



wwPDB EM Validation Summary Report ⓘ

Mar 30, 2026 – 02:41 AM UTC

PDB ID : 8X4E / pdb_00008x4e
EMDB ID : EMD-38048
Title : Cryo-EM structure of Ryanodine receptor 1 (TM helix S0, 5 mM Ca²⁺)
Authors : Chen, Q.; Hu, H.
Deposited on : 2023-11-15
Resolution : 3.30 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.dev132
MolProbity : 4-5-2 with Phenix2.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

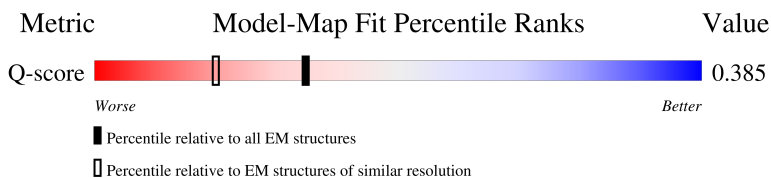
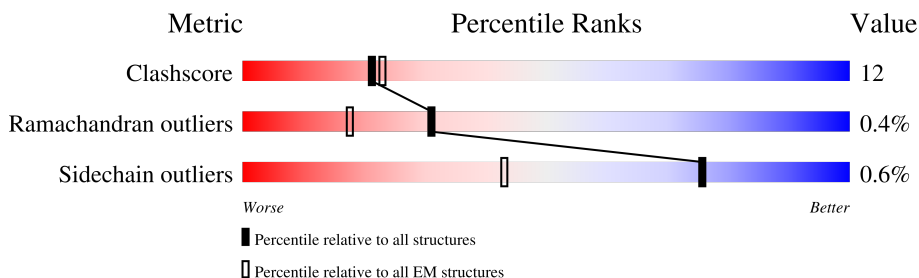
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.30 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	15087 (2.80 - 3.80)

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	5037	
1	B	5037	
1	C	5037	
1	D	5037	

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 118280 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 Ryanodine receptor 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	3982	Total	C	N	O	S	0	0
			29568	18816	5133	5431	188		
1	B	3982	Total	C	N	O	S	0	0
			29568	18816	5133	5431	188		
1	C	3982	Total	C	N	O	S	0	0
			29568	18816	5133	5431	188		
1	D	3982	Total	C	N	O	S	0	0
			29568	18816	5133	5431	188		

- Molecule 2 is ZINC ION (CCD ID: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		AltConf
2	A	1	Total	Zn	0
			1	1	
2	B	1	Total	Zn	0
			1	1	
2	C	1	Total	Zn	0
			1	1	
2	D	1	Total	Zn	0
			1	1	

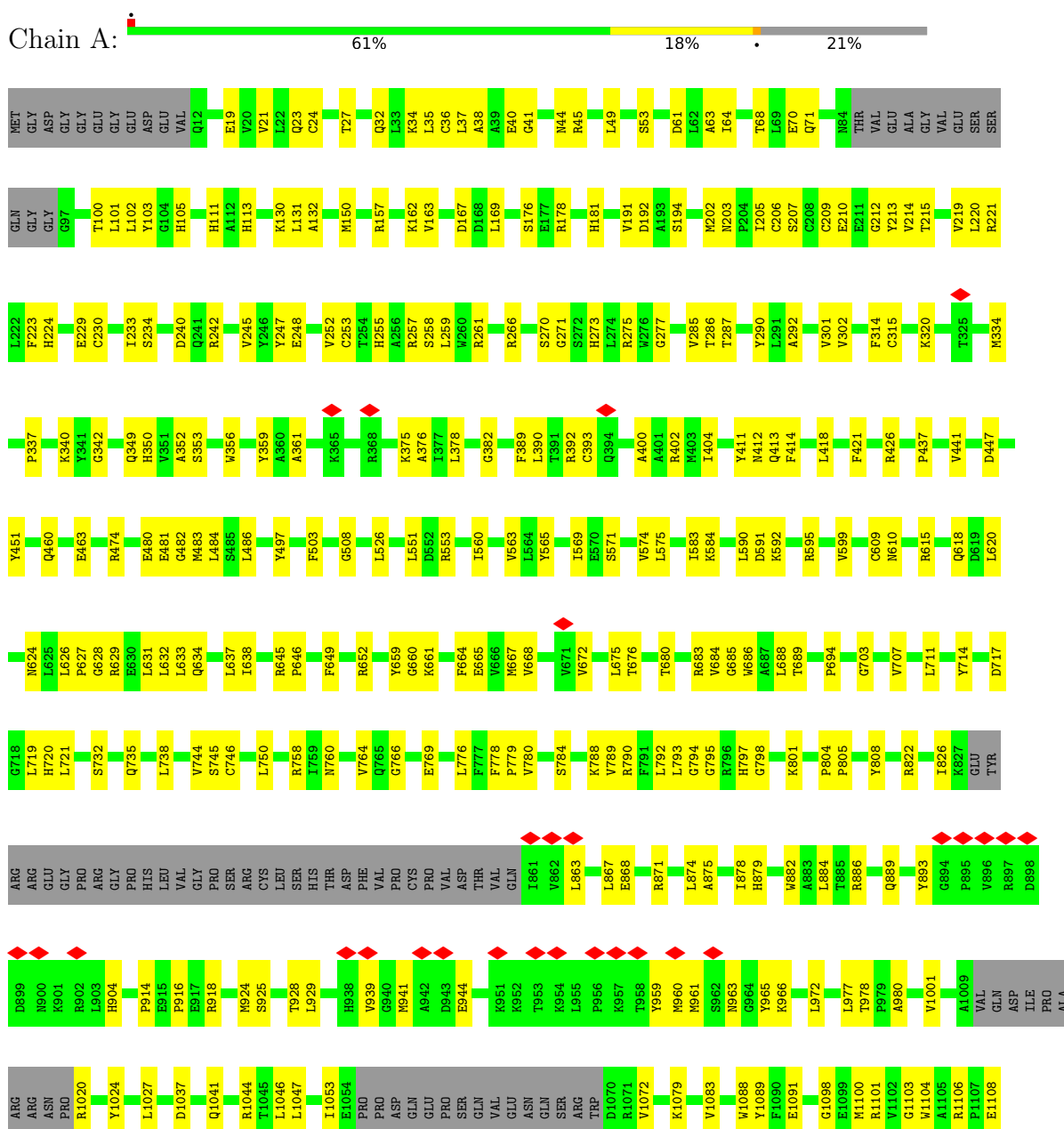
- Molecule 3 is CALCIUM ION (CCD ID: CA) (formula: Ca) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		AltConf
3	A	1	Total	Ca	0
			1	1	
3	B	1	Total	Ca	0
			1	1	
3	C	1	Total	Ca	0
			1	1	
3	D	1	Total	Ca	0
			1	1	

3 Residue-property plots

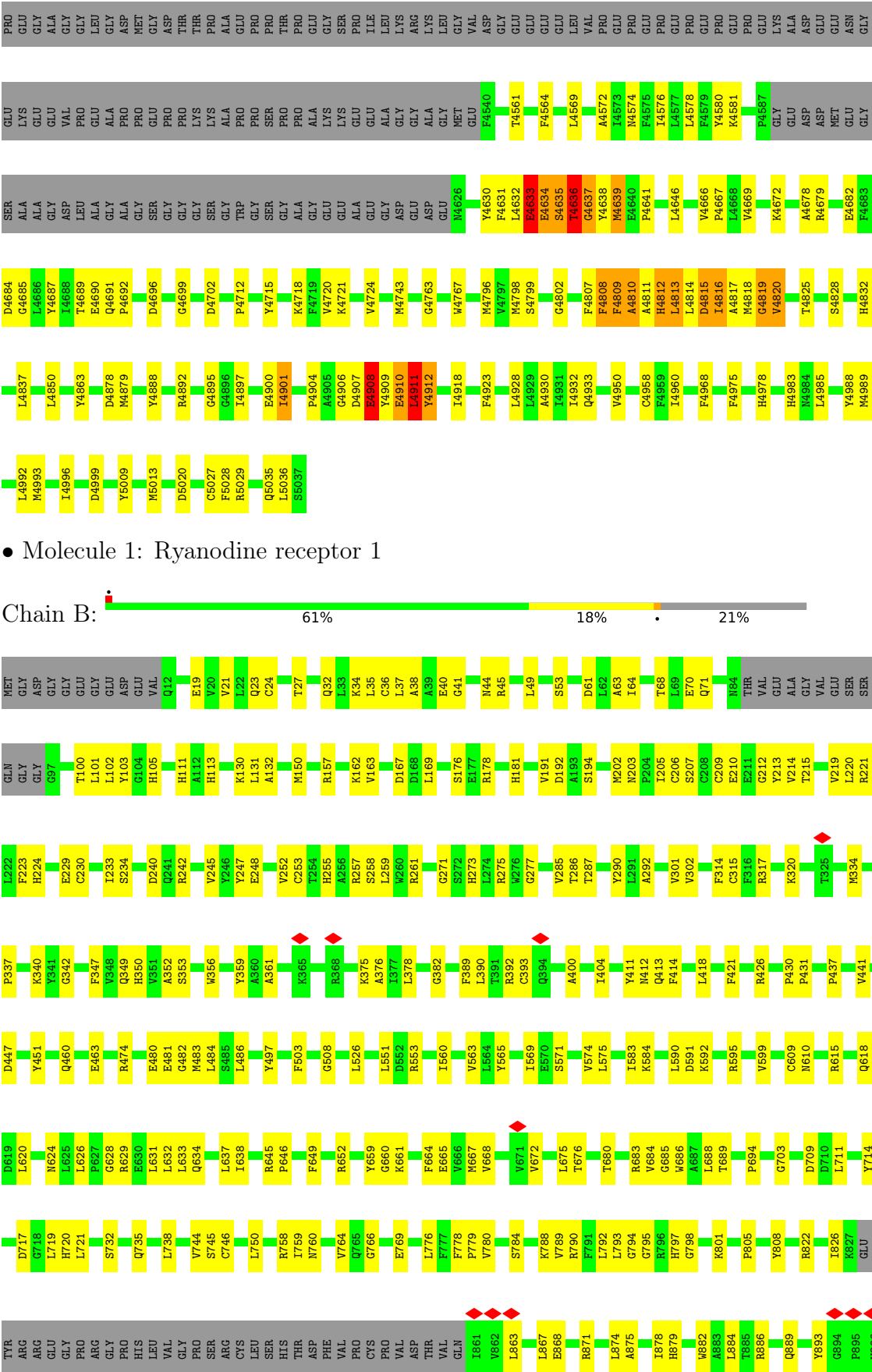
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion 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: Ryanodine receptor 1









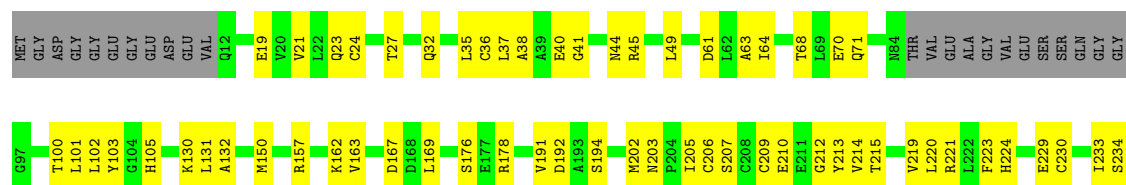
● Molecule 1: Ryanodine receptor 1



Q4102	Q3927	GLU	GLU	ARG	GLY	S3309	C3170	PHE	LEU	THR	LEU	LYS	L2556
F4103	Q3946	ARG	GLU	ARG	ASP	L3312	Y3173	PHE	VAL	ALA	VAL	LYS	A2557
T4104	Q3961	ALA	TRP	ALA	ARG	L3315	S3174	SER	GLU	THR	TRP	ALA	V2558
G4105	R3949	VAL	SER	VAL	SER	L3318	L3175	ALA	ASP	LYS	ASP	VAL	L2559
L4112	Q3960	ALA	VAL	ALA	GLN	M3318	K3179	SER	THR	ASP	PRO	ASP	A2570
S4113	Q3962	CYS	R3762	CYS	THR	A3339	Y3182	GLU	LEU	PRO	LEU	ALA	H2574
C4114	F3962	PHE	L3763	PHE	SER	Q3343	R3187	ILE	ALA	GLU	ARG	GLY	H2584
E4119	T3966	ARG	Q3767	ARG	ILE	A3385	L3190	LYS	GLU	LYS	THR	ASP	T2585
N4120	E3967	MET	S3768	SER	V3511	V3400	L3197	MET	VAL	ASN	PHE	PRO	V2586
E4121	Y3968	T3639	R3770	THR	M3524	F3426	M3201	GLU	ALA	LEU	SER	ARG	Y2587
E4126	G3971	L3641	T3772	GLN	M3528	M3430	A3204	ASN	ARG	PRO	GLN	ARG	S2590
N4130	P3972	P3645	R3773	GLY	T3528	F3435	F3205	LEU	ASP	LYS	VAL	VAL	R2591
R4131	C3973	H3647	G3774	LYS	L3532	V3438	P3208	ARG	GLU	ASP	GLY	THR	L2597
F4132	N3976	M3652	M3778	THR	I3533	S3446	E3212	GLY	LEU	LYS	ILE	GLY	L2603
Q4133	N3989	F3853	C3786	LEU	M3534	H3449	C3216	VAL	PHE	GLN	THR	VAL	A2637
I4139	V3990	L3654	T3790	LEU	L3535	L3468	A3228	SER	LEU	ALA	LEU	ILE	L2644
L4150	G3991	E3655	T3794	GLY	M3535	PHE	L3232	ALA	GLY	MET	LYS	PHE	C2651
S4151	F3992	Y3657	V3799	LYS	H3558	LEU	L3235	VAL	VAL	ALA	ALA	ILE	L2692
E4152	L4012	T3662	L3798	THR	L3569	THR	S3235	GLY	ALA	GLU	GLU	ASN	Q2693
R4159	K4021	L3663	K3799	ASP	M3573	ALA	G3254	ASN	THR	ILE	LEU	LYS	E2694
R4180	V4036	T3664	L3802	LYS	Q3572	ASP	GLY	LEU	ARG	ALA	GLU	ALA	L2695
G4185	M4037	H3667	S3803	SER	A3574	SER	GLY	THR	GLY	GLU	GLU	GLY	L2696
A4186	M4047	S3668	N3809	LYS	R3577	LYS	LEU	TYR	LEU	ASN	THR	THR	R2697
S4187	L4048	R3672	L3817	LYS	G3578	ALA	ALA	THR	LYS	ASP	ILE	HIS	L2698
R4188	V4049	R3672	L3835	ALA	R3582	GLU	GLY	THR	THR	TRP	ALA	GLU	L2703
R4192	S4051	G3681	T3838	LYS	V3593	LYS	A3261	ALA	GLY	ARG	ALA	ALA	CYS
I4193	S4052	E3682	L3842	ALA	H3611	GLY	R3262	L3136	LEU	GLY	LYS	LYS	ALA
Y4194	E4056	P3697	L3842	ASP	P3612	ASP	L3274	L3137	LEU	THR	ASP	ASP	ALA
F4219	K4060	L3716	D3878	ALA	Y3613	ALA	P3275	V3139	GLY	GLY	LYS	TRP	ALA
E4227	M4064	L3721	E3879	LYS	L3613	GLY	W3285	A3135	LEU	GLY	GLY	GLY	ALA
A4228	M4064	Y3722	F3880	GLY	L3613	GLY	E3290	L3143	LEU	TRP	ALA	ILE	ALA
E4229	K4067	Y3725	D3883	SER	L3613	GLY	E3291	F3144	LEU	GLY	ARG	GLY	ALA
D4240	K4069	Y3725	L3884	LYS	L3613	GLY	E3291	Q3145	LEU	GLY	GLY	GLY	ALA
M4245	R4085	M3729	F3886	LYS	L3613	SER	E3291	H3146	LEU	THR	GLY	GLY	ALA
Q4246	G4086	C3733	Q3889	ALA	L3613	ASP	A3291	Q3149	LEU	GLY	LYS	GLY	ALA
I4247	L4087	C3733	L3890	VAL	L3613	GLY	P3293	V3163	LEU	GLY	LYS	GLY	ALA
E4253	L4088	G3738	L3891	THR	L3613	THR	P3294	SER	LEU	GLY	GLY	GLY	ALA
PRO	S4089	G3739	F3899	HIS	L3613	THR	P3302	GLY	GLY	THR	GLY	GLY	ALA
GLU	K4090	E3740	T3919	TRP	L3613	LYS	C3304	ILE	VAL	ARG	GLY	VAL	ALA
GLY	F4093	M3741	T3919	LYS	L3613	LYS	T3308	VAL	ALA	THR	GLY	VAL	ALA
GLU	M4097	GLY	L3923	GLN	L3613	ARG		THR	SER	LEU	GLU	SER	ALA
GLU		ALA		ARG				LEU					GLU









L3315	Y3173	PHE	SER	PRO	SER	GLN	GLU	ALA	Y2558	S2243	L2131	C2021	R1797
N3318	S3174	SER	GLY	LEU	THR	LEU	LEU	LYS	L2559	M2246	L2135	P2022	P1800
A3339	L3175	ALA	ARG	VAL	GLN	PRO	THR	LYS	A2570	Q2247	L2135	R2028	E1905
Q3343	K3179	GLU	GLU	TYR	THR	ASP	HIS	THR	H2574	D2252	L2138	C2042	R1808
A3385	Y3182	ILE	SER	THR	ASP	PRO	MET	ASP	H2584	S2279	P2139	G2043	D1809
V3400	R3187	GLU	HIS	THR	ARG	LEU	ARG	GLU	T2586	E2296	Y2142	L2044	K1810
E3426	L3190	VAL	GLN	LYS	GLY	TYR	ASN	GLY	V2587	Y2299	V2149	G2048	M1814
N3430	L3197	ASN	GLU	GLU	TYR	LYS	PHE	ASP	S2590	S2300	T2152	GLU	A1826
F3435	A3200	LEU	ARG	ALA	PRO	PHE	PRO	ASP	R2591	Y2301	M2153	GLU	R1827
V3438	M3201	LEU	GLN	ASP	PRO	GLU	PRO	ARG	K2597	L2302	L2155	PRO	D1828
S3446	A3204	GLY	ASP	ARG	PRO	ASP	VAL	GLY	R2454	K2316	R2163	GLU	P1829
H3449	F3205	VAL	LEU	LYS	ASP	LEU	LYS	THR	A2455	Y2318	S2164	THR	S1833
S3468	P3208	SER	GLN	ALA	SER	GLY	ILE	LEU	L2457	W2323	L2166	SER	E1834
PHE	E3212	ALA	ALA	VAL	THR	VAL	ARG	VAL	R2458	P2325	L2167	GLU	F1836
LEU	C3216	THR	THR	LEU	LEU	ILE	TRP	ILE	S2459	Y2331	Q2169	ARG	F1838
THR	A3228	GLN	VAL	LYS	LEU	PRO	PRO	PRO	L2460	M2170	M2170	LEU	V1839
ASP	L3232	VAL	GLY	PHE	GLU	ILE	GLU	GLU	L2463	L2332	E2174	ARG	P1840
LYS	S3235	GLN	VAL	GLY	LEU	GLU	LYS	LYS	D2464	D2333	E2175	LEU	V1841
SER	G3254	ASN	VAL	MET	GLN	GLU	ASP	ASP	L2474	F2340	L2176	LEU	L1842
MET	LEU	ASN	GLY	GLY	ALA	LEU	LYS	PHE	L2479	E2348	M2178	THR	V1859
THR	ALA	CYS	THR	TYR	LYS	ALA	ALA	ILE	GLY	T2358	Q2180	VAL	K1860
GLY	THR	HIS	HIS	ALA	GLU	MET	MET	ASN	ASP	K2359	S2181	ARG	Q1861
ALA	LEU	ILE	ILE	VAL	GLN	ILE	ILE	LYS	GLY	K2360	I2182	LEU	I1862
ALA	ALA	LEU	LEU	THR	ALA	TRP	ALA	PHE	ALA	L2368	I2185	LYS	L1863
THR	GLU	ARG	GLY	ARG	GLU	GLU	GLU	ALA	LEU	L2376	H2194	LYS	M1865
ASP	SER	ARG	SER	LEU	ASN	TRP	TRP	TYR	VAL	Q2487	L2197	GLU	I1866
ALA	A3135	LEU	LEU	LYS	LYS	THR	THR	HIS	R2697	A2383	M2198	LYS	E1867
GLN	L3136	ASP	ASP	ASP	HIS	ILE	ILE	GLU	F2494	K2689	Q1952	GLU	P1868
SER	L3137	ALA	ALA	MET	ASN	GLU	LYS	GLY	T2495	P2496	Q1952	PRO	V1870
THR	P3138	ARG	ARG	LEU	THR	TRP	ALA	TRP	P2496	D2497	M2208	GLU	F1871
GLY	V3139	THR	THR	ASP	THR	GLY	ARG	ALA	D2497	L2386	V2207	GLU	E1869
ASP	L3143	VAL	VAL	THR	VAL	LYS	GLY	PHE	CYS	P2385	E2209	GLU	S1869
GLN	F3144	LYS	LYS	SER	LYS	LYS	LYS	ASP	ALA	GLY	V2210	LEU	E1874
ARG	Q3145	SER	GLY	Q2961	GLY	LYS	GLU	ASP	ILE	VAL	L2215	PRO	GLU
THR	H3146	PRO	PRO	Q2961	GLY	GLN	ILE	GLN	GLY	ARG	T2220	GLU	GLU
LYS	Q3149	GLU	GLU	R2065	PRO	GLU	ARG	ASN	PRO	ARG	L2223	GLU	GLU
LYS	V3163	VAL	ILE	R2065	ILE	GLU	THR	ASN	PRO	ARG	L2223	GLU	GLU
ARG	SER	VAL	VAL	A2975	VAL	ALA	GLU	TRP	ASP	ARG	Q2003	GLU	GLU
THR	CYS	LYS	LYS	H2976	LYS	LYS	LYS	TYR	THR	GLU	L2094	GLU	GLU
GLY	TYR	ALA	ALA	LEU	ALA	GLY	GLY	GLY	VAL	PHE	V2098	GLU	GLU
ASP	ARG	LEU	LEU	GLU	THR	GLY	THR	GLY	ASP	GLY	L2010	GLY	GLU
ARG	THR	ARG	ARG	ALA	THR	GLY	ARG	ASN	ALA	GLY	V2102	GLY	GLU
TYR	L3312	LEU	PHE	VAL	SER	VAL	ILE	ASP	THR	GLU	C2240	GLU	GLU
				</									

F4975	T4825	L4681	GLU	ASN	PHE	PRO	SER	14247	S4089	Q3946	E3748	◆
H4978	S4828	F4683	GLY	GLY	ARG	THR	LEU	E4253	K4090	R3949	Q3761	
H4983	C4685	D4684	ALA	LYS	GLY	ASP	ARG	F4093	F4093		R3762	
H4984	L4832	L4686	GLY	GLU	ALA	VAL	ARG	M4097	M4097	T3960	L3763	
L4985	Y4687	Y4688	ASP	VAL	GLY	HIS	Y4316	GLY		F3962	Q3767	
Y4988	L4837	L4688	LEU	PRO	GLY	GLY	R4317	GLU	Q4102	T3966	R3768	
M4989	A4845	E4690	ALA	GLY	GLY	GLN	L4319	GLU	F4103	E3967	S3768	
L4992	L4850	Q4691	ALA	PRO	ASP	PRO	R4320	ASP	T4104	R3770	L3770	
L4995	SER	P4692	GLY	PRO	MET	ALA	R4321	GLU	P4106	H3771	T3772	
L4996	GLY	D4696	GLY	GLU	GLY	GLY	L4322	ASP	E4107	G3971	R3773	
D4999	GLY	Y4697	GLY	PRO	THR	GLY	V4339	GLY		F3972	G3774	
Y5009	D4878	K4698	GLY	LYS	THR	GLY	A4340	GLY	S4113	M3778		
W5010	M4879	G4699	SER	LYS	PRO	ASP	R4341	GLY	C4114	C3786		
D4999	Y4883	D4702	GLY	ALA	ALA	ALA	A4342	GLU	S4115	T3790		
Y5009	Y4888	P4712	GLY	PRO	GLY	GLY	A4343	ALA	E4119	V3989		
W5011	Y4888	Y4715	SER	PRO	THR	GLY	A4344	ALA	N4120	V3990		
Y5012	R4892	Y4715	ALA	PRO	PRO	GLY	A4345	GLY	E4121	V3794		
M5013	G4895	K4718	GLY	ALA	GLY	GLY	ALA	ALA	E4126	L3980		
D5020	G4896	F4719	GLU	LYS	GLY	GLY	GLY	GLY	A4130	F3992		
C5027	L4897	V4720	ALA	LYS	SER	GLY	ALA	GLY	R4130	F3996		
F5028	K4721	K4721	GLU	GLY	ILE	GLY	GLY	ALA	R4131	L3663		
R5029	E4900	V4724	GLY	ALA	LEU	ASP	GLY	ALA	F4132	M4000		
Q5035	I4901	ASP	ASP	GLY	LYS	ALA	LEU	GLY	Q4133	D4006		
L5036	P4904	M4743	GLU	GLY	ARG	ALA	GLY	ALA	I4139	S4007		
S5037	G4906	G4763	ASP	GLY	LEU	GLY	LEU	GLY	E4152	S4008		
	D4907	Y4767	M4626	NET	VAL	GLY	TRP	ALA	R4159	K4021		
	E4908		Y4630	GLU	ASP	ASP	SER	GLY	Y4036	T3838		
	Y4909	L4790	F4631	GLY	GLY	GLY	LEU	THR	N4037	L3835		
	L4911	M4796	L4632	GLU	GLU	VAL	PHE	VAL	L3842	L3838		
	Y4912	S4635	E4634	GLY	GLY	ALA	GLY	ALA	M4047	L3842		
	L4918	M4798	S4635	GLY	GLY	GLY	GLY	ALA	L4048	D3878		
	F4923	S4799	T4636	GLY	LEU	HIS	LEU	ALA	Y4049	E3879		
	L4928	G4802	G4637	VAL	VAL	GLU	VAL	THR	E4050	F3880		
	L4930	F4807	Y4638	A4572	PRO	ALA	VAL	ARG	R4188	D3883		
	I4931	F4808	M4639	N4574	PRO	ALA	GLY	ARG	I4190	L3884		
	Q4933	A4810	P4641	F4576	GLY	GLY	LYS	ALA	E4191	F3885		
	V4950	H4812	L4646	L4577	PRO	VAL	THR	ALA	R4192	R3886		
	C4958	L4814	V4666	F4579	GLY	VAL	VAL	ALA	I4193	M3729		
	F4959	D4815	V4667	L4578	GLY	GLY	THR	ALA	Y4194	C3733		
	I4960	A4817	L4668	Y4580	PRO	VAL	VAL	ALA	F4219	Q3889		
	F4968	M4818	V4669	K4581	VAL	ALA	VAL	ALA	M4064	L3891		
		G4819	V4689	F4587	VAL	ALA	VAL	ALA	K4060	L3890		
		V4820	K4672	P4587	GLY	VAL	GLY	ARG	F4061	F3899		
			A4678	GLY	LYS	VAL	LEU	LEU	K4067	G3738		
			L4816	ASP	GLY	ALA	LEU	ARG	L4068	G3739		
			A4679	GLY	ASP	ASP	ALA	GLY	K4069	E3740		
			G4679	ASP	GLY	GLY	MET	LEU	T3919	N3741		
			K4680	MET	GLU	PRO	ASP	TYR	L3923	GLY		
					GLU	PRO	ASP	ARG	Q3927	ALA		

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	279704	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	50	Depositor
Minimum defocus (nm)	1200	Depositor
Maximum defocus (nm)	2200	Depositor
Magnification	Not provided	
Image detector	FEI FALCON III (4k x 4k)	Depositor
Maximum map value	3.162	Depositor
Minimum map value	-1.419	Depositor
Average map value	-0.000	Depositor
Map value standard deviation	0.061	Depositor
Recommended contour level	0.182	Depositor
Map size (Å)	643.2, 643.2, 643.2	wwPDB
Map dimensions	600, 600, 600	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.072, 1.072, 1.072	Depositor

5 Model quality ⓘ

5.1 Standard geometry ⓘ

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

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	0.30	10/30188 (0.0%)	0.42	14/41084 (0.0%)
1	B	0.30	10/30188 (0.0%)	0.42	14/41084 (0.0%)
1	C	0.30	10/30188 (0.0%)	0.42	14/41084 (0.0%)
1	D	0.30	10/30188 (0.0%)	0.42	14/41084 (0.0%)
All	All	0.30	40/120752 (0.0%)	0.42	56/164336 (0.0%)

The worst 5 of 40 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	4811	ALA	CA-C	-8.80	1.42	1.52
1	B	4811	ALA	CA-C	-8.80	1.42	1.52
1	C	4811	ALA	CA-C	-8.80	1.42	1.52
1	D	4811	ALA	CA-C	-8.80	1.42	1.52
1	A	4911	LEU	CA-C	-7.89	1.42	1.52

The worst 5 of 56 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	4912	TYR	N-CA-C	-11.61	99.22	113.50
1	B	4912	TYR	N-CA-C	-11.61	99.22	113.50
1	C	4912	TYR	N-CA-C	-11.61	99.22	113.50
1	D	4912	TYR	N-CA-C	-11.61	99.22	113.50
1	A	4812	HIS	N-CA-C	-10.05	99.34	112.41

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	29568	0	27784	682	0
1	B	29568	0	27784	684	0
1	C	29568	0	27784	693	0
1	D	29568	0	27784	698	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
2	D	1	0	0	0	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
3	C	1	0	0	0	0
3	D	1	0	0	0	0
All	All	118280	0	111136	2705	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 12.

The worst 5 of 2705 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:4634:GLU:HG3	1:B:4636:THR:HG22	1.46	0.97
1:C:4634:GLU:HG3	1:C:4636:THR:HG22	1.46	0.97
1:A:4634:GLU:HG3	1:A:4636:THR:HG22	1.46	0.94
1:D:4634:GLU:HG3	1:D:4636:THR:HG22	1.46	0.94
1:D:4069:LYS:HB2	1:D:4133:GLN:HE22	1.41	0.85

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	3934/5037 (78%)	3496 (89%)	423 (11%)	15 (0%)	30	60
1	B	3934/5037 (78%)	3496 (89%)	423 (11%)	15 (0%)	30	60
1	C	3934/5037 (78%)	3496 (89%)	423 (11%)	15 (0%)	30	60
1	D	3934/5037 (78%)	3496 (89%)	423 (11%)	15 (0%)	30	60
All	All	15736/20148 (78%)	13984 (89%)	1692 (11%)	60 (0%)	31	60

5 of 60 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	4808	PHE
1	B	4808	PHE
1	C	4808	PHE
1	D	4808	PHE
1	A	1835	GLU

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	2905/4276 (68%)	2887 (99%)	18 (1%)	78	81
1	B	2905/4276 (68%)	2887 (99%)	18 (1%)	78	81
1	C	2905/4276 (68%)	2887 (99%)	18 (1%)	78	81
1	D	2905/4276 (68%)	2887 (99%)	18 (1%)	78	81
All	All	11620/17104 (68%)	11548 (99%)	72 (1%)	76	81

5 of 72 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	4317	ARG
1	D	4911	LEU
1	D	4319	LEU

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	D	4639	MET
1	B	4320	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 150 such sidechains are listed below:

Mol	Chain	Res	Type
1	D	44	ASN
1	D	4005	GLN
1	D	909	ASN
1	D	1760	HIS
1	B	1491	ASN

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 8 ligands modelled in this entry, 8 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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.

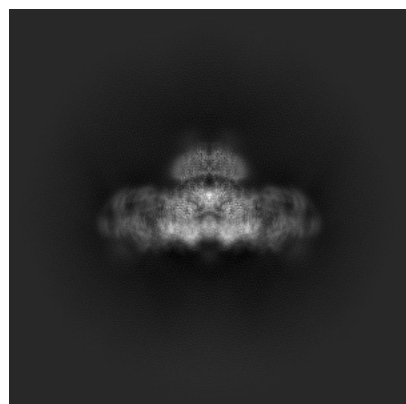
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-38048. These allow visual inspection of the internal detail of the map and identification of artifacts.

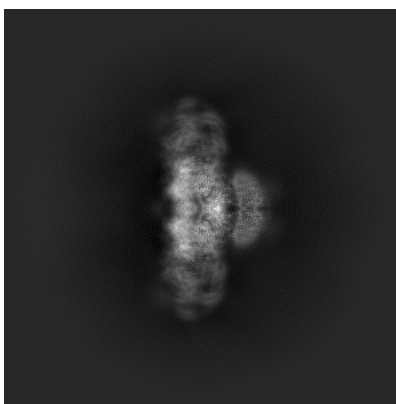
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

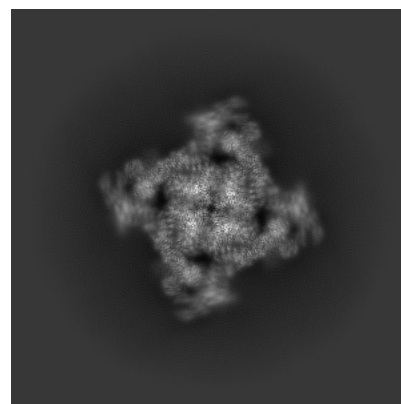
6.1.1 Primary map



X

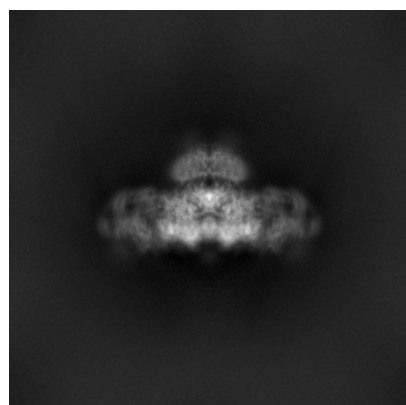


Y

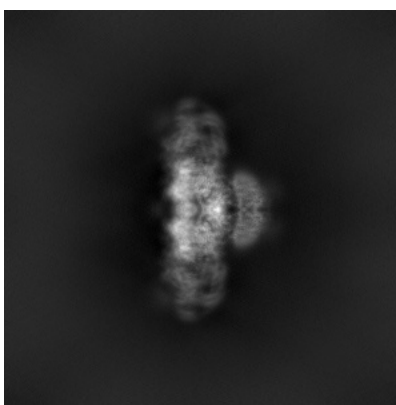


Z

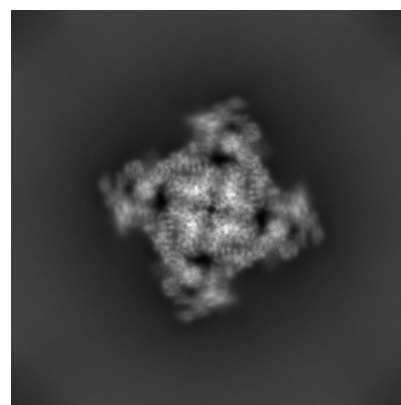
6.1.2 Raw map



X



Y

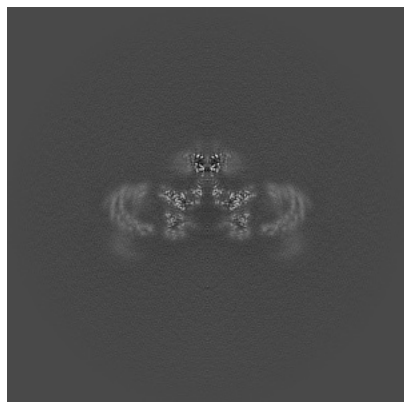


Z

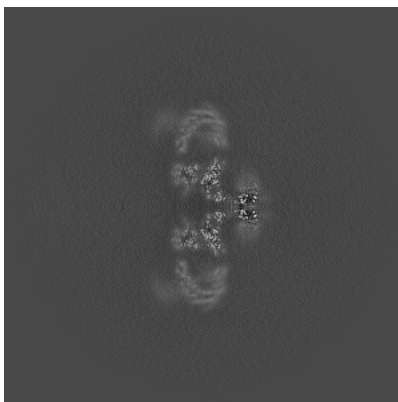
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

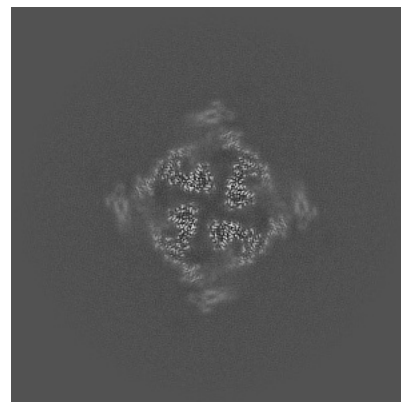
6.2.1 Primary map



X Index: 300

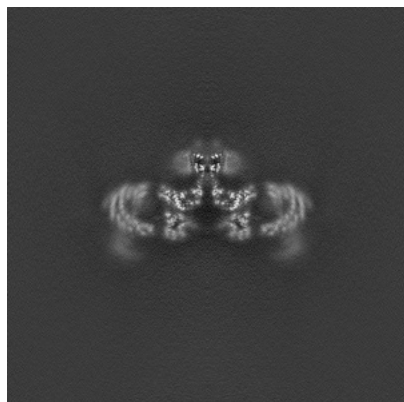


Y Index: 300

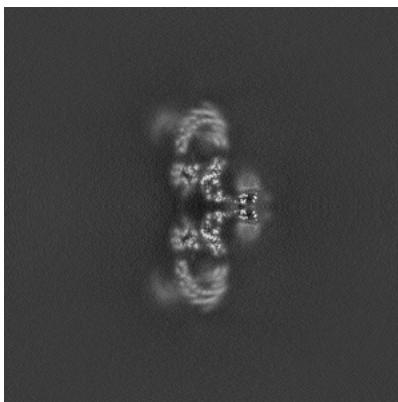


Z Index: 300

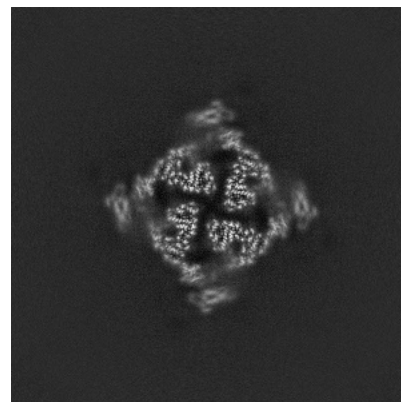
6.2.2 Raw map



X Index: 300



Y Index: 300

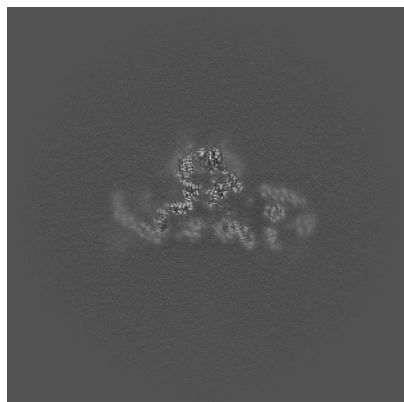


Z Index: 300

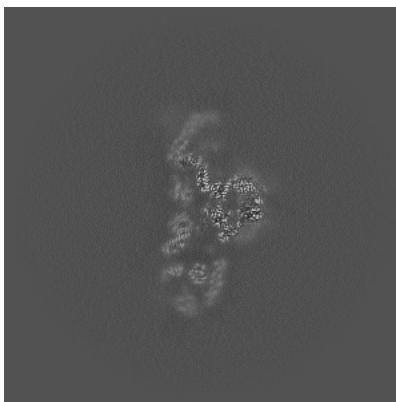
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

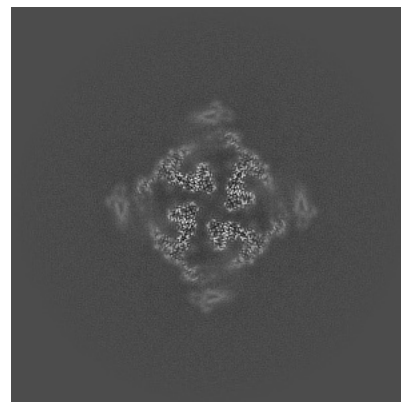
6.3.1 Primary map



X Index: 321

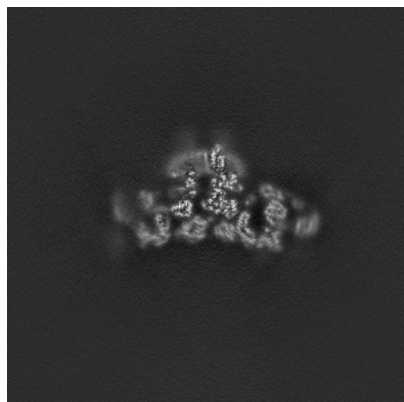


Y Index: 321

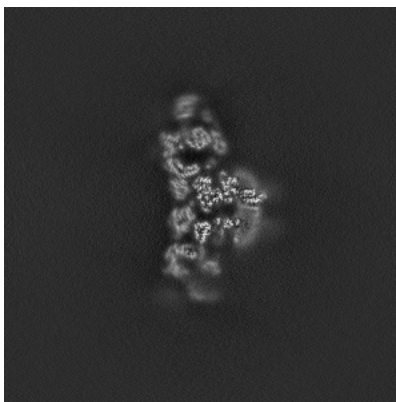


Z Index: 302

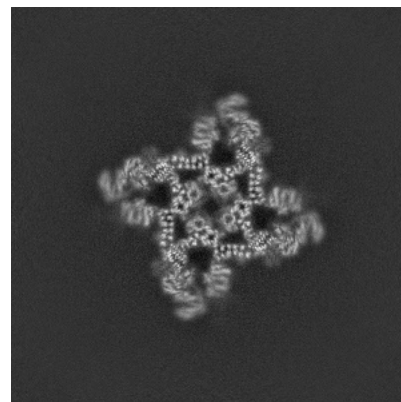
6.3.2 Raw map



X Index: 329



Y Index: 271

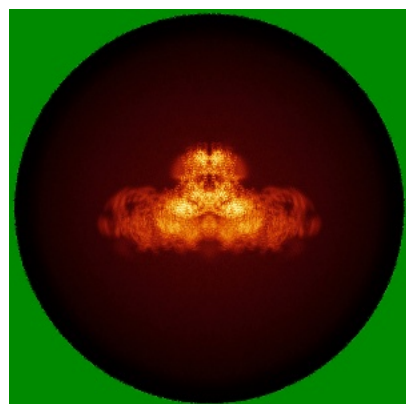


Z Index: 273

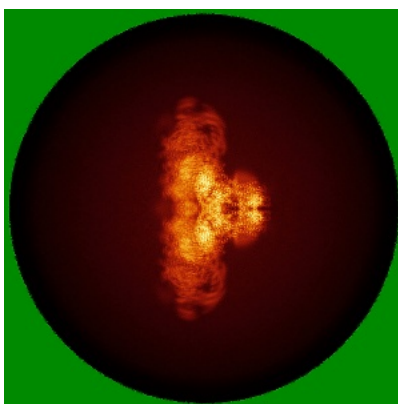
The images above show the largest variance slices of the map in three orthogonal directions.

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

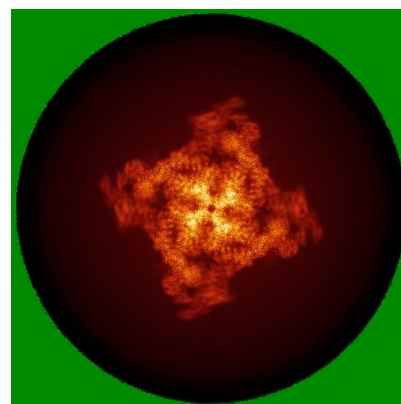
6.4.1 Primary map



X

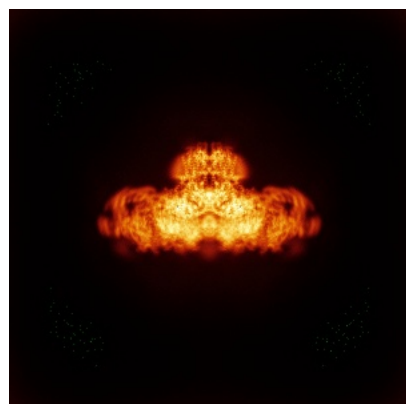


Y

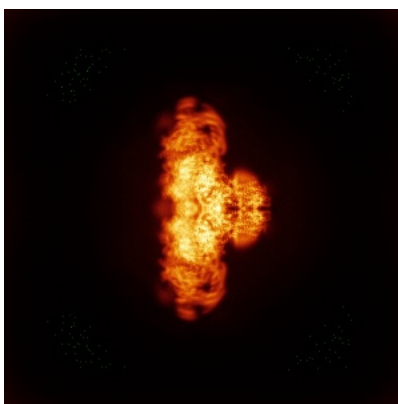


Z

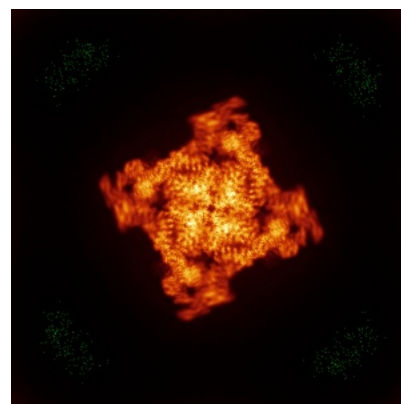
6.4.2 Raw map



X



Y

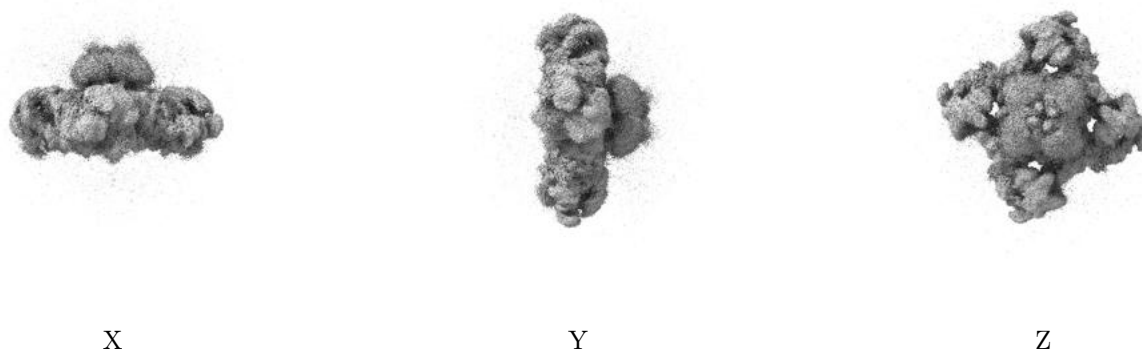


Z

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.

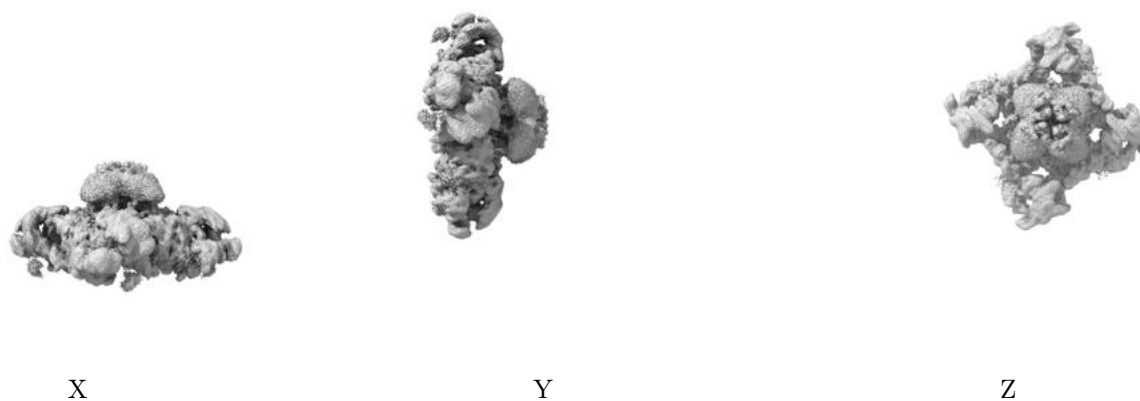
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.182. 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.

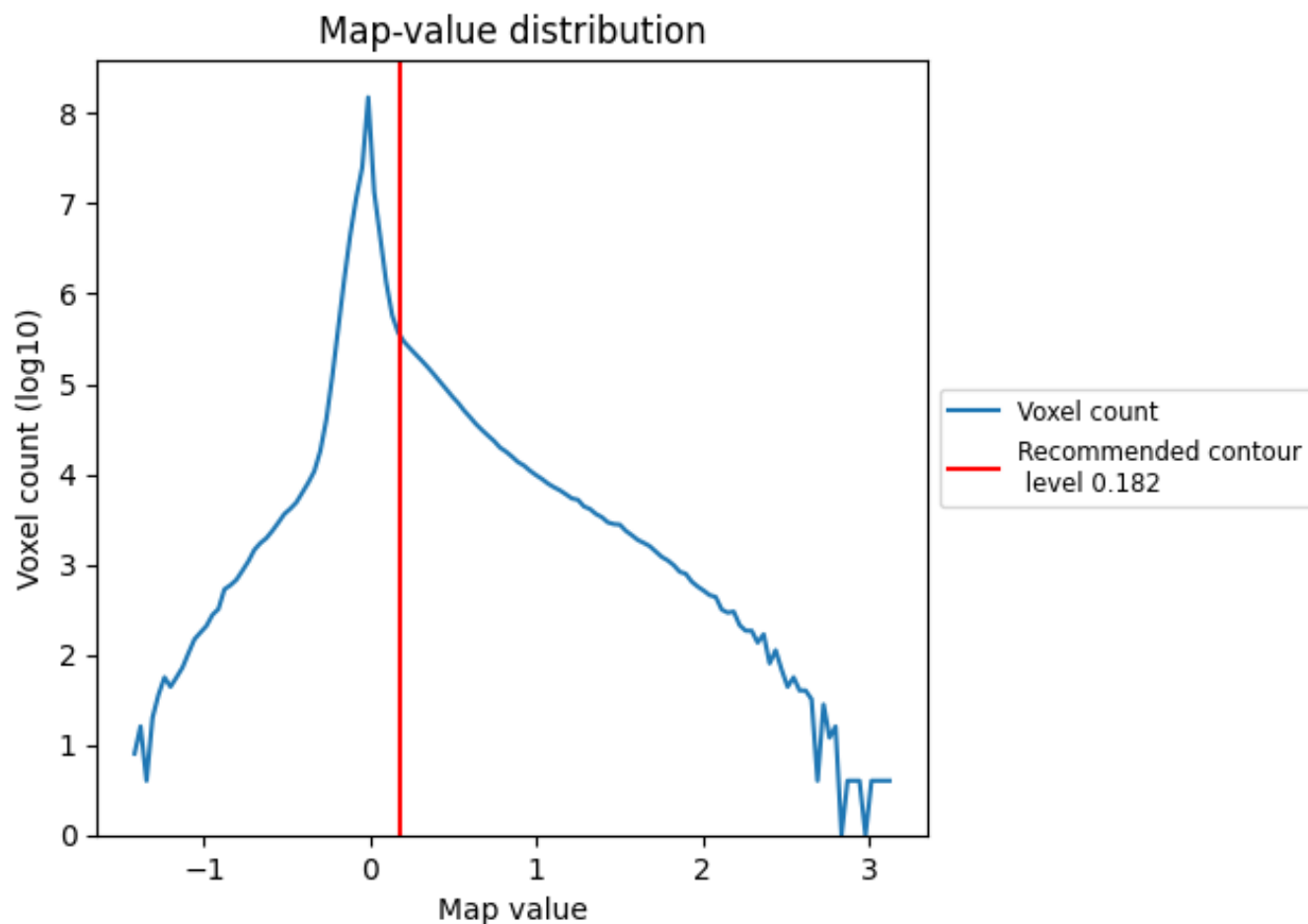
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

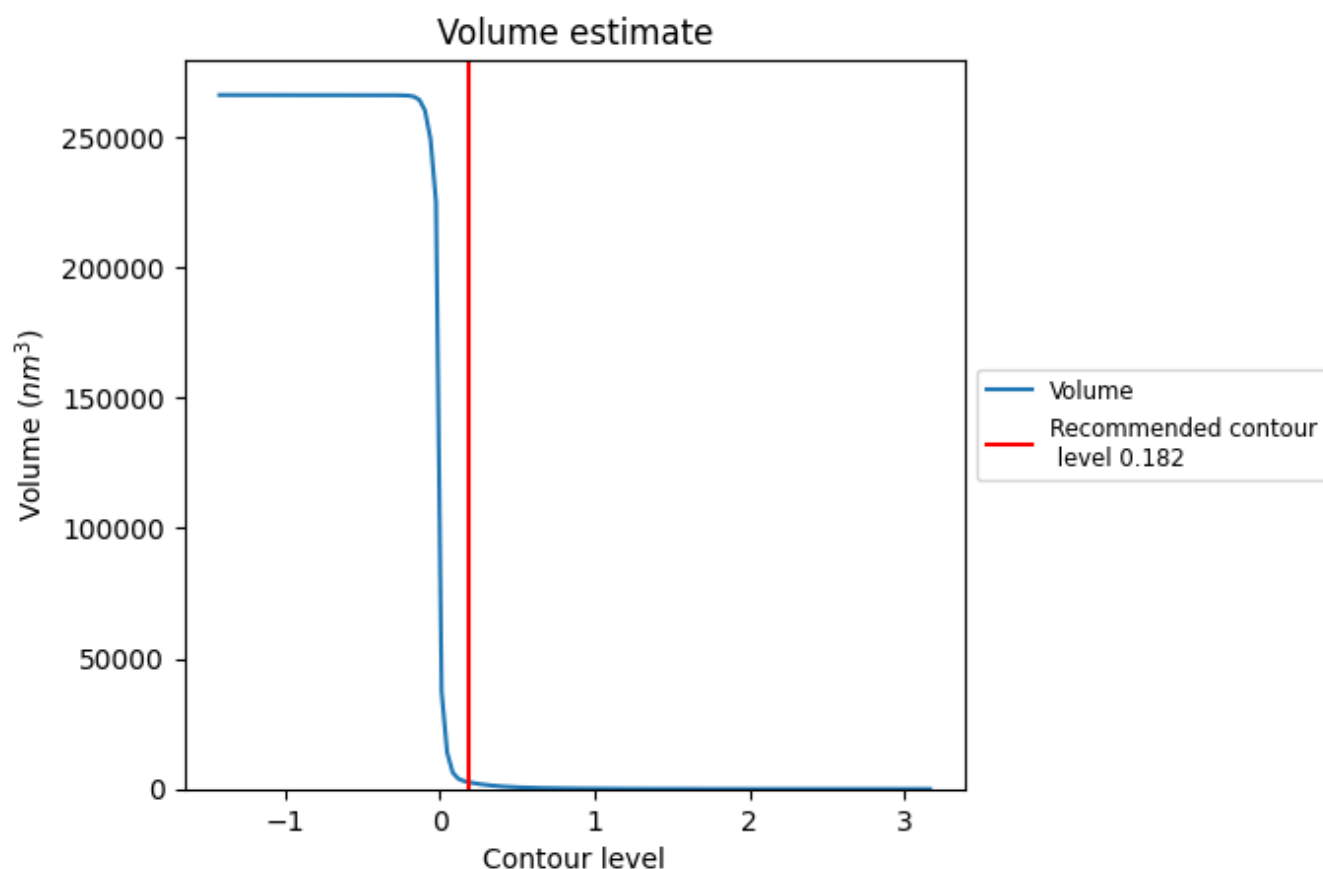
This section contains the results of statistical analysis of the map.

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.

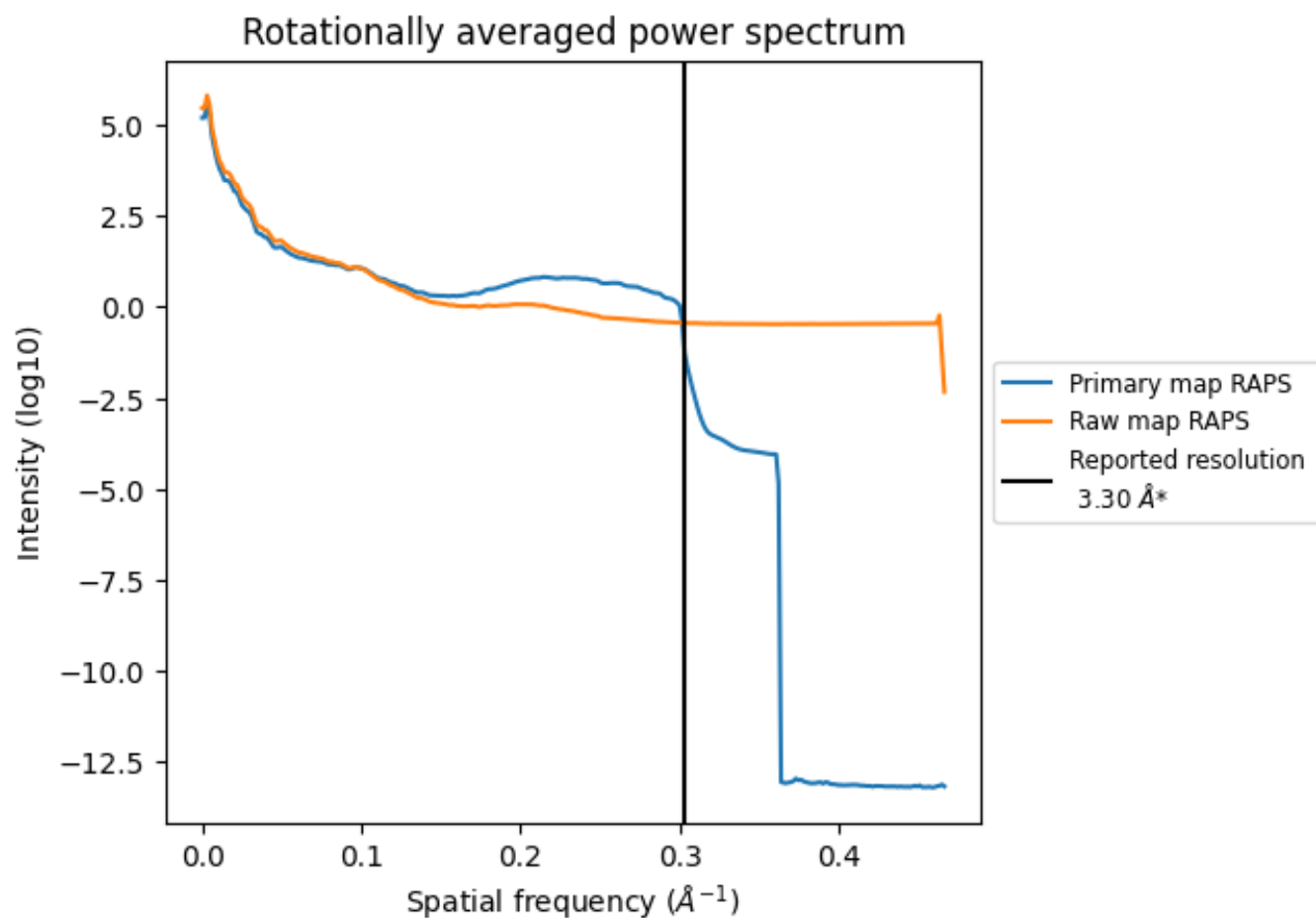
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 2676 nm^3 ; this corresponds to an approximate mass of 2418 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 ⓘ

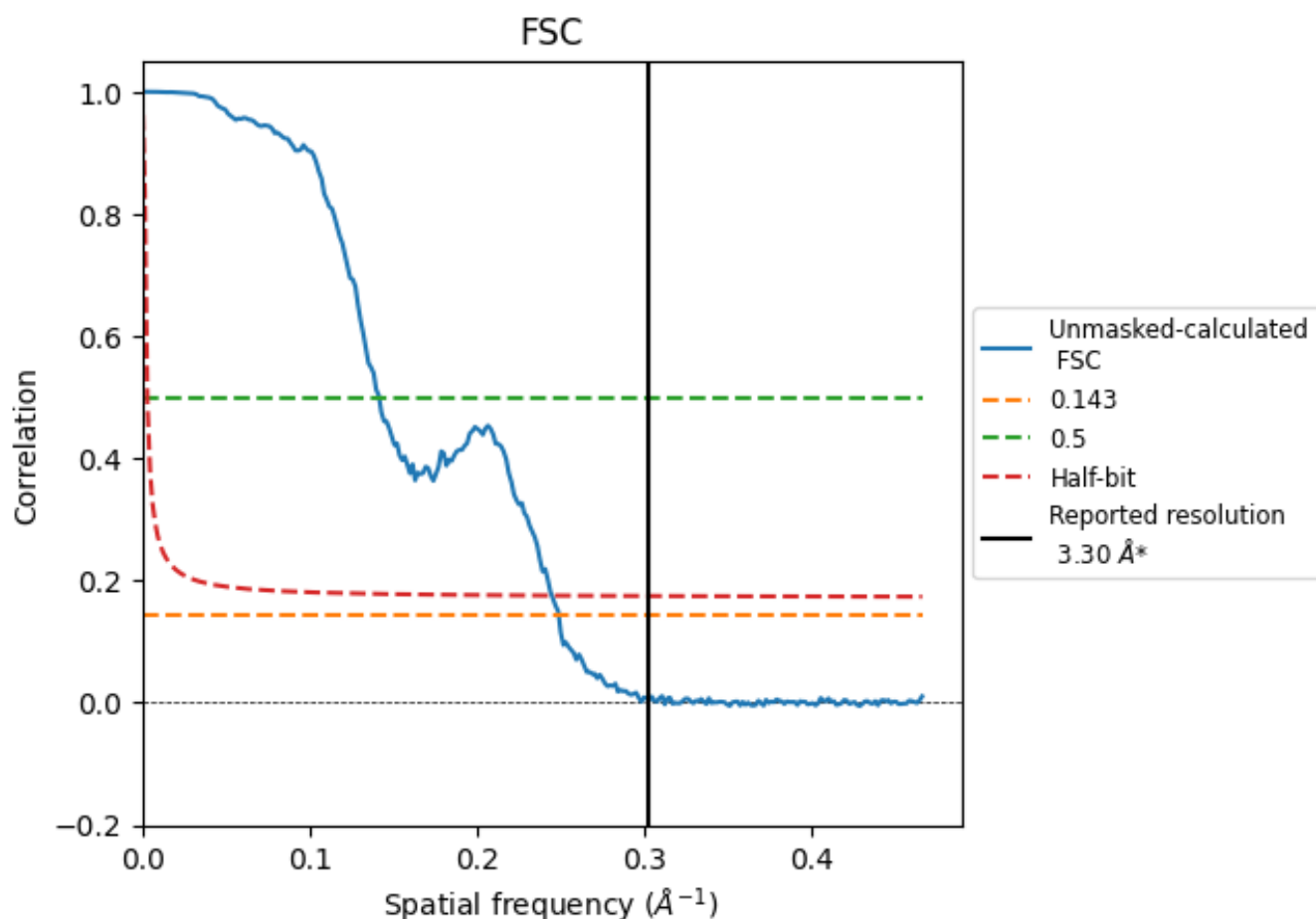


*Reported resolution corresponds to spatial frequency of 0.303 Å⁻¹

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 0.303 Å⁻¹

8.2 Resolution estimates [i](#)

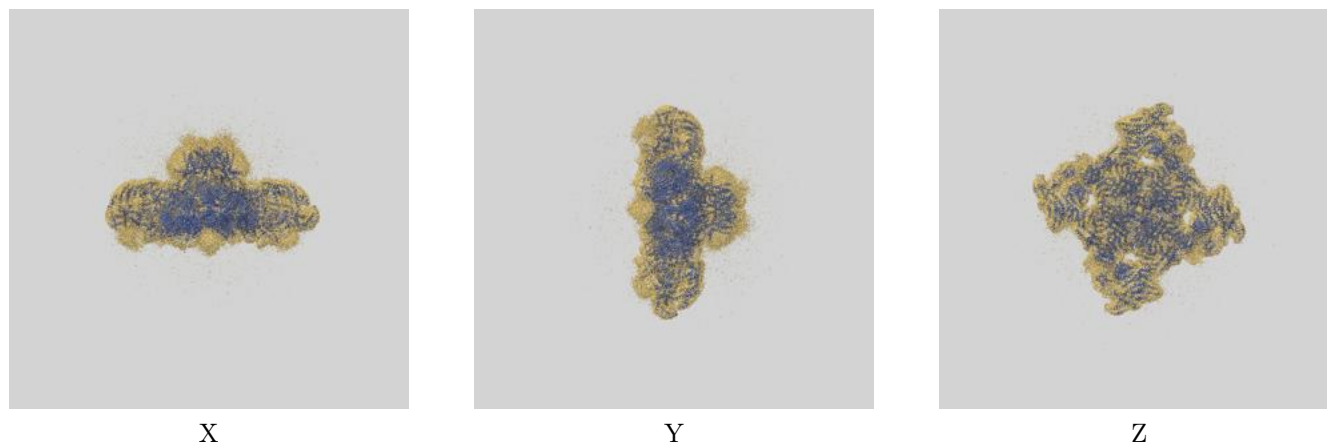
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.30	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	4.02	7.06	4.08

*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 4.02 differs from the reported value 3.3 by more than 10 %

9 Map-model fit [i](#)

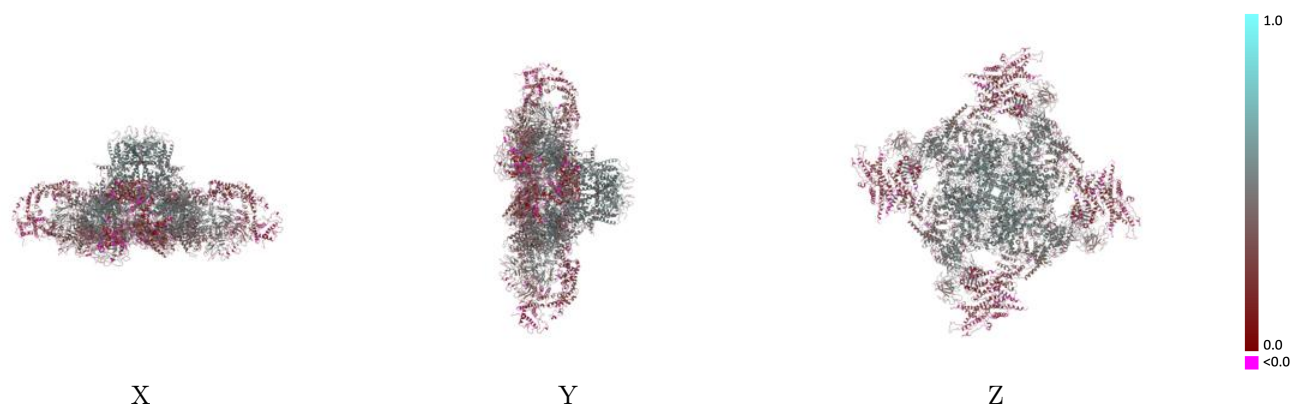
This section contains information regarding the fit between EMDB map EMD-38048 and PDB model 8X4E. Per-residue inclusion information can be found in [section 3](#) on [page 4](#).

9.1 Map-model overlay [i](#)



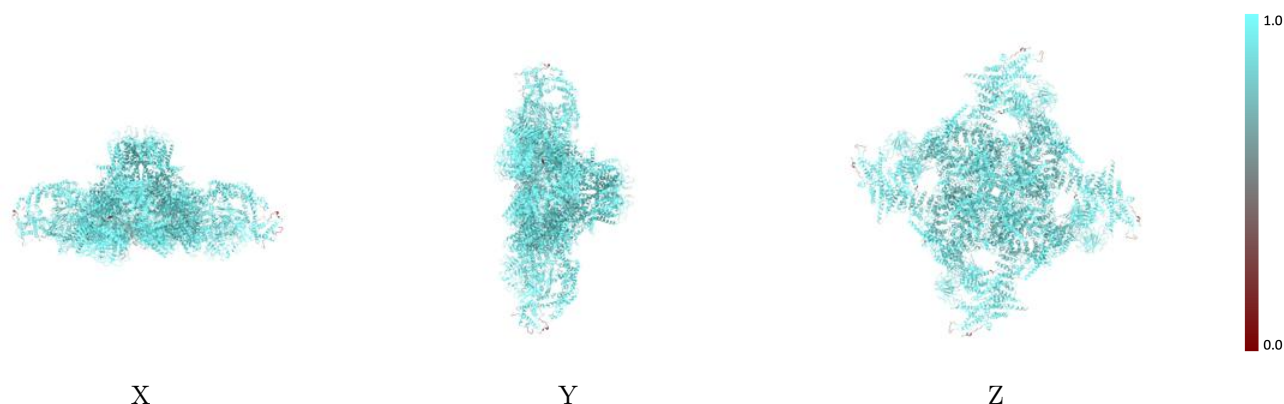
The images above show the 3D surface view of the map at the recommended contour level 0.182 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



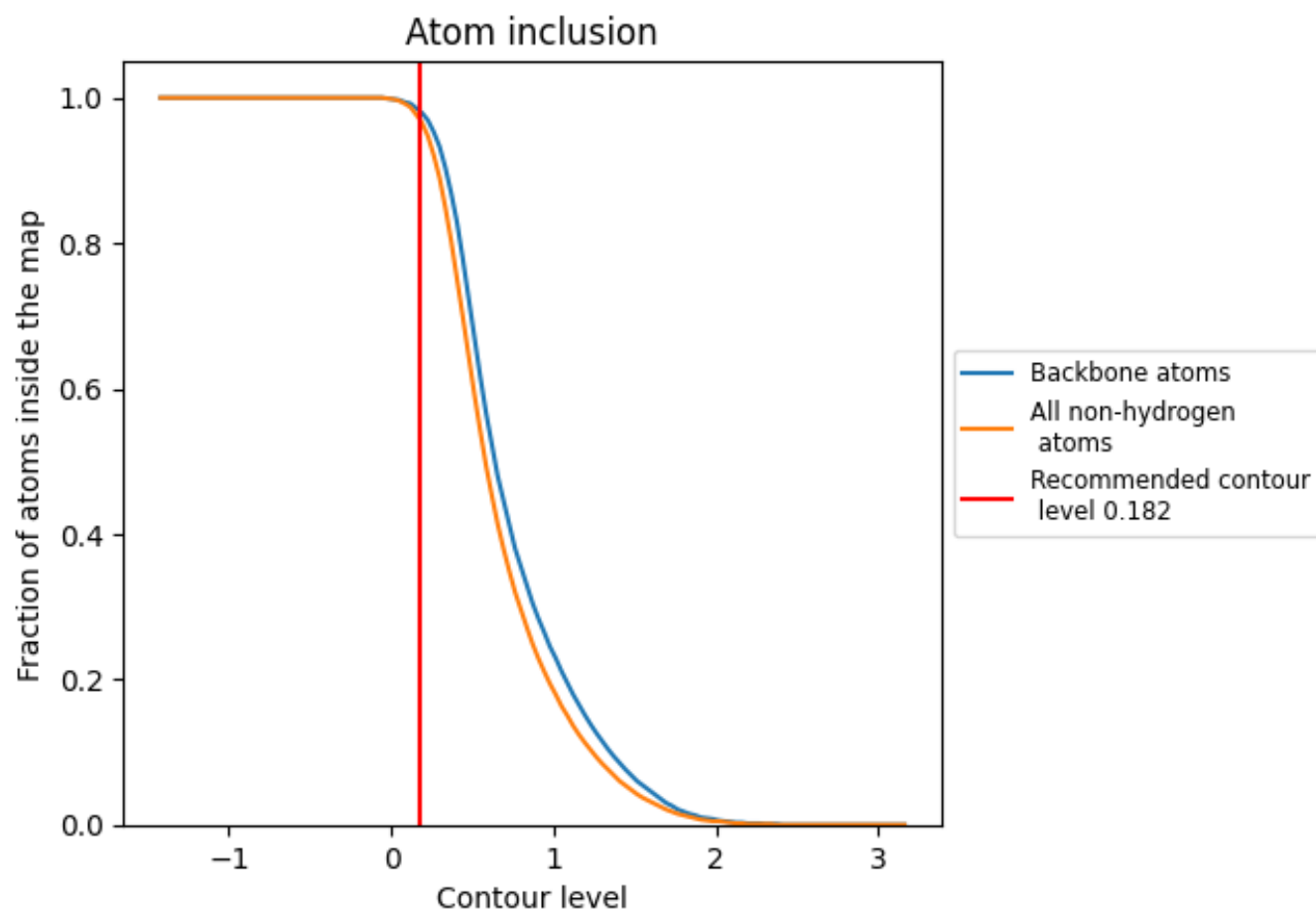
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.182).

9.4 Atom inclusion [i](#)



At the recommended contour level, 98% of all backbone atoms, 97% 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 (0.182) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	<div></div> 0.9690	<div></div> 0.3850
A	<div></div> 0.9690	<div></div> 0.3840
B	<div></div> 0.9690	<div></div> 0.3850
C	<div></div> 0.9690	<div></div> 0.3850
D	<div></div> 0.9690	<div></div> 0.3850

