



Full wwPDB EM Validation Report ⓘ

Jul 28, 2026 – 10:15 AM EDT

PDB ID : 9MJO / pdb_00009mjo
EMDB ID : EMD-48318
Title : Cryo-EM structure of human NBCn2 bound to Carbonate
Authors : Yang, S.; Capper, M.J.; Zilberg, G.; Warren, A.L.; Wacker, D.
Deposited on : 2024-12-16
Resolution : 2.45 Å(reported)

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

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/EMValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

EMDB validation analysis : 0.0.1.dev133
Mogul : 2022.3.0, CSD as543be (2022)
MolProbity : 4-5-2 with Phenix2.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.50

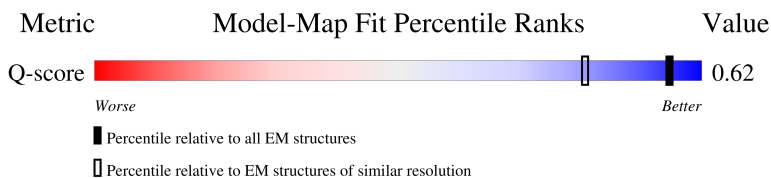
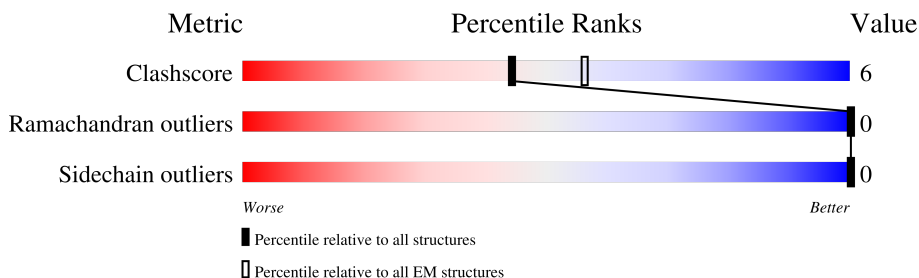
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

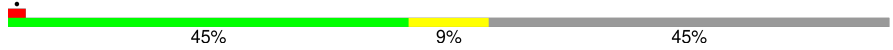
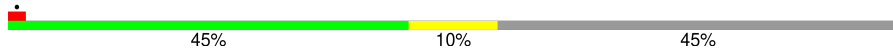
The reported resolution of this entry is 2.45 Å.

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	5931 (1.96 - 2.95)

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	981	
1	B	981	

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 8638 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 Sodium-driven chloride bicarbonate exchanger.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	B	538	Total	C	N	O	S	1	0
			4198	2794	661	708	35		
1	A	538	Total	C	N	O	S	1	0
			4198	2794	661	708	35		

There are 182 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	159	MET	-	initiating methionine	UNP Q6U841
B	?	-	ASN	deletion	UNP Q6U841
B	?	-	ARG	deletion	UNP Q6U841
B	?	-	ILE	deletion	UNP Q6U841
B	?	-	PRO	deletion	UNP Q6U841
B	?	-	ILE	deletion	UNP Q6U841
B	?	-	VAL	deletion	UNP Q6U841
B	?	-	ARG	deletion	UNP Q6U841
B	?	-	SER	deletion	UNP Q6U841
B	?	-	PHE	deletion	UNP Q6U841
B	?	-	ALA	deletion	UNP Q6U841
B	?	-	ASP	deletion	UNP Q6U841
B	?	-	ILE	deletion	UNP Q6U841
B	?	-	GLY	deletion	UNP Q6U841
B	?	-	LYS	deletion	UNP Q6U841
B	?	-	LYS	deletion	UNP Q6U841
B	?	-	GLN	deletion	UNP Q6U841
B	?	-	SER	deletion	UNP Q6U841
B	?	-	GLU	deletion	UNP Q6U841
B	?	-	PRO	deletion	UNP Q6U841
B	?	-	ASN	deletion	UNP Q6U841
B	?	-	SER	deletion	UNP Q6U841
B	?	-	MET	deletion	UNP Q6U841
B	?	-	ASP	deletion	UNP Q6U841
B	?	-	LYS	deletion	UNP Q6U841
B	?	-	ASN	deletion	UNP Q6U841

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Chain	Residue	Modelled	Actual	Comment	Reference
B	?	-	ALA	deletion	UNP Q6U841
B	?	-	GLY	deletion	UNP Q6U841
B	?	-	GLN	deletion	UNP Q6U841
B	?	-	VAL	deletion	UNP Q6U841
B	?	-	VAL	deletion	UNP Q6U841
B	?	-	SER	deletion	UNP Q6U841
B	?	-	PRO	deletion	UNP Q6U841
B	?	-	GLN	deletion	UNP Q6U841
B	?	-	SER	deletion	UNP Q6U841
B	?	-	ALA	deletion	UNP Q6U841
B	?	-	PRO	deletion	UNP Q6U841
B	?	-	ALA	deletion	UNP Q6U841
B	?	-	CYS	deletion	UNP Q6U841
B	?	-	VAL	deletion	UNP Q6U841
B	?	-	GLU	deletion	UNP Q6U841
B	?	-	ASN	deletion	UNP Q6U841
B	?	-	LYS	deletion	UNP Q6U841
B	?	-	ASN	deletion	UNP Q6U841
B	?	-	ASP	deletion	UNP Q6U841
B	?	-	VAL	deletion	UNP Q6U841
B	?	-	SER	deletion	UNP Q6U841
B	?	-	ARG	deletion	UNP Q6U841
B	?	-	GLU	deletion	UNP Q6U841
B	?	-	ASN	deletion	UNP Q6U841
B	?	-	SER	deletion	UNP Q6U841
B	?	-	THR	deletion	UNP Q6U841
B	?	-	VAL	deletion	UNP Q6U841
B	?	-	ASP	deletion	UNP Q6U841
B	?	-	PHE	deletion	UNP Q6U841
B	?	-	SER	deletion	UNP Q6U841
B	?	-	LYS	deletion	UNP Q6U841
B	?	-	GLY	deletion	UNP Q6U841
B	?	-	LEU	deletion	UNP Q6U841
B	?	-	GLY	deletion	UNP Q6U841
B	?	-	GLY	deletion	UNP Q6U841
B	?	-	GLN	deletion	UNP Q6U841
B	?	-	GLN	deletion	UNP Q6U841
B	?	-	LYS	deletion	UNP Q6U841
B	?	-	GLY	deletion	UNP Q6U841
B	?	-	HIS	deletion	UNP Q6U841
B	?	-	THR	deletion	UNP Q6U841
B	?	-	SER	deletion	UNP Q6U841

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Chain	Residue	Modelled	Actual	Comment	Reference
B	?	-	PRO	deletion	UNP Q6U841
B	?	-	CYS	deletion	UNP Q6U841
B	1119	GLY	-	expression tag	UNP Q6U841
B	1120	ARG	-	expression tag	UNP Q6U841
B	1121	PRO	-	expression tag	UNP Q6U841
B	1122	LEU	-	expression tag	UNP Q6U841
B	1123	GLU	-	expression tag	UNP Q6U841
B	1124	VAL	-	expression tag	UNP Q6U841
B	1125	LEU	-	expression tag	UNP Q6U841
B	1126	PHE	-	expression tag	UNP Q6U841
B	1127	GLN	-	expression tag	UNP Q6U841
B	1128	GLY	-	expression tag	UNP Q6U841
B	1129	PRO	-	expression tag	UNP Q6U841
B	1130	HIS	-	expression tag	UNP Q6U841
B	1131	HIS	-	expression tag	UNP Q6U841
B	1132	HIS	-	expression tag	UNP Q6U841
B	1133	HIS	-	expression tag	UNP Q6U841
B	1134	HIS	-	expression tag	UNP Q6U841
B	1135	HIS	-	expression tag	UNP Q6U841
B	1136	HIS	-	expression tag	UNP Q6U841
B	1137	HIS	-	expression tag	UNP Q6U841
B	1138	HIS	-	expression tag	UNP Q6U841
B	1139	HIS	-	expression tag	UNP Q6U841
A	159	MET	-	initiating methionine	UNP Q6U841
A	?	-	ASN	deletion	UNP Q6U841
A	?	-	ARG	deletion	UNP Q6U841
A	?	-	ILE	deletion	UNP Q6U841
A	?	-	PRO	deletion	UNP Q6U841
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A	?	-	VAL	deletion	UNP Q6U841
A	?	-	ARG	deletion	UNP Q6U841
A	?	-	SER	deletion	UNP Q6U841
A	?	-	PHE	deletion	UNP Q6U841
A	?	-	ALA	deletion	UNP Q6U841
A	?	-	ASP	deletion	UNP Q6U841
A	?	-	ILE	deletion	UNP Q6U841
A	?	-	GLY	deletion	UNP Q6U841
A	?	-	LYS	deletion	UNP Q6U841
A	?	-	LYS	deletion	UNP Q6U841
A	?	-	GLN	deletion	UNP Q6U841
A	?	-	SER	deletion	UNP Q6U841
A	?	-	GLU	deletion	UNP Q6U841

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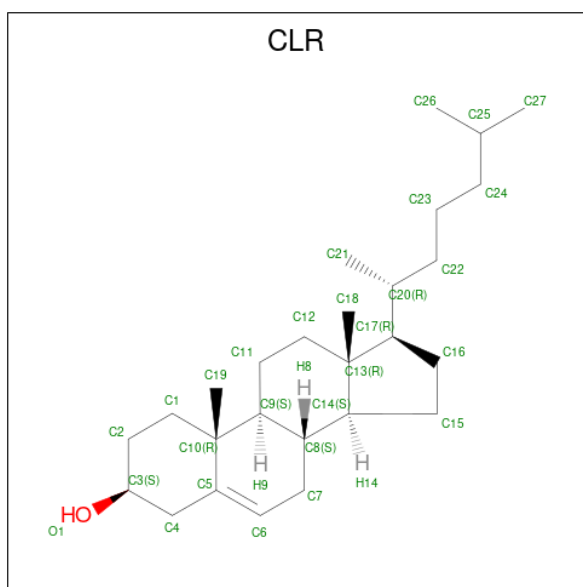
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A	?	-	PRO	deletion	UNP Q6U841
A	?	-	ASN	deletion	UNP Q6U841
A	?	-	SER	deletion	UNP Q6U841
A	?	-	MET	deletion	UNP Q6U841
A	?	-	ASP	deletion	UNP Q6U841
A	?	-	LYS	deletion	UNP Q6U841
A	?	-	ASN	deletion	UNP Q6U841
A	?	-	ALA	deletion	UNP Q6U841
A	?	-	GLY	deletion	UNP Q6U841
A	?	-	GLN	deletion	UNP Q6U841
A	?	-	VAL	deletion	UNP Q6U841
A	?	-	VAL	deletion	UNP Q6U841
A	?	-	SER	deletion	UNP Q6U841
A	?	-	PRO	deletion	UNP Q6U841
A	?	-	GLN	deletion	UNP Q6U841
A	?	-	SER	deletion	UNP Q6U841
A	?	-	ALA	deletion	UNP Q6U841
A	?	-	PRO	deletion	UNP Q6U841
A	?	-	ALA	deletion	UNP Q6U841
A	?	-	CYS	deletion	UNP Q6U841
A	?	-	VAL	deletion	UNP Q6U841
A	?	-	GLU	deletion	UNP Q6U841
A	?	-	ASN	deletion	UNP Q6U841
A	?	-	LYS	deletion	UNP Q6U841
A	?	-	ASN	deletion	UNP Q6U841
A	?	-	ASP	deletion	UNP Q6U841
A	?	-	VAL	deletion	UNP Q6U841
A	?	-	SER	deletion	UNP Q6U841
A	?	-	ARG	deletion	UNP Q6U841
A	?	-	GLU	deletion	UNP Q6U841
A	?	-	ASN	deletion	UNP Q6U841
A	?	-	SER	deletion	UNP Q6U841
A	?	-	THR	deletion	UNP Q6U841
A	?	-	VAL	deletion	UNP Q6U841
A	?	-	ASP	deletion	UNP Q6U841
A	?	-	PHE	deletion	UNP Q6U841
A	?	-	SER	deletion	UNP Q6U841
A	?	-	LYS	deletion	UNP Q6U841
A	?	-	GLY	deletion	UNP Q6U841
A	?	-	LEU	deletion	UNP Q6U841
A	?	-	GLY	deletion	UNP Q6U841
A	?	-	GLY	deletion	UNP Q6U841

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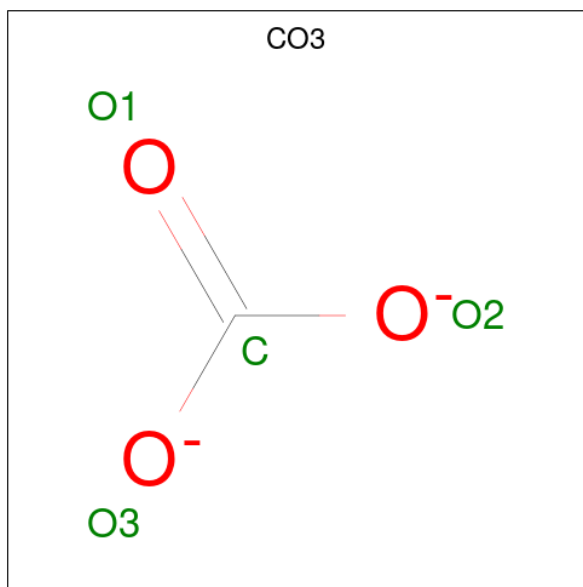
Chain	Residue	Modelled	Actual	Comment	Reference
A	?	-	GLN	deletion	UNP Q6U841
A	?	-	GLN	deletion	UNP Q6U841
A	?	-	LYS	deletion	UNP Q6U841
A	?	-	GLY	deletion	UNP Q6U841
A	?	-	HIS	deletion	UNP Q6U841
A	?	-	THR	deletion	UNP Q6U841
A	?	-	SER	deletion	UNP Q6U841
A	?	-	PRO	deletion	UNP Q6U841
A	?	-	CYS	deletion	UNP Q6U841
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A	1120	ARG	-	expression tag	UNP Q6U841
A	1121	PRO	-	expression tag	UNP Q6U841
A	1122	LEU	-	expression tag	UNP Q6U841
A	1123	GLU	-	expression tag	UNP Q6U841
A	1124	VAL	-	expression tag	UNP Q6U841
A	1125	LEU	-	expression tag	UNP Q6U841
A	1126	PHE	-	expression tag	UNP Q6U841
A	1127	GLN	-	expression tag	UNP Q6U841
A	1128	GLY	-	expression tag	UNP Q6U841
A	1129	PRO	-	expression tag	UNP Q6U841
A	1130	HIS	-	expression tag	UNP Q6U841
A	1131	HIS	-	expression tag	UNP Q6U841
A	1132	HIS	-	expression tag	UNP Q6U841
A	1133	HIS	-	expression tag	UNP Q6U841
A	1134	HIS	-	expression tag	UNP Q6U841
A	1135	HIS	-	expression tag	UNP Q6U841
A	1136	HIS	-	expression tag	UNP Q6U841
A	1137	HIS	-	expression tag	UNP Q6U841
A	1138	HIS	-	expression tag	UNP Q6U841
A	1139	HIS	-	expression tag	UNP Q6U841

- Molecule 2 is CHOLESTEROL (CCD ID: CLR) (formula: C₂₇H₄₆O).



Mol	Chain	Residues	Atoms			AltConf
2	B	1	Total	C	O	0
			28	27	1	
2	B	1	Total	C	O	0
			28	27	1	
2	B	1	Total	C	O	0
			28	27	1	
2	B	1	Total	C	O	0
			28	27	1	
2	A	1	Total	C	O	0
			28	27	1	
2	A	1	Total	C	O	0
			28	27	1	
2	A	1	Total	C	O	0
			28	27	1	

- Molecule 3 is CARBONATE ION (CCD ID: CO3) (formula: CO₃).



Mol	Chain	Residues	Atoms			AltConf
3	B	1	Total	C	O	0
			4	1	3	
3	A	1	Total	C	O	0
			4	1	3	

- Molecule 4 is SODIUM ION (CCD ID: NA) (formula: Na).

Mol	Chain	Residues	Atoms		AltConf
4	B	2	Total	Na	0
			2	2	
4	A	2	Total	Na	0
			2	2	

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		AltConf
5	B	3	Total	O	0
			3	3	
5	A	3	Total	O	0
			3	3	



MET	THR	M1039	V879	F733	I606	THR	ALA	L476	ARG	LEU	VAL
SER	ALA	P1040	W737	V737	E626	ALA	ALA	Q477	HIS	GLU	PHE
ASP	ASN	K1044	S892	T738	E632	HIS	HIS	R478	ARG	GLY	ARG
THR	SER	K1045	L739	L739	E642	GLY	GLY	T479	THR	TRP	ASP
PRO	LYS	LYS	V765	V765	E646	ALA	ALA	R481	PRO	LYS	SER
ASP	LEU	LEU	T768	T768	L659	GLU	PRO	I482	VAL	ALA	GLN
LYS	GLU	GLU	V773	V773	O667	GLY	ALA	F483	ARG	THR	VAL
ALA	ASP	ASP	L774	L774	E671	GLY	GLY	I487	HIS	LEU	ALA
GLU	PRO	PRO	L775	L775	P672	HIS	GLY	R492	LEU	THR	THR
PRO	LYS	LYS	I775	I775	ASN	ASN	GLU	D500	ASN	LEU	GLY
LYS	GLU	GLU	I779	I779	PRO	PRO	GLU	F513	PRO	GLY	ASP
GLU	GLU	GLU	G780	G780	SER	SER	THR	L514	GLY	ASP	GLY
GLN	GLN	GLN	R910	R910	ASN	ASN	LEU	F515	LEU	GLN	THR
SER	SER	SER	M915	M915	THR	THR	GLY	S522	ALA	ARG	PRO
MET	MET	MET	L919	L919	LEU	LEU	THR	F527	VAL	GLY	LEU
LEU	LEU	LEU	R796	R796	LYS	LYS	LEU	G528	PRO	PRO	ASP
GLY	GLY	GLY	R799	R799	TRP	TRP	GLY	R538	LYS	GLY	GLY
ASP	ASP	ASP	P810	P810	ARG	ARG	GLU	A541	ASN	GLN	LYS
GLY	GLY	GLY	W811	W811	GLU	GLU	ASN	T551	VAL	TYR	LYS
THR	THR	THR	T812	T812	ILE	ILE	ILE	G560	PRO	HIS	ILE
VAL	VAL	VAL	T813	T813	SER	SER	ALA	L566	SER	GLU	ALA
GLN	GLN	GLN	V814	V814	ASP	ASP	SER	L573	ILE	ILE	ALA
LEU	LEU	LEU	I815	I815	ILE	ILE	ILE	E576	PRO	THR	ASN
PRO	PRO	PRO	I818	I818	W695	W695	ASP	R594	ALA	LEU	LEU
HIS	HIS	HIS	L822	L822	E696	E696	ASP	Y590	VAL	MET	THR
HIS	HIS	HIS	T825	T825	L698	L698	ILE	R594	PRO	ASP	GLY
HIS	HIS	HIS	I826	I826	K704	K704	ILE	VAL	ASN	GLY	VAL
HIS	HIS	HIS	L827	L827	S705	S705	ILE	GLY	GLY	ARG	GLY
ARG	ARG	ARG	E843	E843	L706	L706	ILE	LYS	ALA	ALA	ASP
ASP	ASP	ASP	K848	K848	H707	H707	ILE	ASN	GLY	GLY	GLY
ASP	ASP	ASP	C850	C850	G716	G716	ILE	LYS	THR	THR	ASP
PRO	PRO	PRO	D855	D855	H717	H717	ILE	ARG	SER	SER	ASP
SER	SER	SER	L856	L856	D718	D718	ILE	GLY	GLY	GLY	GLY
VAL	VAL	VAL	L857	L857	H719	H719	ILE	THR	THR	THR	GLY
ILE	ILE	ILE	V861	V861	P720	P720	ILE	VAL	VAL	VAL	VAL
ASN	ASN	ASN	M862	M862	Y721	Y721	ILE	ASN	ASN	ASN	ASN
ILE	ILE	ILE	S867	S867	V725	V725	ILE	VAL	VAL	VAL	VAL
ILE	ILE	ILE	G870	G870	V730	V730	ILE	GLY	GLY	GLY	GLY
SER	SER	SER	W873	W873			ILE	GLY	GLY	GLY	GLY
LYS	LYS	LYS	F874	F874			ILE	GLY	GLY	GLY	GLY
THR	THR	THR	V875	V875			ILE	GLY	GLY	GLY	GLY
ALA	ALA	ALA	A876	A876			ILE	GLY	GLY	GLY	GLY
LEU	LEU	LEU					ILE	GLY	GLY	GLY	GLY
TRP	TRP	TRP					ILE	GLY	GLY	GLY	GLY
ARG	ARG	ARG					ILE	GLY	GLY	GLY	GLY
ASN	ASN	ASN					ILE	GLY	GLY	GLY	GLY
LEU	LEU	LEU					ILE	GLY	GLY	GLY	GLY
LEU	LEU	LEU					ILE	GLY	GLY	GLY	GLY
ILE	ILE	ILE					ILE	GLY	GLY	GLY	GLY

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C2	Depositor
Number of particles used	291402	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 ($e^-/\text{\AA}^2$)	50.0	Depositor
Minimum defocus (nm)	500	Depositor
Maximum defocus (nm)	1800	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	0.646	Depositor
Minimum map value	-0.546	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.011	Depositor
Recommended contour level	0.086	Depositor
Map size (Å)	330.0, 330.0, 330.0	wwPDB
Map dimensions	400, 400, 400	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.825, 0.825, 0.825	Depositor

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: CO3, CLR, NA

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	0.23	0/4309	0.38	0/5855
1	B	0.23	0/4309	0.38	0/5855
All	All	0.23	0/8618	0.38	0/11710

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 [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	4198	0	4293	57	0
1	B	4198	0	4293	58	0
2	A	112	0	184	6	0
2	B	112	0	184	6	0
3	A	4	0	0	0	0
3	B	4	0	0	0	0
4	A	2	0	0	0	0
4	B	2	0	0	0	0
5	A	3	0	0	0	0
5	B	3	0	0	0	0
All	All	8638	0	8954	113	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 (113) 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:A:500:ASP:HB3	1:A:910:ARG:HG2	1.65	0.79
1:B:500:ASP:HB3	1:B:910:ARG:HG2	1.65	0.76
1:B:522:SER:HB3	1:B:942:PHE:HZ	1.54	0.72
1:A:522:SER:HB3	1:A:942:PHE:HZ	1.54	0.71
1:B:843:GLU:HG3	1:B:1040:PRO:HB3	1.74	0.69
1:A:843:GLU:HG3	1:A:1040:PRO:HB3	1.74	0.68
1:B:479:THR:HG22	1:B:481:ARG:H	1.58	0.67
1:A:479:THR:HG22	1:A:481:ARG:H	1.58	0.67
1:B:626:GLU:HG2	1:B:953:ILE:HG23	1.77	0.67
1:A:626:GLU:HG2	1:A:953:ILE:HG23	1.77	0.64
1:A:642:GLU:O	1:A:646:GLU:HG3	1.98	0.63
1:B:642:GLU:O	1:B:646:GLU:HG3	1.99	0.63
1:B:576:GLU:OE1	1:B:590:TYR:OH	2.15	0.62
1:A:943:LEU:HD21	2:A:1202:CLR:H182	1.83	0.60
1:A:576:GLU:OE1	1:A:590:TYR:OH	2.15	0.60
1:B:943:LEU:HD21	2:B:1202:CLR:H182	1.83	0.59
1:B:827:LEU:HD22	1:B:1010:PRO:HG2	1.85	0.58
1:A:827:LEU:HD22	1:A:1010:PRO:HG2	1.85	0.57
1:A:848:LYS:NZ	1:A:908:GLU:O	2.37	0.56
1:A:522:SER:HB2	1:A:938:LEU:HD13	1.87	0.56
1:B:737:VAL:HG21	1:B:943:LEU:HD23	1.88	0.56
1:A:773:VAL:HG22	1:A:934:PRO:HD2	1.86	0.56
1:B:848:LYS:NZ	1:B:908:GLU:O	2.37	0.56
1:B:773:VAL:HG22	1:B:934:PRO:HD2	1.86	0.56
1:A:737:VAL:HG21	1:A:943:LEU:HD23	1.88	0.55
1:B:522:SER:HB2	1:B:938:LEU:HD13	1.87	0.55
1:A:739:LEU:HB3	1:A:768:THR:HG23	1.91	0.53
1:A:972:PHE:HB2	1:A:975:LEU:HD12	1.91	0.53
1:B:551:THR:HG22	1:B:566:LEU:HD12	1.91	0.53
1:B:739:LEU:HB3	1:B:768:THR:HG23	1.91	0.52
1:A:632:ILE:HG22	1:A:879:VAL:HG23	1.91	0.52
1:B:606:ILE:HD13	2:B:1201:CLR:H162	1.92	0.52
1:B:779:ILE:HD12	2:A:1203:CLR:H11	1.92	0.52
1:B:632:ILE:HG22	1:B:879:VAL:HG23	1.90	0.52
1:A:606:ILE:HD13	2:A:1201:CLR:H162	1.92	0.52
1:A:551:THR:HG22	1:A:566:LEU:HD12	1.91	0.51
1:B:972:PHE:HB2	1:B:975:LEU:HD12	1.91	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:1203:CLR:H11	1:A:779:ILE:HD12	1.92	0.50
1:A:716:GLY:HA3	1:A:721:TYR:CZ	2.46	0.50
1:B:716:GLY:HA3	1:B:721:TYR:CZ	2.46	0.50
1:A:667:CYS:SG	1:A:720:PRO:HB3	2.52	0.50
1:A:861:VAL:HG12	1:A:862:MET:HE2	1.94	0.50
1:B:667:CYS:SG	1:B:720:PRO:HB3	2.52	0.50
1:B:775:ILE:O	1:B:779:ILE:HG12	2.12	0.49
1:A:775:ILE:O	1:A:779:ILE:HG12	2.12	0.49
1:B:861:VAL:HG12	1:B:862:MET:HE2	1.94	0.49
1:B:867:SER:OG	1:B:873:TRP:NE1	2.47	0.48
1:B:659:LEU:HD11	1:A:725:VAL:HG21	1.96	0.48
1:B:492:ARG:NH1	1:B:850:CYS:O	2.48	0.47
1:A:492:ARG:NH1	1:A:850:CYS:O	2.47	0.47
1:A:923:SER:HA	1:A:926:MET:HE2	1.97	0.47
1:B:725:VAL:HG21	1:A:659:LEU:HD11	1.96	0.47
1:A:822:LEU:O	1:A:825:THR:HG22	2.15	0.47
1:A:961:LEU:HD21	1:A:975:LEU:HD21	1.97	0.47
1:A:867:SER:OG	1:A:873:TRP:NE1	2.47	0.46
1:B:923:SER:HA	1:B:926:MET:HE2	1.97	0.46
1:B:698:LEU:HD11	1:B:706:LEU:HD22	1.98	0.46
1:A:788:VAL:HB	1:A:927:THR:HG22	1.97	0.46
1:B:1007:ILE:HG23	1:B:1008:VAL:HG13	1.97	0.46
1:A:1039:MET:HE3	1:A:1044:LYS:HE3	1.97	0.46
1:B:822:LEU:O	1:B:825:THR:HG22	2.15	0.46
1:A:698:LEU:HD11	1:A:706:LEU:HD22	1.98	0.46
1:B:857:LEU:HD11	2:B:1201:CLR:H181	1.98	0.46
1:A:1007:ILE:HG23	1:A:1008:VAL:HG13	1.97	0.45
1:B:513:PHE:CE1	1:B:915:MET:HB3	2.51	0.45
1:B:788:VAL:HB	1:B:927:THR:HG22	1.97	0.45
1:B:1039:MET:HE3	1:B:1044:LYS:HE3	1.97	0.45
1:B:810:PRO:HG2	1:B:813:THR:HG23	1.98	0.45
1:B:961:LEU:HD21	1:B:975:LEU:HD21	1.97	0.45
1:A:733:PHE:O	1:A:737:VAL:HG23	2.17	0.45
1:A:483:PHE:O	1:A:487:ILE:HG12	2.17	0.45
1:B:733:PHE:O	1:B:737:VAL:HG23	2.17	0.45
1:A:799:ARG:NH2	1:A:870:GLY:O	2.50	0.45
1:B:483:PHE:O	1:B:487:ILE:HG12	2.17	0.44
1:B:527:PHE:CE2	1:B:573:LEU:HB2	2.52	0.44
1:A:527:PHE:CE2	1:A:573:LEU:HB2	2.52	0.44
1:A:857:LEU:HD11	2:A:1201:CLR:H181	1.98	0.44
1:B:551:THR:HG21	1:B:874:PHE:HB2	2.00	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:560:GLY:N	1:B:855:ASP:OD2	2.49	0.44
1:B:799:ARG:NH2	1:B:870:GLY:O	2.50	0.44
1:B:919:LEU:HD23	2:B:1204:CLR:H261	1.98	0.44
1:A:513:PHE:CE1	1:A:915:MET:HB3	2.52	0.44
1:A:560:GLY:N	1:A:855:ASP:OD2	2.49	0.44
1:A:515:PHE:CE1	1:A:765:VAL:HG11	2.53	0.44
1:A:919:LEU:HD23	2:A:1204:CLR:H261	1.98	0.44
1:A:551:THR:HG21	1:A:874:PHE:HB2	2.00	0.44
1:A:730:VAL:HG11	2:A:1203:CLR:H181	1.99	0.44
1:B:515:PHE:CE1	1:B:765:VAL:HG11	2.53	0.44
1:B:730:VAL:HG11	2:B:1203:CLR:H181	1.99	0.44
1:A:810:PRO:HG2	1:A:813:THR:HG23	1.98	0.43
1:A:815:ILE:O	1:A:818:ILE:HG22	2.18	0.43
1:A:958:ARG:NH2	1:A:990:GLN:OE1	2.52	0.43
1:B:958:ARG:NH2	1:B:990:GLN:OE1	2.52	0.42
1:B:815:ILE:O	1:B:818:ILE:HG22	2.18	0.42
1:B:528:GLY:HA3	1:B:541:ALA:HA	2.02	0.42
1:B:962:PHE:HZ	1:B:988:ILE:HG13	1.85	0.41
1:B:538:ARG:HA	1:B:796:ARG:HG3	2.02	0.41
1:A:538:ARG:HA	1:A:796:ARG:HG3	2.01	0.41
1:A:528:GLY:HA3	1:A:541:ALA:HA	2.02	0.41
1:B:744:LYS:HD3	1:B:744:LYS:HA	1.93	0.41
1:A:590:TYR:O	1:A:594:ARG:HB2	2.21	0.41
1:B:590:TYR:O	1:B:594:ARG:HB2	2.21	0.41
1:A:962:PHE:HZ	1:A:988:ILE:HG13	1.85	0.41
1:A:779:ILE:HG22	1:A:781:ILE:HG12	2.03	0.41
1:B:779:ILE:HG22	1:B:781:ILE:HG12	2.03	0.40
1:B:875:VAL:HG22	1:B:876:ALA:H	1.85	0.40
1:A:527:PHE:HE2	1:A:573:LEU:HB2	1.86	0.40
1:A:875:VAL:HG22	1:A:876:ALA:H	1.85	0.40
1:B:521:MET:HE1	1:B:923:SER:OG	2.22	0.40
1:A:848:LYS:HD2	1:A:908:GLU:HG3	2.03	0.40
1:B:527:PHE:HE2	1:B:573:LEU:HB2	1.87	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	531/981 (54%)	520 (98%)	11 (2%)	0	100	100
1	B	531/981 (54%)	520 (98%)	11 (2%)	0	100	100
All	All	1062/1962 (54%)	1040 (98%)	22 (2%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	456/865 (53%)	456 (100%)	0	100	100
1	B	456/865 (53%)	456 (100%)	0	100	100
All	All	912/1730 (53%)	912 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	656	HIS
1	B	664	GLN
1	B	984	HIS
1	A	656	HIS
1	A	664	GLN
1	A	984	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 14 ligands modelled in this entry, 4 are monoatomic - leaving 10 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	CLR	B	1204	-	31,31,31	0.27	0	48,48,48	0.39	0
2	CLR	A	1202	-	31,31,31	0.30	0	48,48,48	0.43	0
2	CLR	A	1203	-	31,31,31	0.28	0	48,48,48	0.39	0
3	CO3	A	1205	4	3,3,3	0.80	0	2,3,3	0.11	0
2	CLR	A	1204	-	31,31,31	0.28	0	48,48,48	0.39	0
2	CLR	B	1203	-	31,31,31	0.29	0	48,48,48	0.39	0
2	CLR	A	1201	-	31,31,31	0.30	0	48,48,48	0.38	0
3	CO3	B	1205	4	3,3,3	0.81	0	2,3,3	0.12	0
2	CLR	B	1202	-	31,31,31	0.31	0	48,48,48	0.43	0
2	CLR	B	1201	-	31,31,31	0.29	0	48,48,48	0.38	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
2	CLR	B	1204	-	-	4/10/68/68	0/4/4/4
2	CLR	A	1202	-	-	0/10/68/68	0/4/4/4
2	CLR	A	1203	-	-	1/10/68/68	0/4/4/4
2	CLR	A	1204	-	-	4/10/68/68	0/4/4/4
2	CLR	B	1203	-	-	1/10/68/68	0/4/4/4
2	CLR	A	1201	-	-	1/10/68/68	0/4/4/4
2	CLR	B	1202	-	-	0/10/68/68	0/4/4/4
2	CLR	B	1201	-	-	1/10/68/68	0/4/4/4

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (12) torsion outliers are listed below:

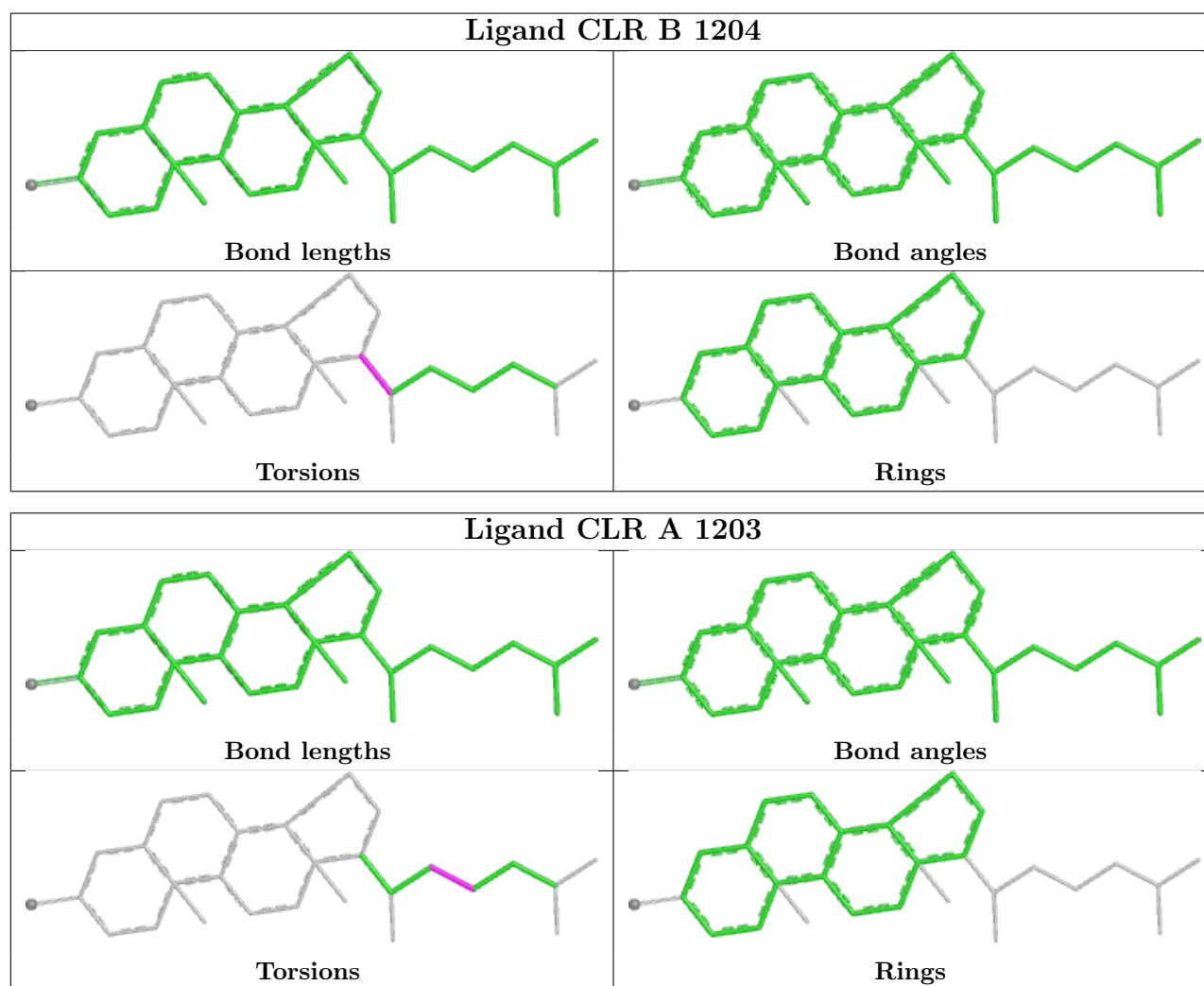
Mol	Chain	Res	Type	Atoms
2	B	1204	CLR	C13-C17-C20-C21
2	A	1204	CLR	C13-C17-C20-C21
2	B	1204	CLR	C13-C17-C20-C22
2	A	1204	CLR	C13-C17-C20-C22
2	B	1204	CLR	C16-C17-C20-C21
2	A	1204	CLR	C16-C17-C20-C21
2	B	1204	CLR	C16-C17-C20-C22
2	A	1204	CLR	C16-C17-C20-C22
2	B	1203	CLR	C20-C22-C23-C24
2	A	1203	CLR	C20-C22-C23-C24
2	B	1201	CLR	C16-C17-C20-C22
2	A	1201	CLR	C16-C17-C20-C22

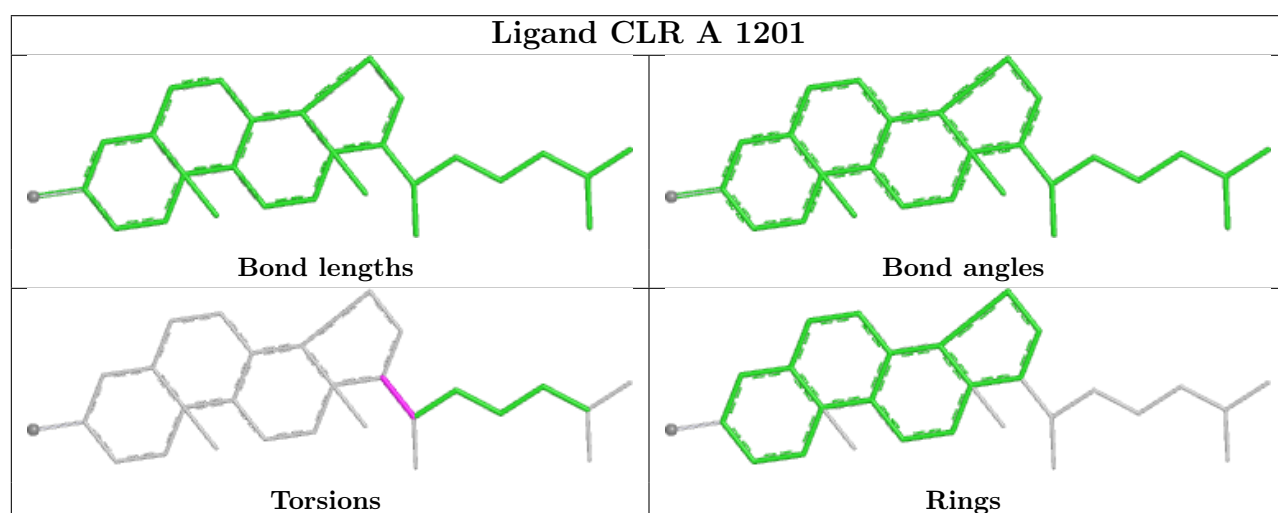
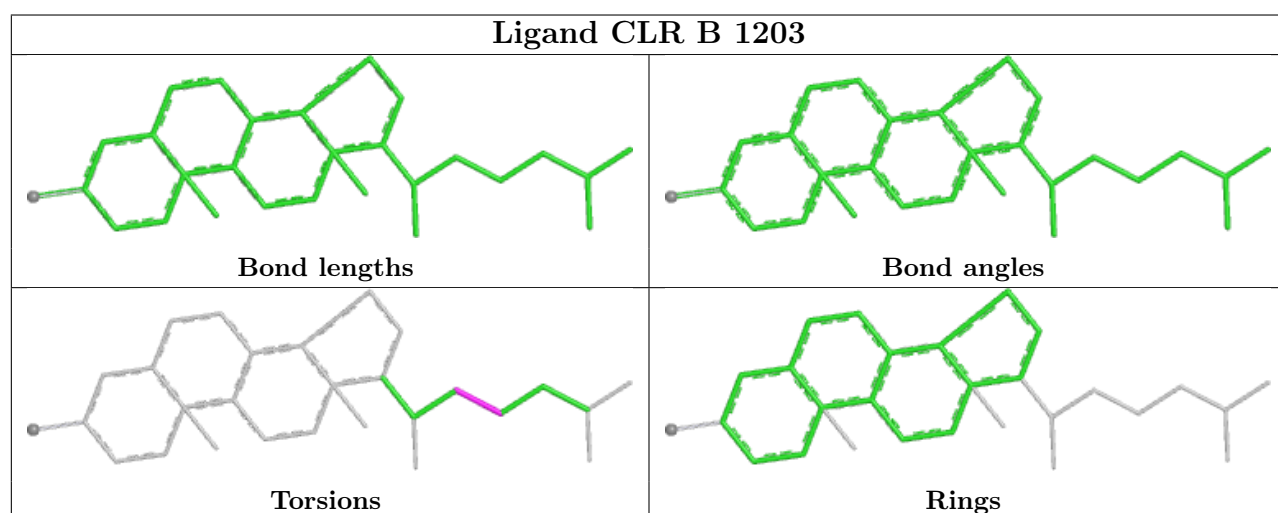
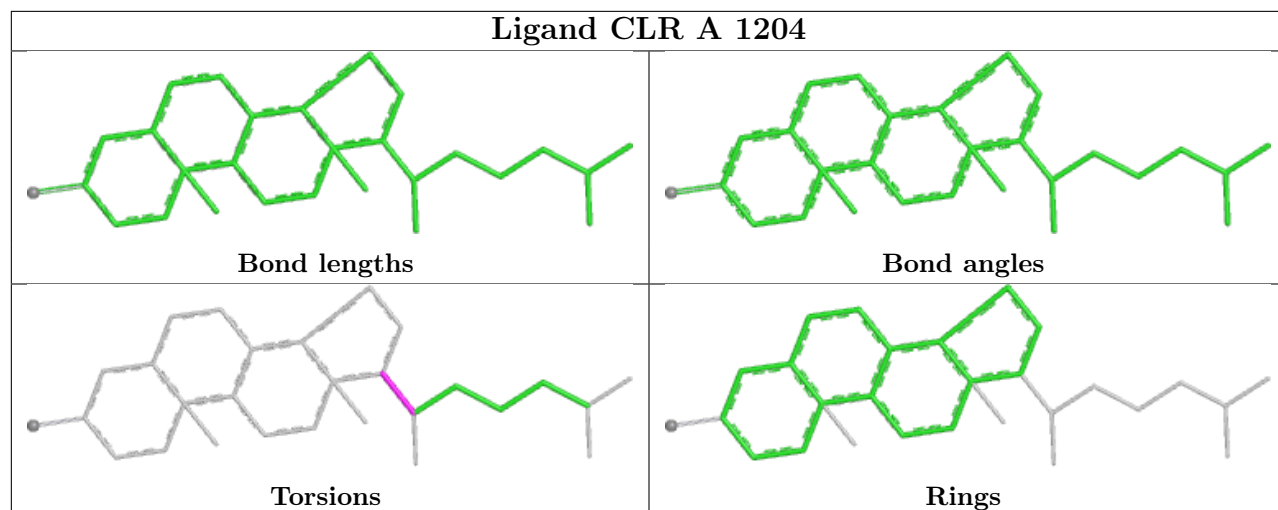
There are no ring outliers.

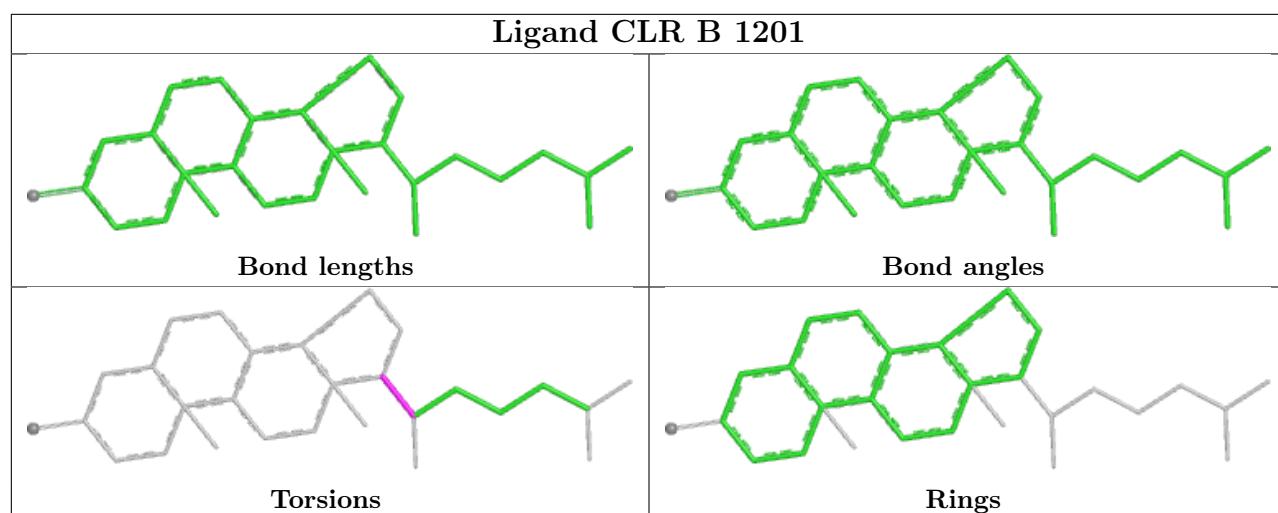
8 monomers are involved in 12 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	1204	CLR	1	0
2	A	1202	CLR	1	0
2	A	1203	CLR	2	0
2	A	1204	CLR	1	0
2	B	1203	CLR	2	0
2	A	1201	CLR	2	0
2	B	1202	CLR	1	0
2	B	1201	CLR	2	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.

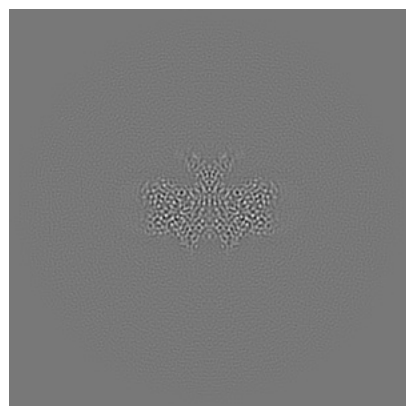
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-48318. These allow visual inspection of the internal detail of the map and identification of artifacts.

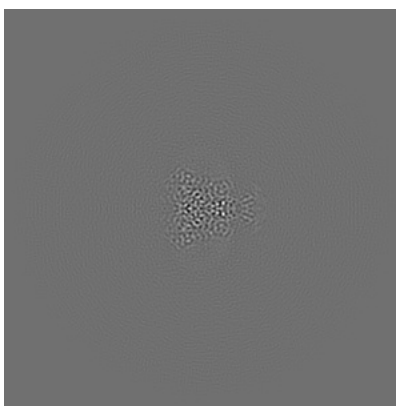
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

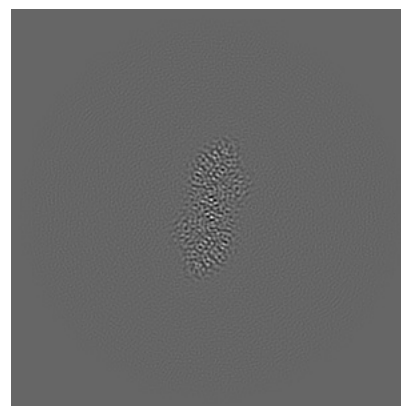
6.1.1 Primary map



X

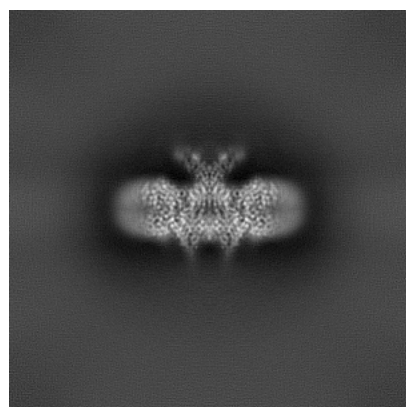


Y

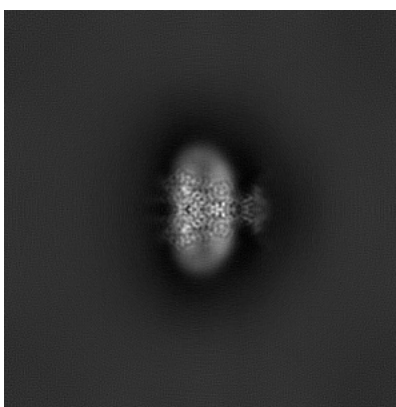


Z

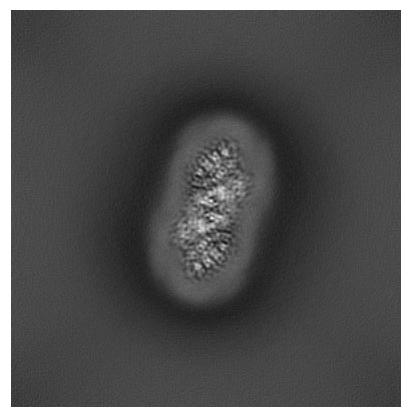
6.1.2 Raw map



X



Y

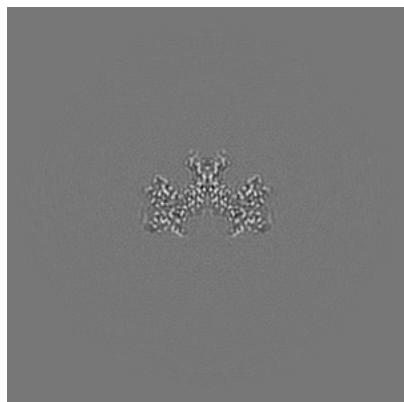


Z

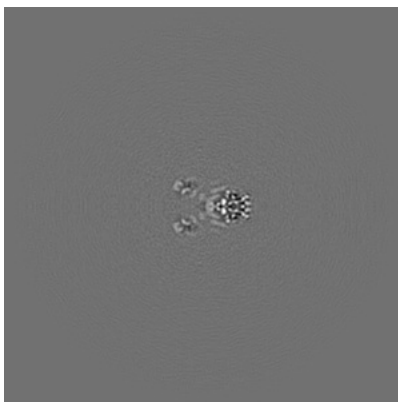
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

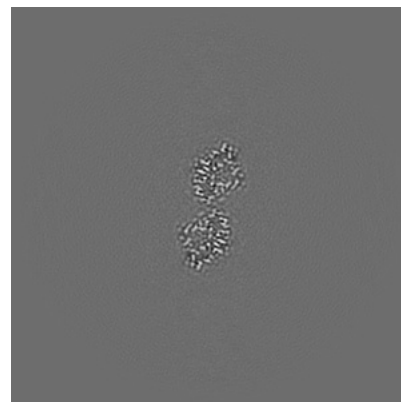
6.2.1 Primary map



X Index: 200

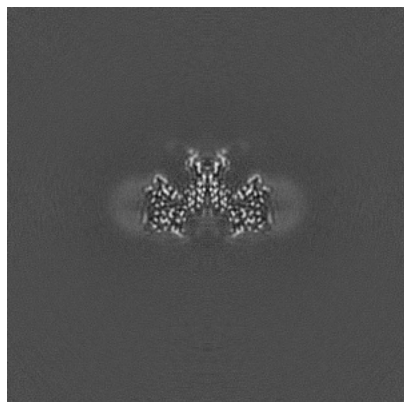


Y Index: 200

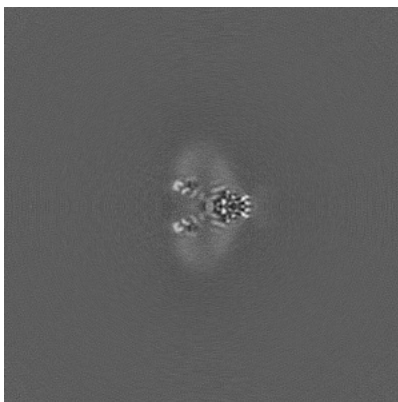


Z Index: 200

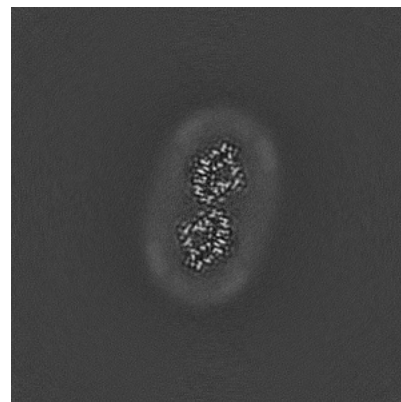
6.2.2 Raw map



X Index: 200



Y Index: 200

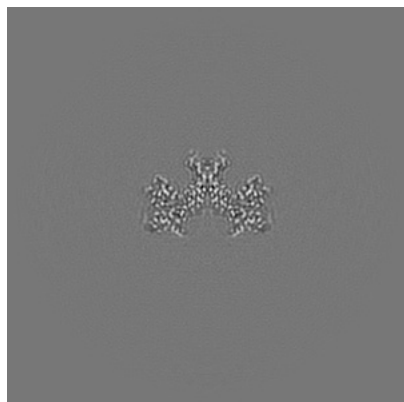


Z Index: 200

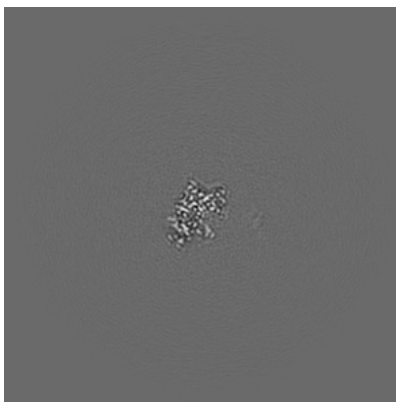
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

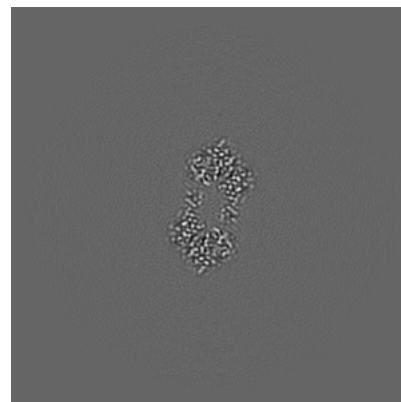
6.3.1 Primary map



X Index: 200

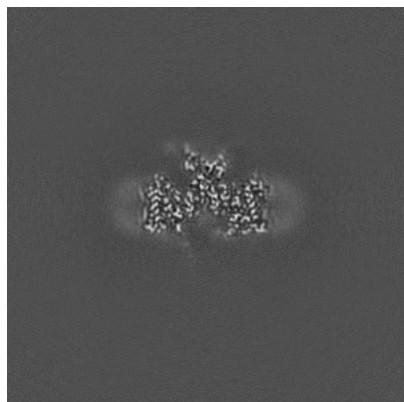


Y Index: 171

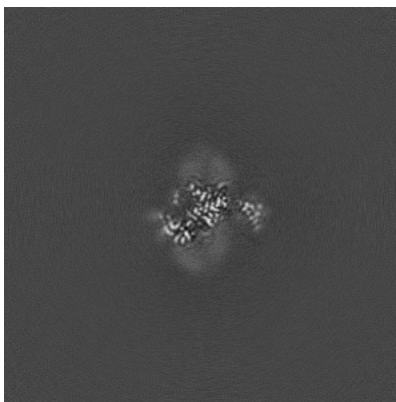


Z Index: 182

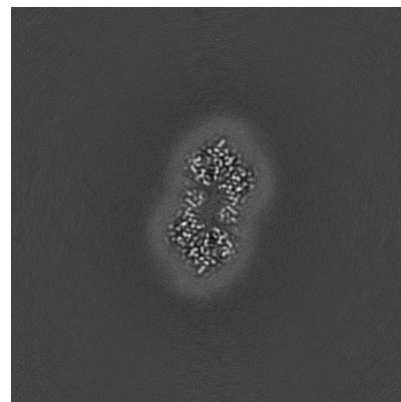
6.3.2 Raw map



X Index: 197



Y Index: 183

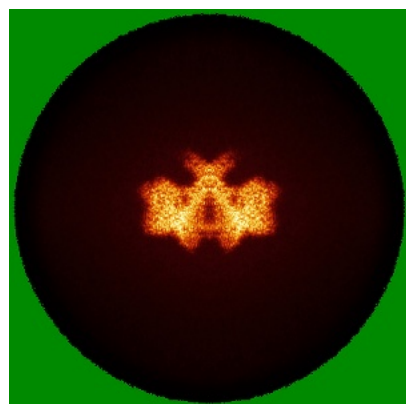


Z Index: 182

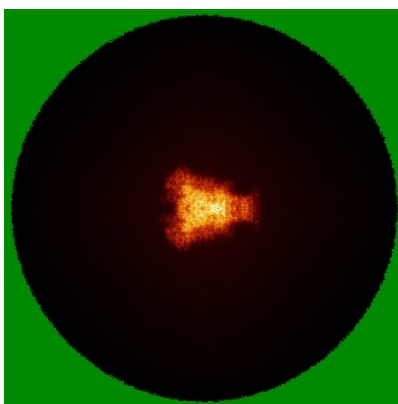
The images above show the largest variance slices of the map in three orthogonal directions.

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

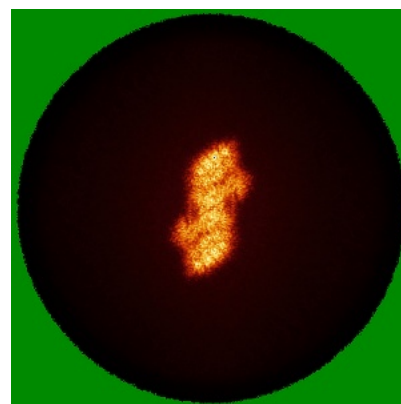
6.4.1 Primary map



X

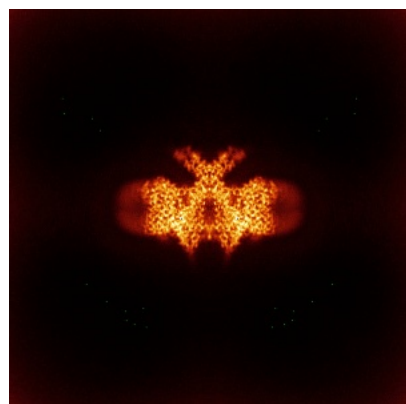


Y

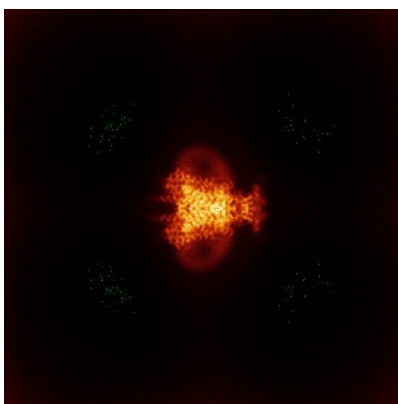


Z

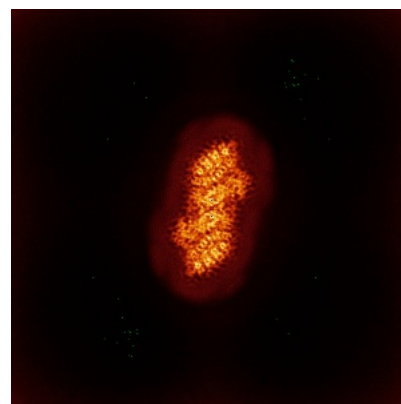
6.4.2 Raw map



X



Y

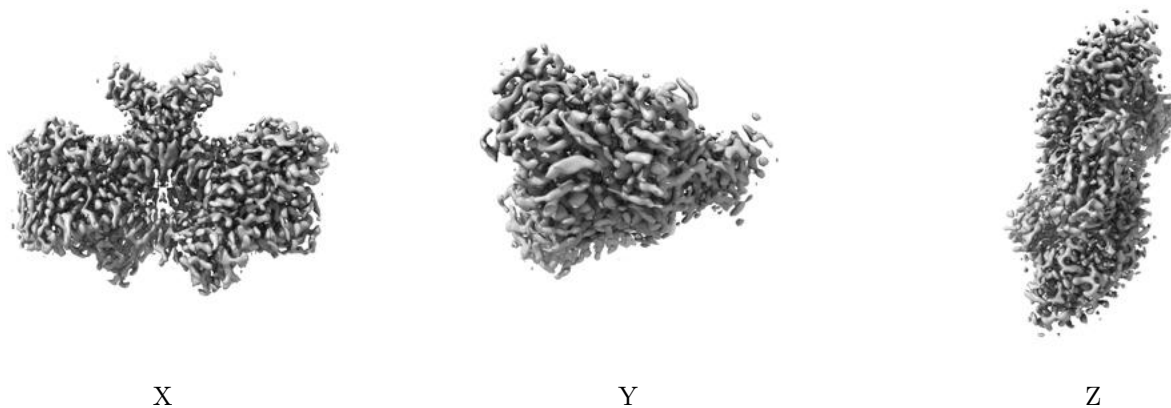


Z

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.

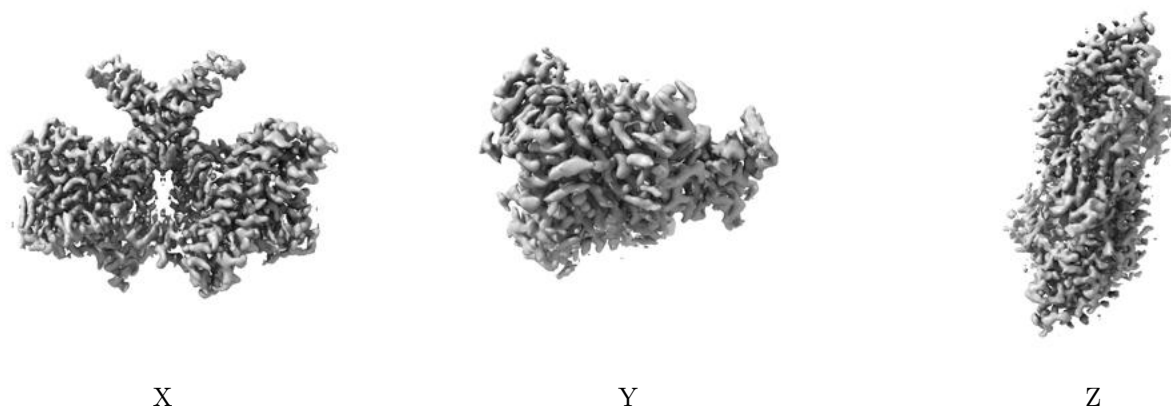
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.086. 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.

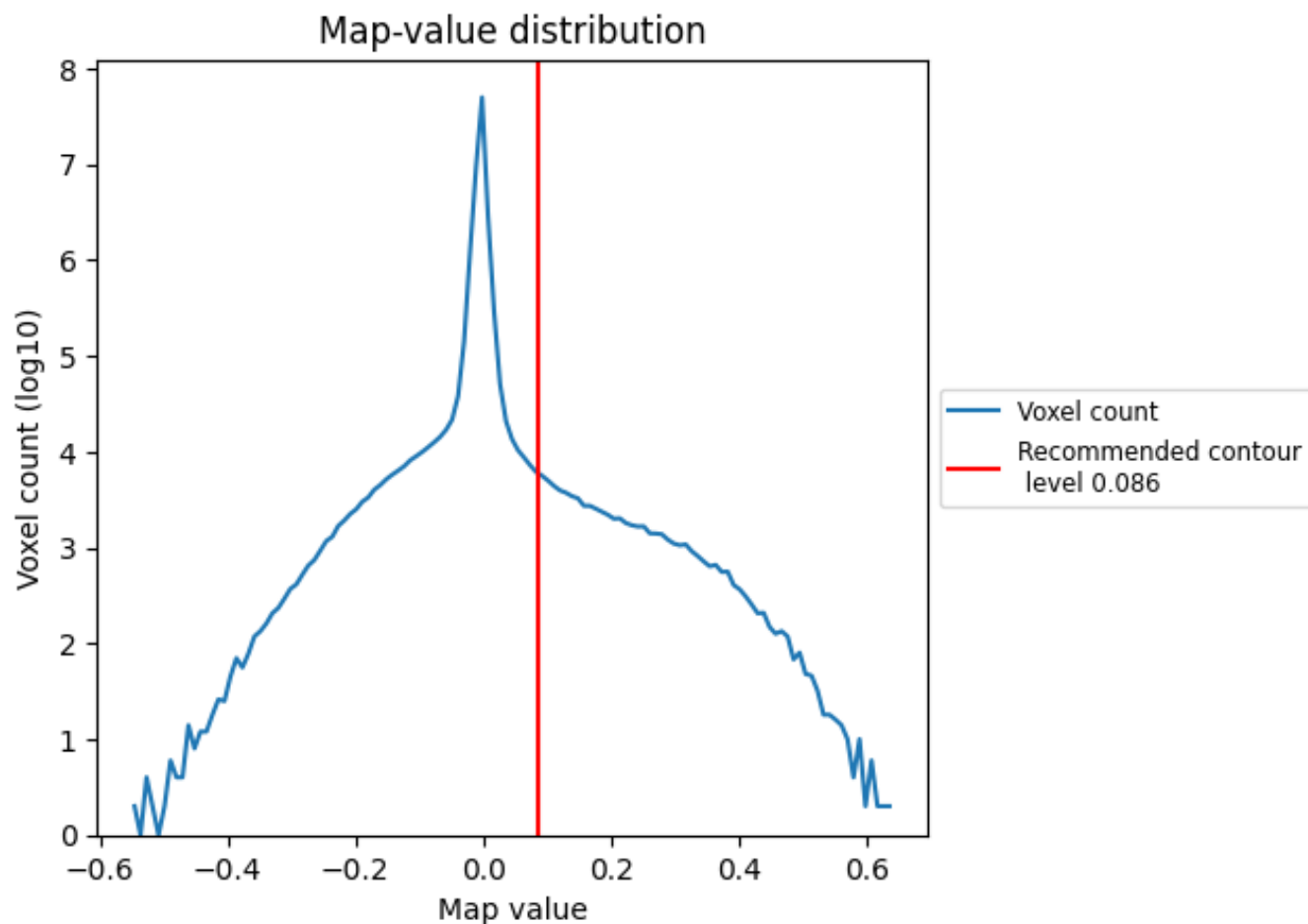
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

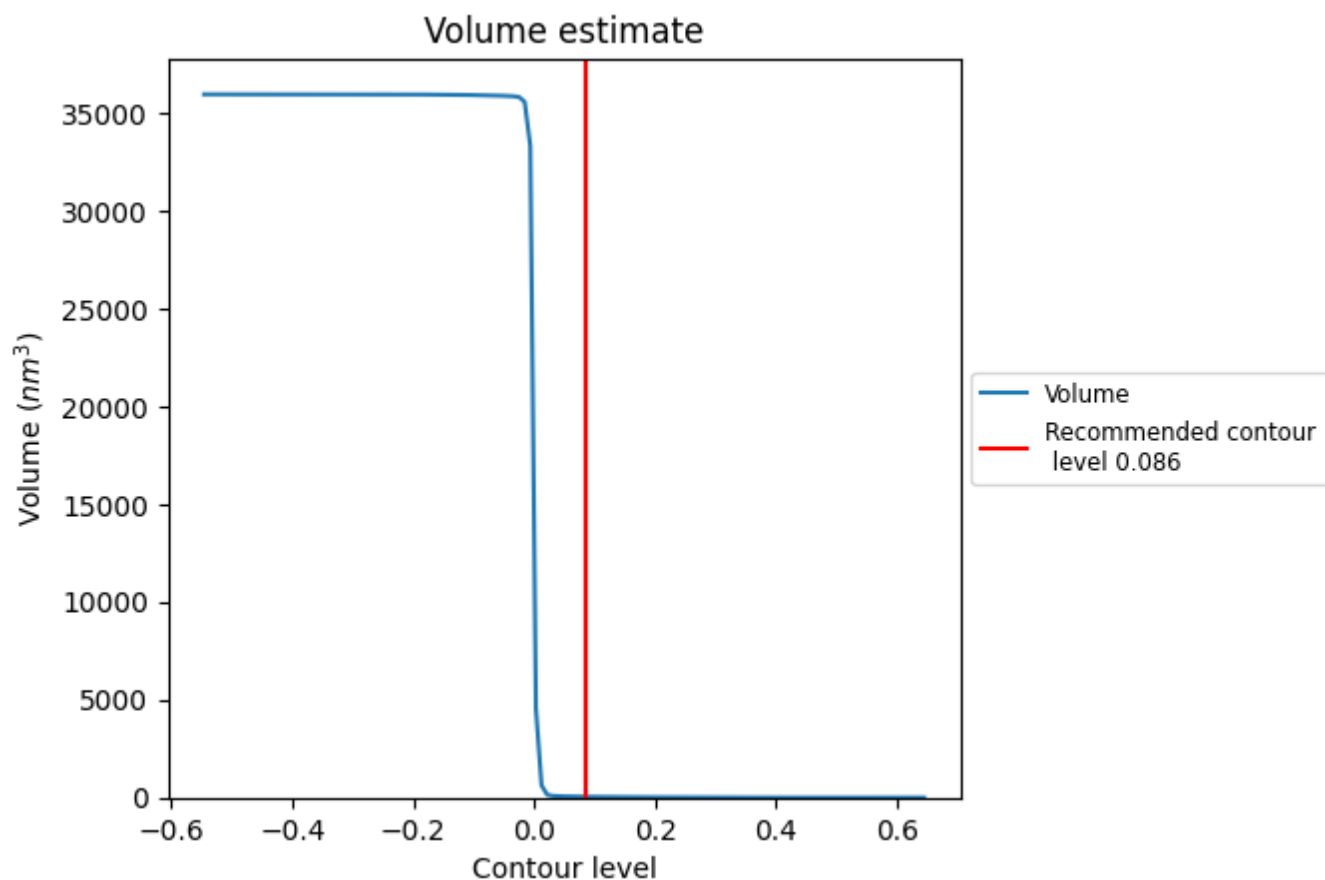
This section contains the results of statistical analysis of the map.

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.

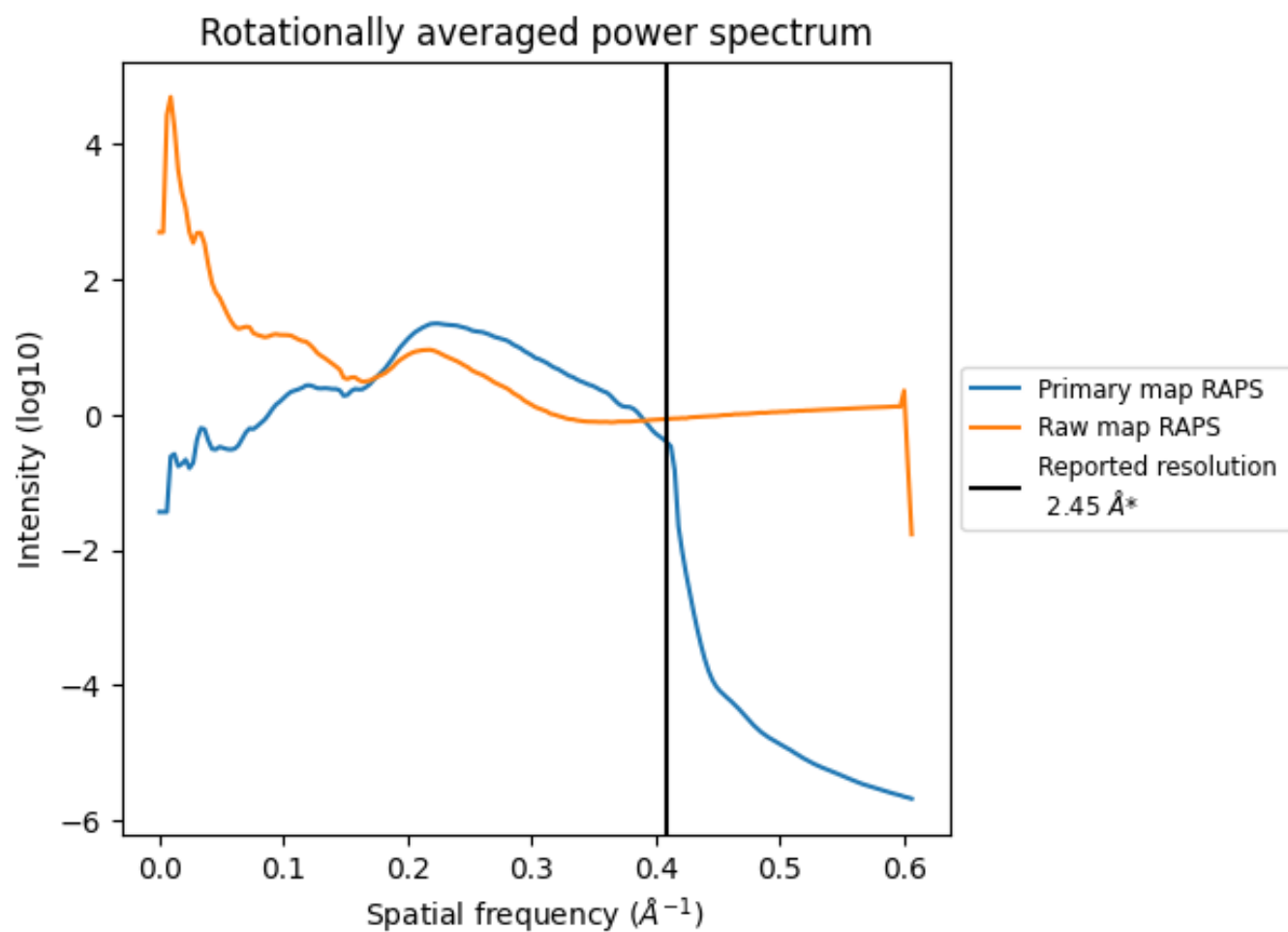
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 41 nm³; this corresponds to an approximate mass of 37 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 ⓘ

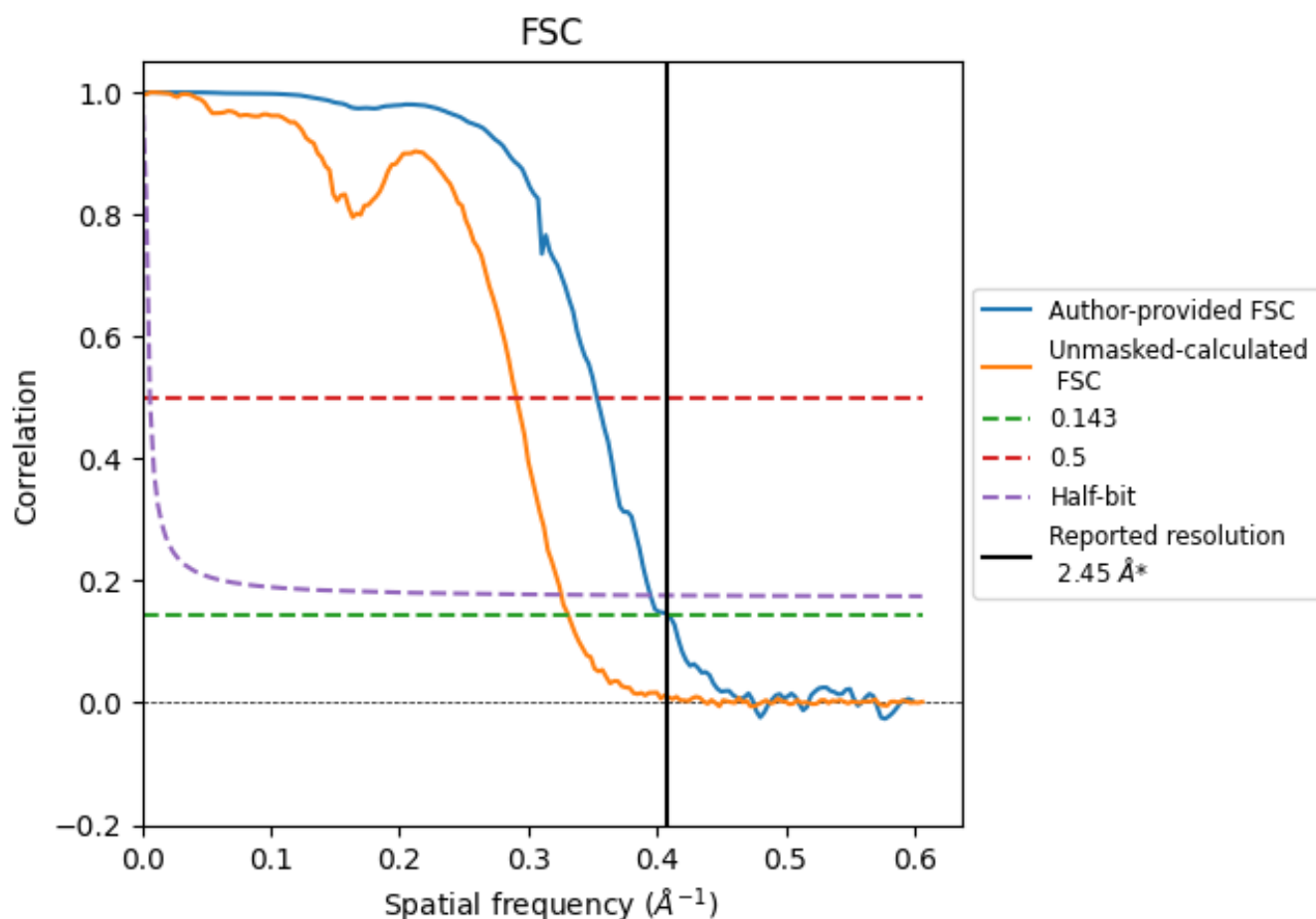


*Reported resolution corresponds to spatial frequency of 0.408 Å⁻¹

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 0.408 $\text{\AA}^{-1}$

8.2 Resolution estimates [i](#)

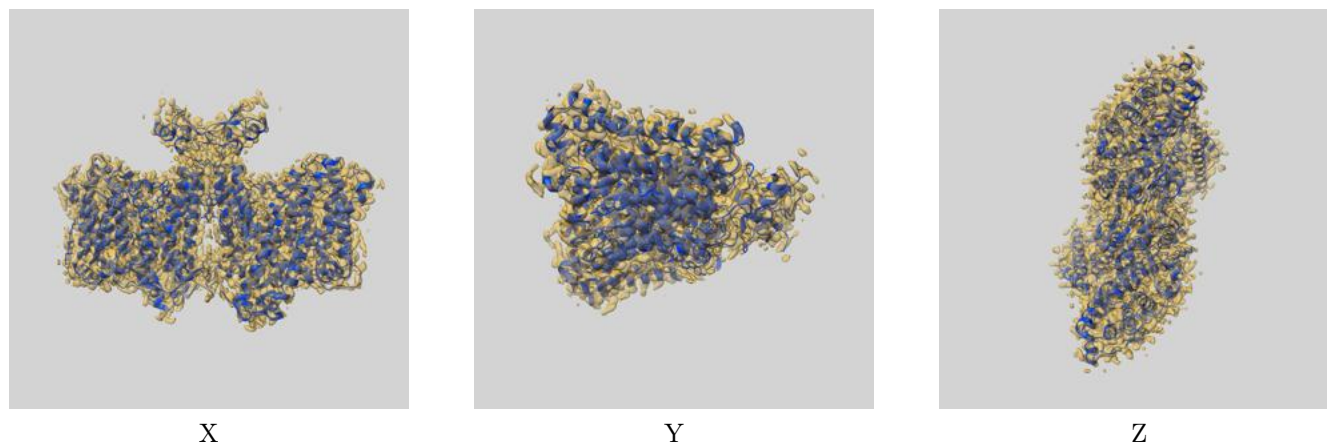
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.45	-	-
Author-provided FSC curve	2.44	2.83	2.53
Unmasked-calculated*	3.02	3.44	3.07

*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 3.02 differs from the reported value 2.45 by more than 10 %

9 Map-model fit [i](#)

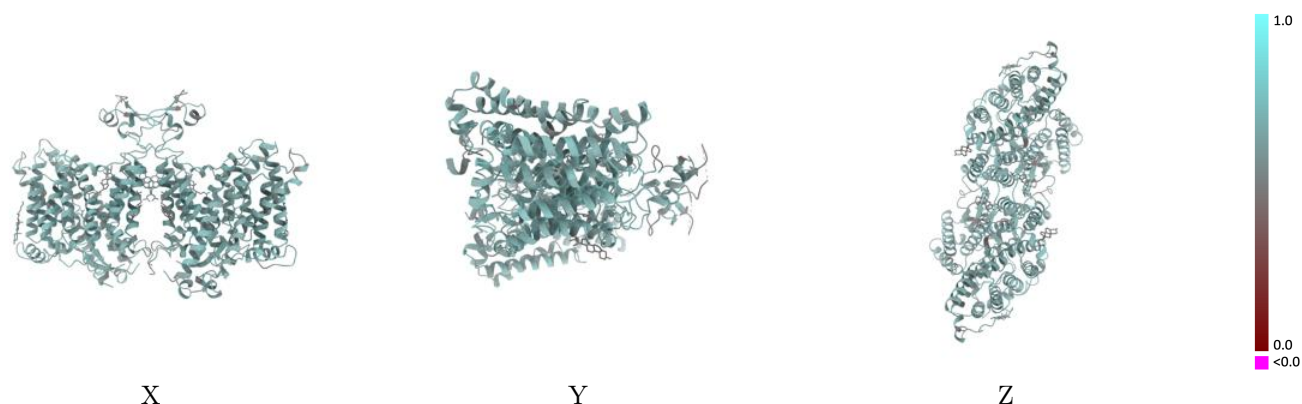
This section contains information regarding the fit between EMDB map EMD-48318 and PDB model 9MJO. Per-residue inclusion information can be found in section [3](#) on page [10](#).

9.1 Map-model overlay [i](#)



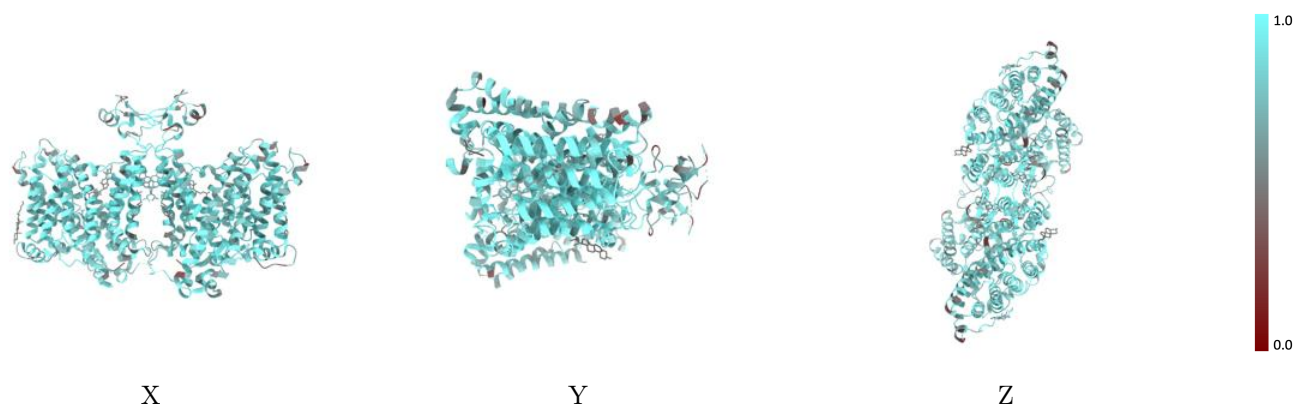
The images above show the 3D surface view of the map at the recommended contour level 0.086 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



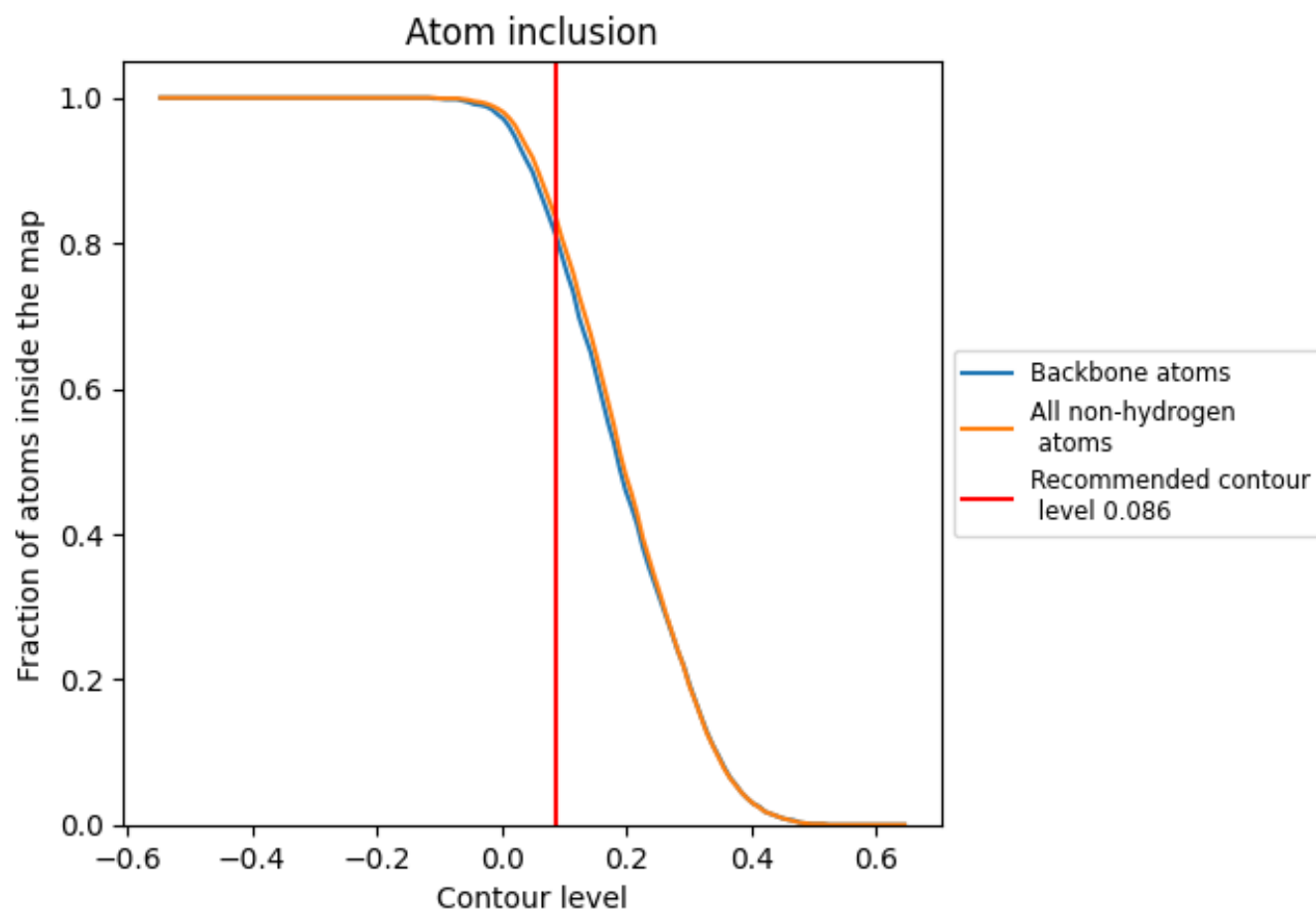
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions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

9.3 Atom inclusion mapped to coordinate model [i](#)



The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.086).

9.4 Atom inclusion [i](#)



At the recommended contour level, 81% of all backbone atoms, 84% 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 (0.086) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.8370	0.6200
A	0.8390	0.6210
B	0.8390	0.6200

