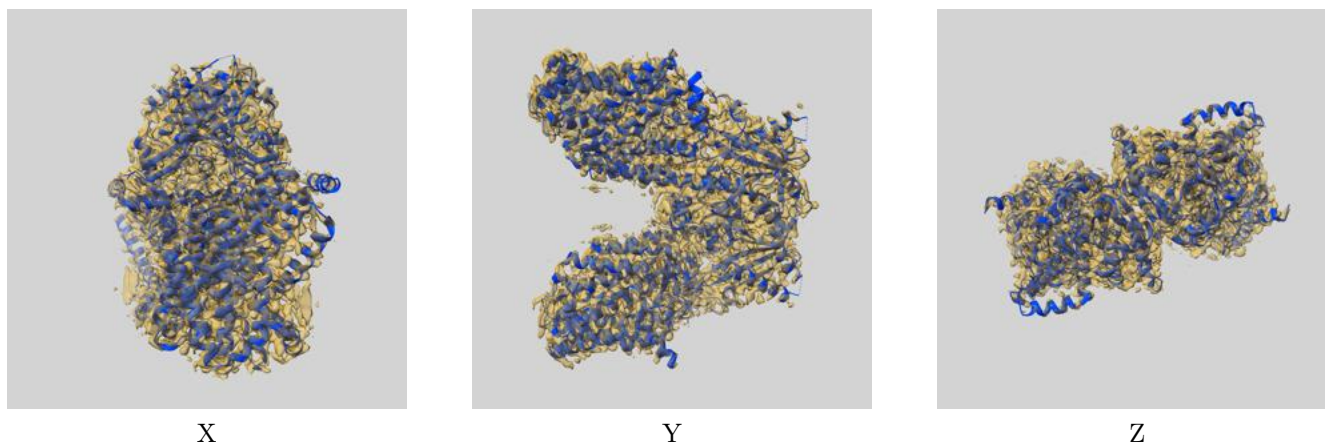
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.66	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	3.06	3.33	3.08

*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 3.06 differs from the reported value 2.66 by more than 10 %

9 Map-model fit [i](#)

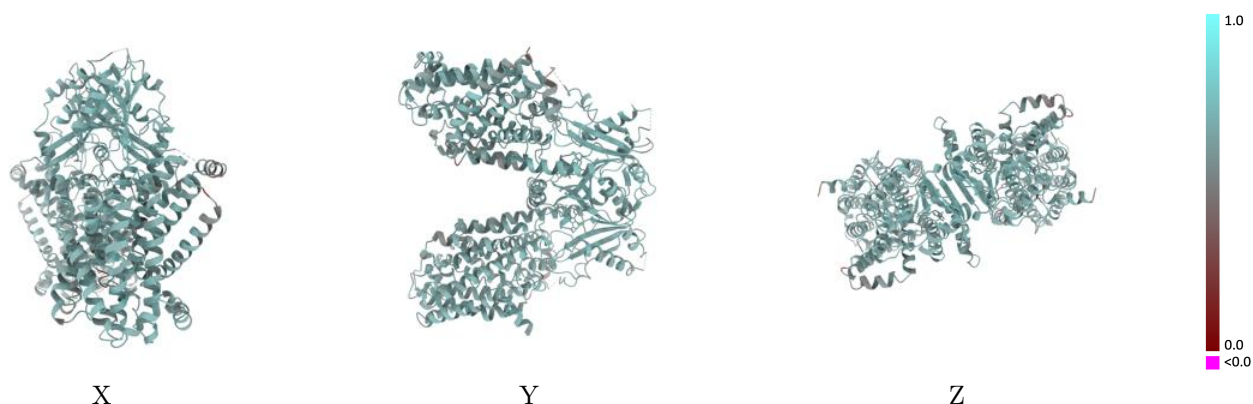
This section contains information regarding the fit between EMDB map EMD-80068 and PDB model 25EX. Per-residue inclusion information can be found in section [3](#) on page [11](#).

9.1 Map-model overlay [i](#)



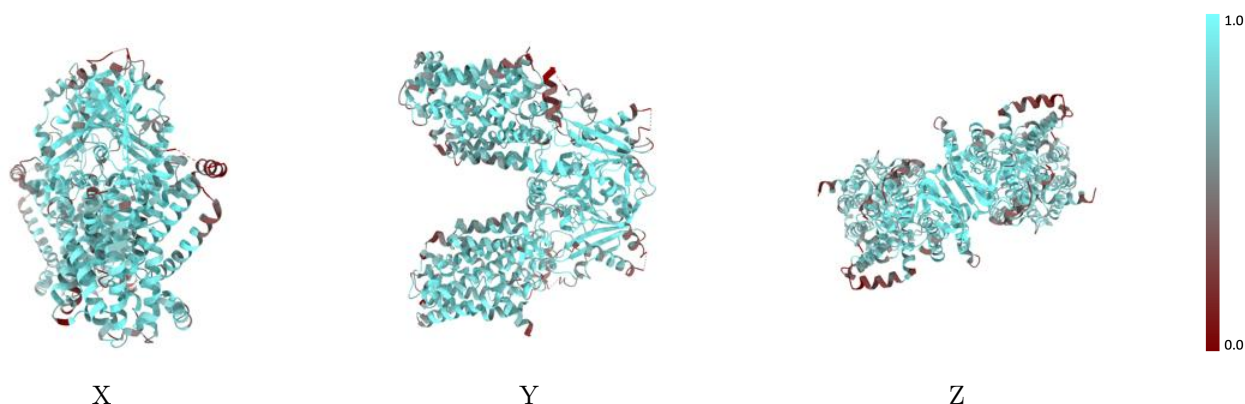
The images above show the 3D surface view of the map at the recommended contour level 1.31 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



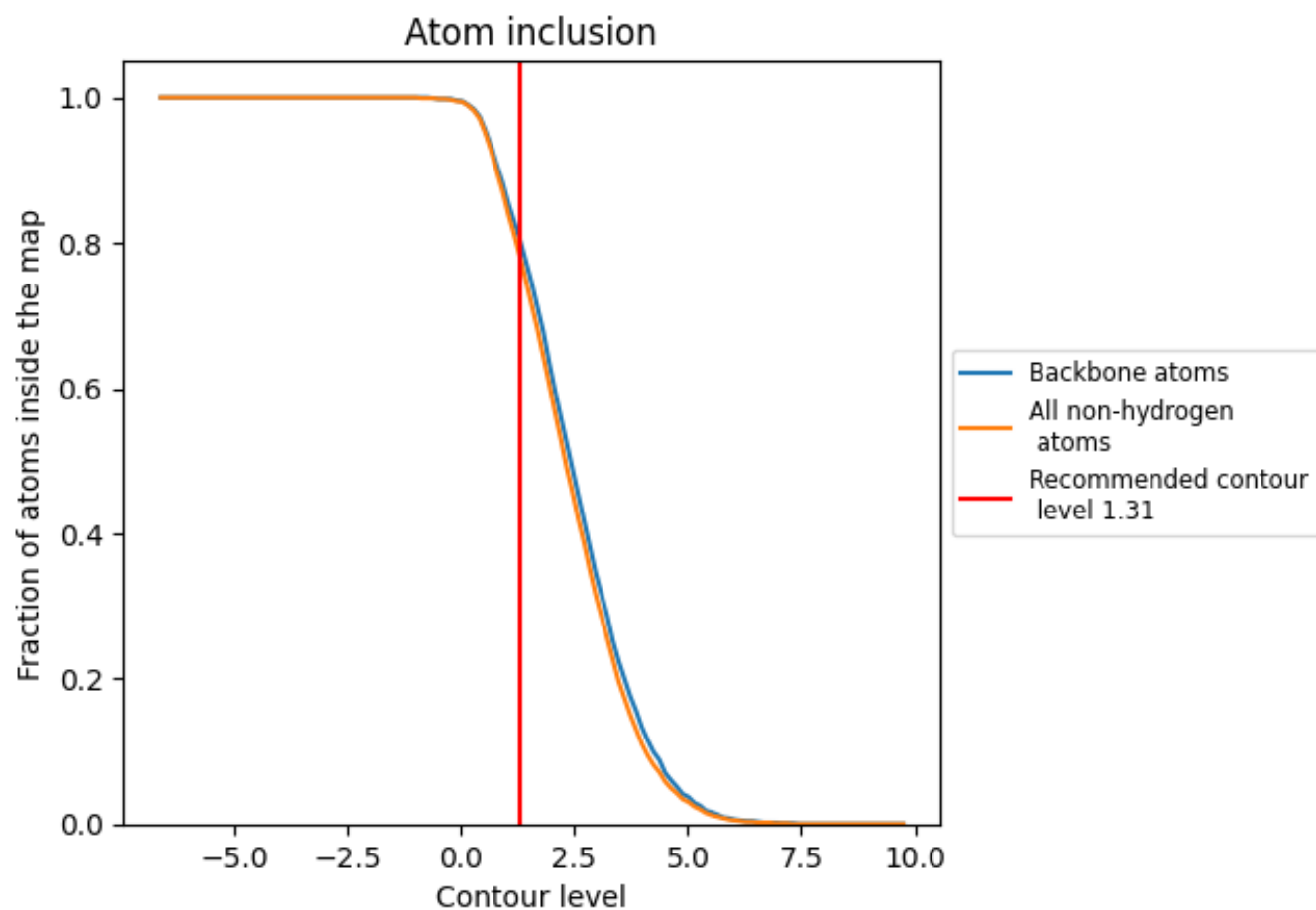
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (1.31).

9.4 Atom inclusion [i](#)



At the recommended contour level, 80% of all backbone atoms, 78% 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 (1.31) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.7800	0.6210
A	0.7850	0.6230
B	0.7800	0.6200

