



wwPDB EM Validation Summary Report ⓘ

Jul 14, 2026 – 11:49 AM JST

PDB ID : 9XAC / pdb_00009xac
EMDB ID : EMD-66682
Title : Cryo-EM structure of the pre-40S ribosome (Enp1-Rrp12 WT) from *Chaetomium thermophilum*, state Rrp12-A1
Authors : Lau, B.; Li, Y.; Zhu, J.; Fischer, P.; Hong, X.; Yuan, R.; Beckmann, R.; Hurt, E.; Cheng, J.
Deposited on : 2025-10-22
Resolution : 3.30 Å (reported)
Based on initial model : 6RXU

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
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) : 2.50

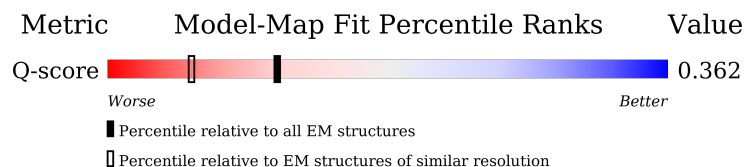
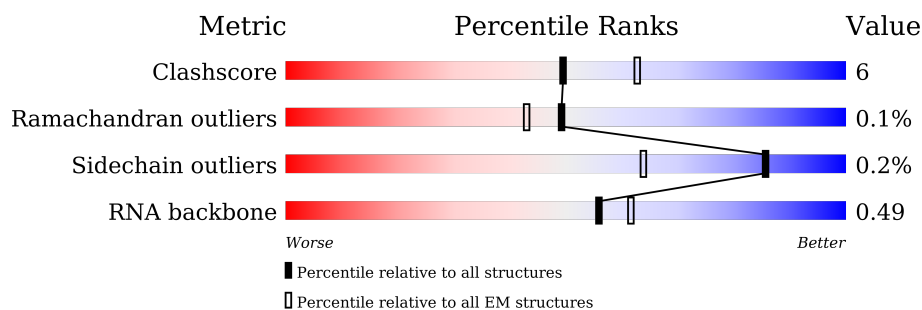
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 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.



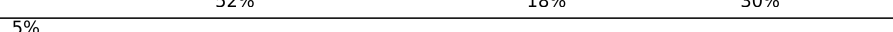
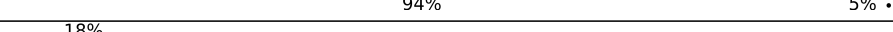
Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	229148	23984	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
RNA backbone	8273	3508	-
Q-score	-	25397	15087 (2.80 - 3.80)

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	E	255	
2	H	264	
3	I	212	

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Mol	Chain	Length	Quality of chain
4	J	239	
5	K	203	
6	L	202	
7	M	190	
8	O	161	
9	P	144	
10	Q	151	
11	R	150	
12	S	153	
13	T	143	
14	V	156	
15	W	153	
16	Z	130	
17	a	145	
18	b	136	
19	c	99	
20	e	82	
21	f	68	
22	h	62	
23	i	154	
24	A	1796	
25	0	127	
26	1	282	
27	2	830	
28	3	259	

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Mol	Chain	Length	Quality of chain
29	4	480	33%48%9%44%
30	5	445	16%15%82%
31	7	1235	80%70%10%20%

2 Entry composition [i](#)

There are 34 unique types of molecules in this entry. The entry contains 80191 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 Small ribosomal subunit protein eS1.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	E	213	Total	C	N	O	S	0	0
			1723	1096	319	303	5		

- Molecule 2 is a protein called 40S ribosomal protein S4.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	H	261	Total	C	N	O	S	0	0
			2072	1314	389	362	7		

- Molecule 3 is a protein called 40S ribosomal protein s5-like protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	I	199	Total	C	N	O	S	0	0
			1557	971	294	285	7		

- Molecule 4 is a protein called 40S ribosomal protein S6.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	J	232	Total	C	N	O	S	0	0
			1875	1171	376	323	5		

- Molecule 5 is a protein called 40S ribosomal protein S7.

Mol	Chain	Residues	Atoms				AltConf	Trace
5	K	195	Total	C	N	O	0	0
			1562	983	300	279		

- Molecule 6 is a protein called 40S ribosomal protein S8.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	L	201	Total	C	N	O	S	0	0
			1621	1009	330	281	1		

- Molecule 7 is a protein called 40S ribosomal protein s9-like protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	M	179	Total	C	N	O	S	0	0
			1466	933	290	241	2		

- Molecule 8 is a protein called 40S ribosomal protein S11-like protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
8	O	150	Total	C	N	O	S	0	0
			1222	780	236	201	5		

- Molecule 9 is a protein called 40S ribosomal protein S12.

Mol	Chain	Residues	Atoms					AltConf	Trace
9	P	118	Total	C	N	O	S	0	0
			923	577	167	171	8		

- Molecule 10 is a protein called 40S ribosomal protein S13-like protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
10	Q	150	Total	C	N	O	S	0	0
			1182	756	220	205	1		

- Molecule 11 is a protein called 40S ribosomal protein S14-like protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
11	R	135	Total	C	N	O	S	0	0
			1002	614	199	184	5		

- Molecule 12 is a protein called 40S ribosomal protein s15-like protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
12	S	115	Total	C	N	O	S	0	0
			917	583	172	159	3		

- Molecule 13 is a protein called 40S ribosomal protein S16-like protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
13	T	117	Total	C	N	O	S	0	0
			909	588	162	158	1		

- Molecule 14 is a protein called Putative ribosomal protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
14	V	122	Total	C	N	O	S	0	0
			998	629	191	177	1		

- Molecule 15 is a protein called 40S ribosomal protein S19-like protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
15	W	142	Total	C	N	O	S	0	0
			1117	694	221	201	1		

- Molecule 16 is a protein called 40S ribosomal protein S22-like protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
16	Z	129	Total	C	N	O	S	0	0
			1037	659	195	178	5		

- Molecule 17 is a protein called 40S ribosomal protein s23-like protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
17	a	142	Total	C	N	O	S	0	0
			1099	694	215	188	2		

- Molecule 18 is a protein called Small ribosomal subunit protein eS24.

Mol	Chain	Residues	Atoms					AltConf	Trace
18	b	125	Total	C	N	O	S	0	0
			1006	633	198	173	2		

- Molecule 19 is a protein called 40S ribosomal protein S25.

Mol	Chain	Residues	Atoms					AltConf	Trace
19	c	69	Total	C	N	O	S	0	0
			546	345	101	98	2		

- Molecule 20 is a protein called Ribosomal protein s27-like protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
20	e	81	Total	C	N	O	S	0	0
			611	386	111	107	7		

- Molecule 21 is a protein called 40S ribosomal protein S28-like protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
21	f	61	Total	C	N	O	S	0	0
			484	298	97	88	1		

- Molecule 22 is a protein called 40S ribosomal protein S30.

Mol	Chain	Residues	Atoms					AltConf	Trace
22	h	21	Total	C	N	O		0	0
			181	117	38	26			

- Molecule 23 is a protein called 40S ribosomal protein S27a-like protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
23	i	65	Total	C	N	O	S	0	0
			528	332	97	93	6		

- Molecule 24 is a RNA chain called 18S rRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
24	A	1582	Total	C	N	O	P	0	0
			33747	15079	6022	11064	1582		

- Molecule 25 is a protein called Trm112.

Mol	Chain	Residues	Atoms					AltConf	Trace
25	0	127	Total	C	N	O	S	0	0
			993	636	163	187	7		

- Molecule 26 is a protein called Methyltransferase-like protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
26	1	267	Total	C	N	O	S	0	0
			2013	1260	355	388	10		

- Molecule 27 is a protein called Bms1-type G domain-containing protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
27	2	728	Total	C	N	O	S	0	0
			5822	3656	1054	1092	20		

- Molecule 28 is a protein called Pre-rRNA-processing protein PNO1.

Mol	Chain	Residues	Atoms					AltConf	Trace
28	3	184	Total	C	N	O	S	0	0
			1451	921	267	256	7		

- Molecule 29 is a protein called Bystin-like protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
29	4	270	Total	C	N	O	S	0	0
			2154	1401	377	366	10		

- Molecule 30 is a protein called Putative low-temperature viability protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
30	5	80	Total	C	N	O	S	0	0
			656	414	112	129	1		

- Molecule 31 is a protein called Ribosomal RNA-processing protein 12-like conserved domain-containing protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
31	7	987	Total	C	N	O	S	0	0
			7710	4932	1326	1414	38		

- Molecule 32 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		AltConf
32	Q	1	Total	Mg	0
			1	1	
32	a	1	Total	Mg	0
			1	1	

- Molecule 33 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		AltConf
33	e	1	Total	Zn	0
			1	1	

- Molecule 34 is water.

Mol	Chain	Residues	Atoms		AltConf
34	Q	1	Total	O	0
			1	1	

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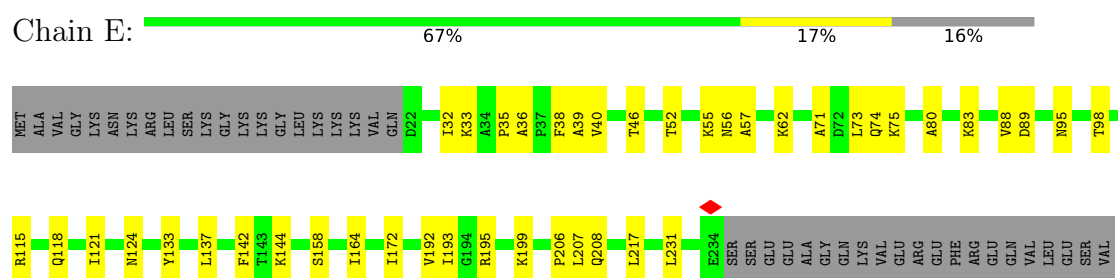
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Mol	Chain	Residues	Atoms		AltConf
34	A	3	Total	O	0
			3	3	

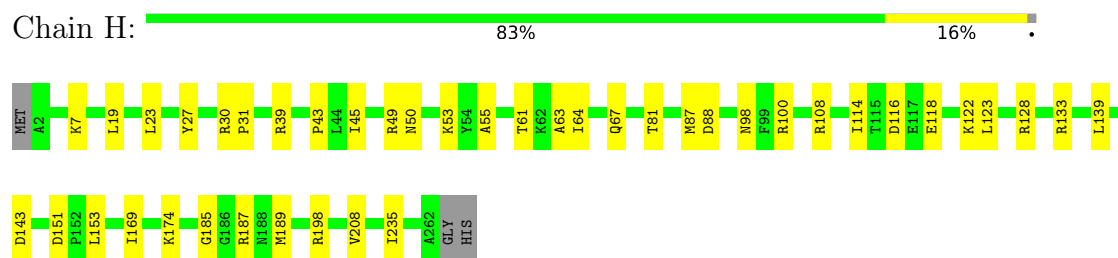
3 Residue-property plots [i](#)

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

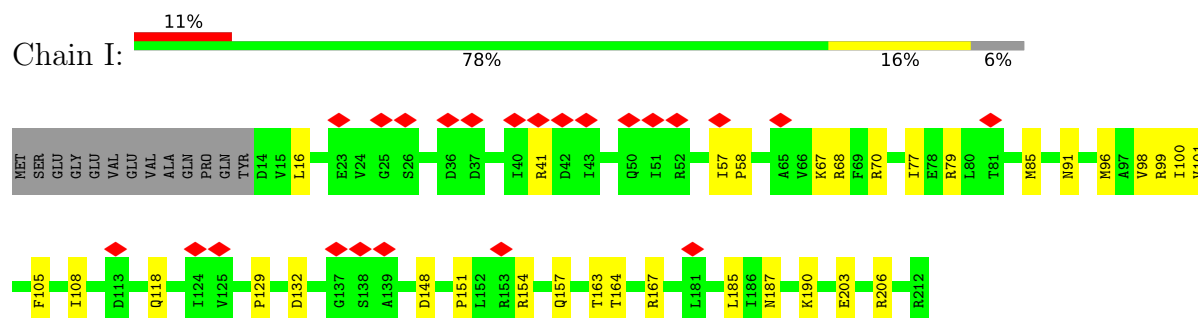
- Molecule 1: Small ribosomal subunit protein eS1



- Molecule 2: 40S ribosomal protein S4

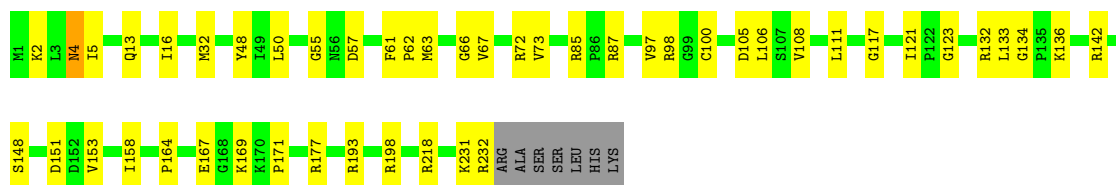


- Molecule 3: 40S ribosomal protein s5-like protein



- Molecule 4: 40S ribosomal protein S6





- Molecule 5: 40S ribosomal protein S7

Chain K: 78% 18% .



- Molecule 6: 40S ribosomal protein S8

Chain L: 89% 11%



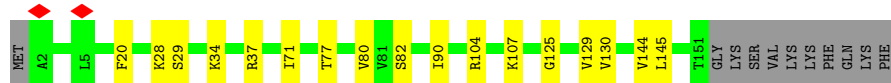
- Molecule 7: 40S ribosomal protein s9-like protein

Chain M: 81% 13% 6%



- Molecule 8: 40S ribosomal protein S11-like protein

Chain O: 83% 11% 7%



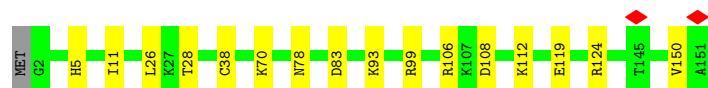
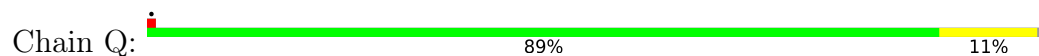
- Molecule 9: 40S ribosomal protein S12

Chain P: 76% 13% 18%

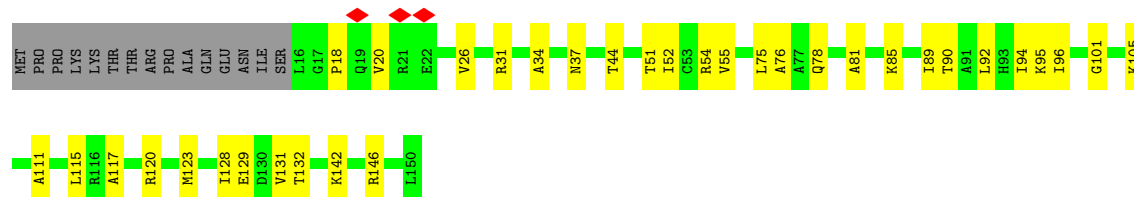




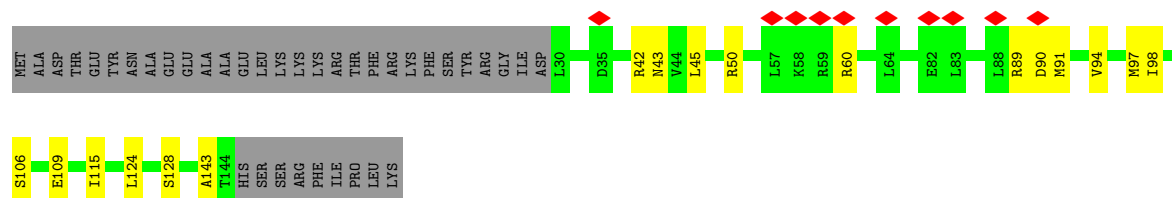
- Molecule 10: 40S ribosomal protein S13-like protein



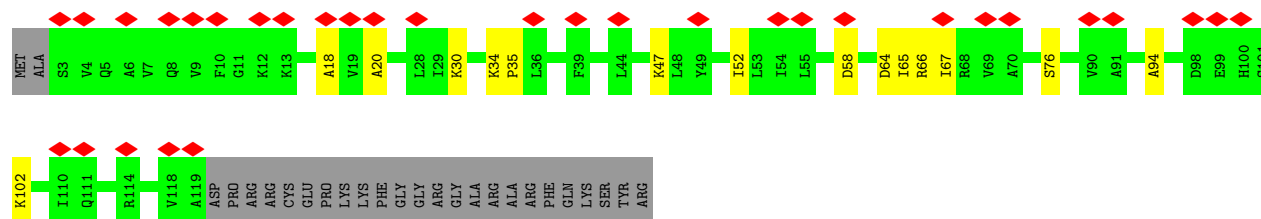
- Molecule 11: 40S ribosomal protein S14-like protein



- Molecule 12: 40S ribosomal protein s15-like protein

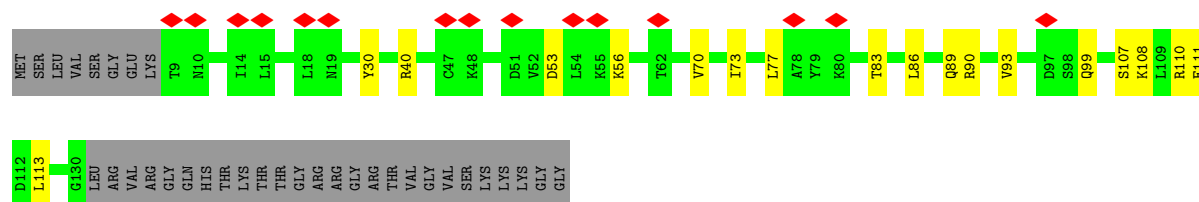


- Molecule 13: 40S ribosomal protein S16-like protein

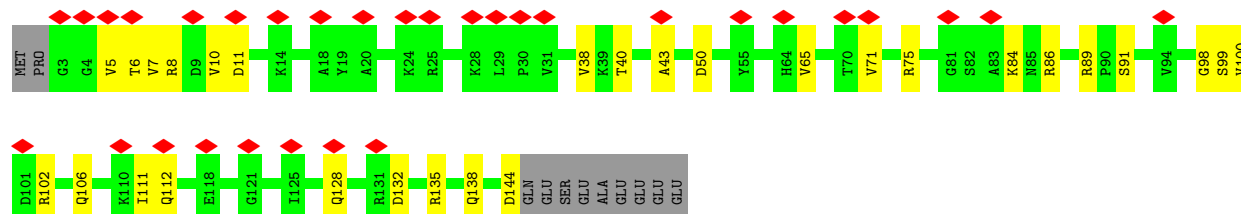
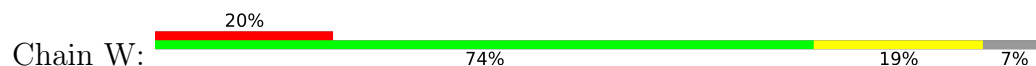


- Molecule 14: Putative ribosomal protein

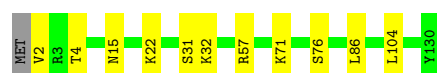
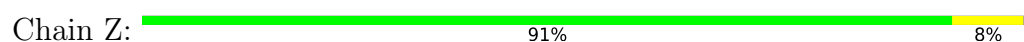




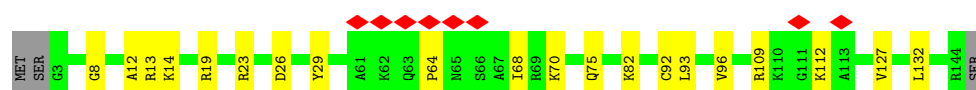
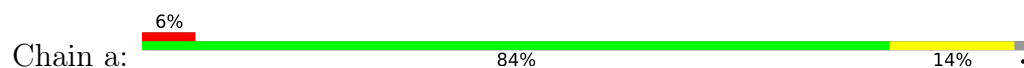
- Molecule 15: 40S ribosomal protein S19-like protein



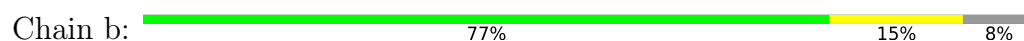
- Molecule 16: 40S ribosomal protein S22-like protein



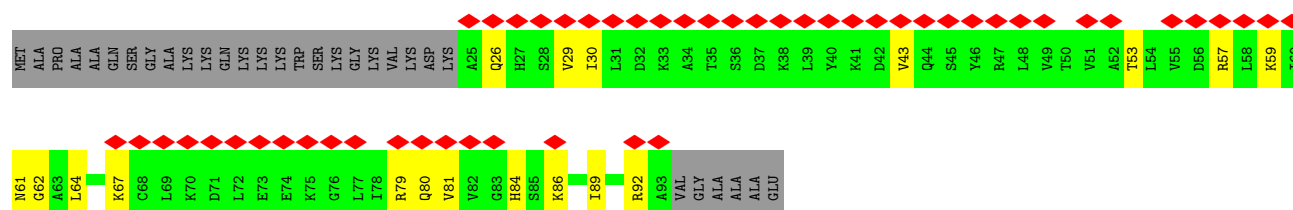
- Molecule 17: 40S ribosomal protein s23-like protein



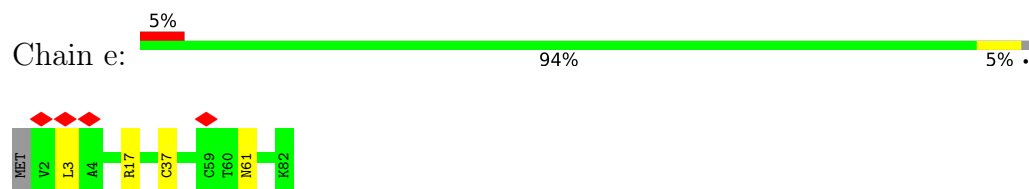
- Molecule 18: Small ribosomal subunit protein eS24



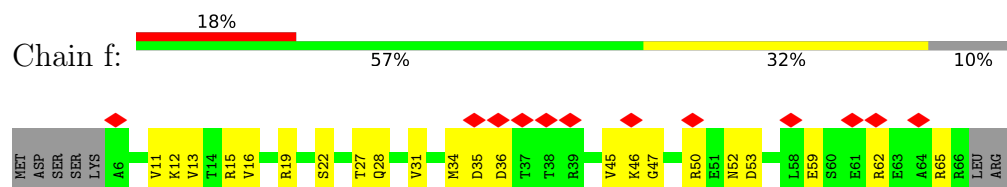
- Molecule 19: 40S ribosomal protein S25



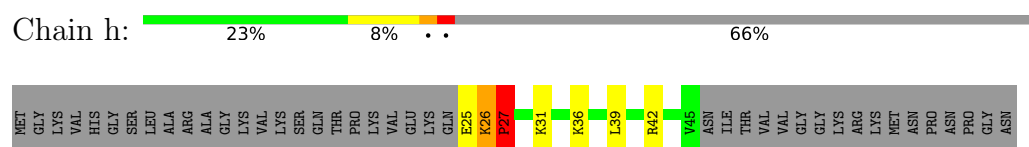
- Molecule 20: Ribosomal protein s27-like protein



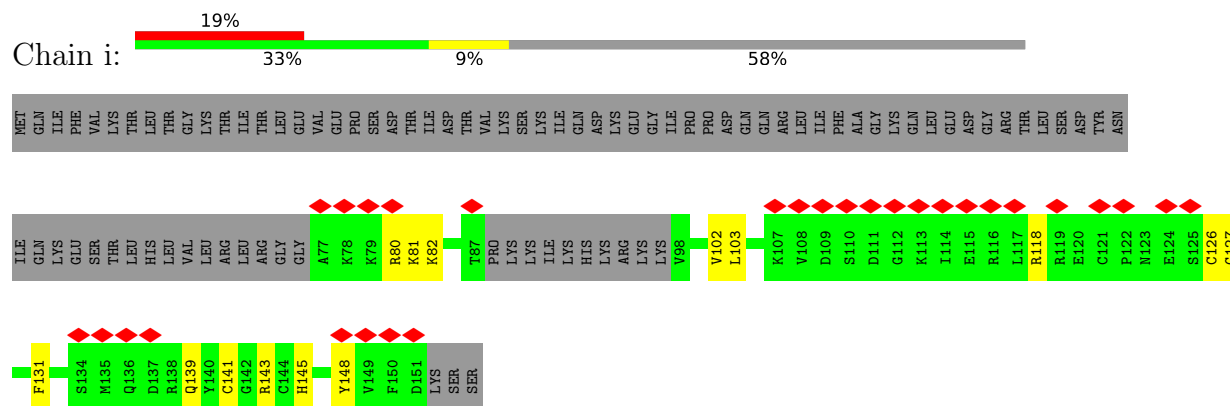
- Molecule 21: 40S ribosomal protein S28-like protein



- Molecule 22: 40S ribosomal protein S30



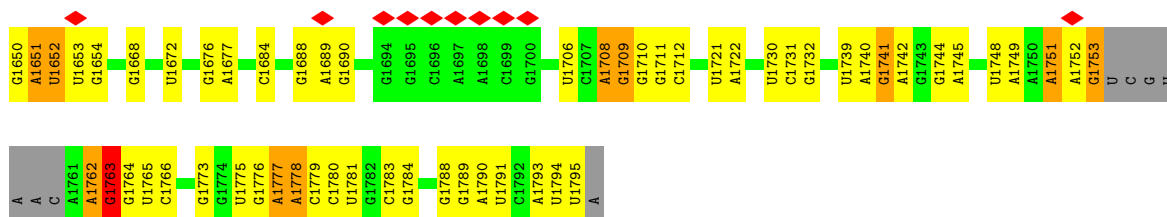
- Molecule 23: 40S ribosomal protein S27a-like protein



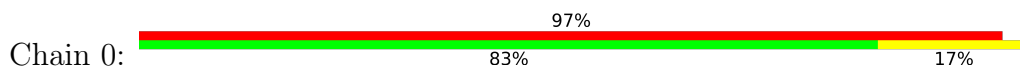
- Molecule 24: 18S rRNA



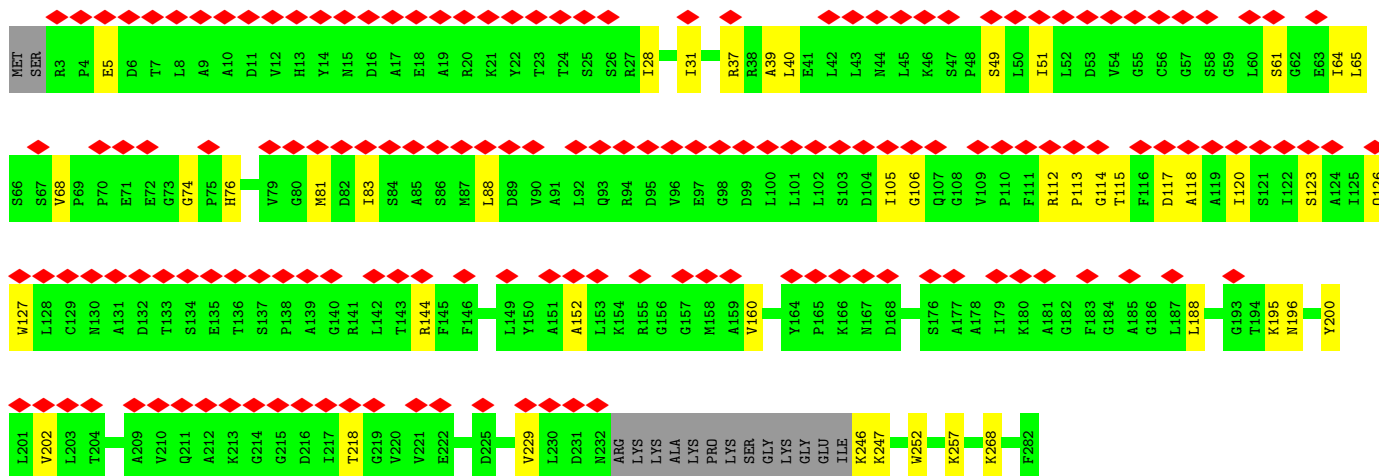
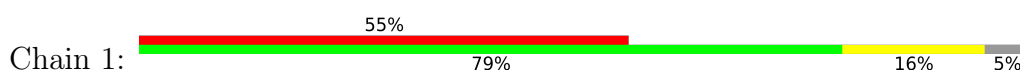




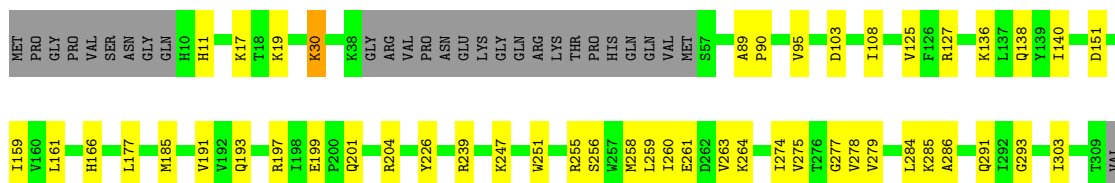
• Molecule 25: Trm112



• Molecule 26: Methyltransferase-like protein



• Molecule 27: Bms1-type G domain-containing protein



F901	D841	I781	P721	K661	A601	L541	Y481	T421	Q361	W301	E241	C181	D121
L902	A842	P782	Q722	L662	Q602	T542	T482	T422	V362	I302	L242	A182	A122
T903	P843	M783	I723	A663	K603	E543	T483	G423	L363	A303	L243	E183	A123
S904	K844	T784	Q724	Q664	N604	A544	N484	E424	V364	I304	L244	T184	G124
N905	A845	S785	K725	A665	L605	F545	T485	T425	E365	S306	L246	M186	M126
N906	T846	L786	K726	L666	E606	D546	N486	R426	P366	R307	A247	M187	M127
R907	A847	H787	A727	Q667	Y607	T547	L487	T427	S367	A308	R248	S188	S128
F908	S848	F788	Y728	E668	L608	A548	N488	N428	I368	Y309	H249	L189	A129
I909	L849	I789	K729	P669	G609	F549	H489	D429	Y369	D310	G250	R190	A130
V910	E850	P790	L730	V670	E610	A550	F490	S430	D370	V311	N251	A191	Q131
K911	E851	S791	I731	Q671	R611	E551	K491	F431	E371	A312	E252	V192	I132
S912	Y852	T792	P732	K672	F612	M552	T492	T432	K372	A133	H253	F193	G133
V913	M853	L793	R733	P673	A613	L553	E493	G433	V373	Q314	M254	D194	P134
L914	T854	S794	L734	K674	A614	T554	L494	K434	I374	I315	S255	L195	R135
G915	M855	E795	A735	N675	D615	T555	V495	Q435	E375	S316	M256	ALA	R136
F916	V856	V796	E736	P676	T616	V556	P496	E436	K376	F317	A257	THR	V137
S917	S857	T797	S737	N677	L617	L557	L497	A437	L377	E318	E258	LYS	V138
K918	A858	I798	E738	Q678	A618	Y558	S498	D438	V378	E319	F259	ARG	G139
V919	S859	G799	Y739	E679	V619	E559	A499	V439	Q379	E319	F259	LYS	G139
C920	L860	C800	G740	Q680	L620	Q560	A500	V440	T380	T320	E260	GLU	G140
I921	A861	R801	R741	V681	F621	P561	M501	L441	V381	F321	I261	LYS	L141
E922	C862	E802	A742	P682	N622	E562	Y502	G442	E382	Q322	F262	GLY	L142
S923	S863	H803	A743	S683	V623	L563	Q503	K443	G383	E323	E263	SER	S143
L924	T864	N804	L744	T684	Y624	R564	R504	A444	L384	I324	M264	GLU	F144
P925	P865	E805	E745	A685	S625	L565	V505	T445	L385	L325	I265	SER	A145
T926	H866	K806	Q746	H686	T626	D566	L506	R446	T386	E326	F266	ALA	L146
D927	M867	A807	R747	T687	T627	V567	E507	A447	I387	P327	E267	HIS	D147
L928	L868	R808	H748	L688	T628	C568	H508	N448	K388	F328	G268	ASP	P148
N929	S869	T809	E749	M689	P629	R569	G509	G449	Q389	N329	M269	P212	P148
L930	A870	T810	E750	D690	Q630	A570	N510	P450	Y390	L330	A270	E213	P150
P931	T871	A811	V751	L691	K631	L571	A511	E451	A391	V331	D271	L214	K151
R932	L872	F812	Q752	V692	R632	R572	P512	A452	A392	A332	E272	I215	V152
L933	L873	D813	Q753	V693	G633	A573	K513	V453	W393	S333	V273	H216	R153
P934	A874	L814	L754	T694	P634	L574	T514	L454	L394	Y334	A274	L218	K154
T935	L875	L815	L755	M695	V635	V575	M515	M455	E395	L335	S275	Q219	R155
L936	T876	V816	L756	S696	L636	E576	E516	V456	T396	E336	A276	L220	A156
P937	R877	L817	S757	Y697	Q637	S577	V517	L457	F397	S337	K277	Y221	Q157
N938	V878	M818	A758	V698	T638	N578	K518	P458	N398	E338	Q277	K222	D158
I939	A759	G819	A759	L699	L639	Q779	I519	L459	V399	A339	P279	T223	A159
V940	D760	H820	D760	P700	N640	A580	F520	N460	I400	K340	R280	I224	L160
L941	K761	K821	K761	R701	S641	I581	E521	L461	G401	N341	L281	A225	R161
V942	F762	M822	V762	E702	F642	V582	T522	L462	A402	I342	L282	G226	K162
W943	S763	S703	S763	S703	L643	S583	V523	K463	M403	R343	E283	G227	I163
S944	S764	F704	S764	F704	S644	A584	V524	P464	F404	I344	I284	S228	L164
N945	P765	E705	P765	E705	T645	G585	Q525	A465	D405	S345	I285	G229	R165
E946	A766	A706	A766	A706	T646	D586	Q526	R466	A406	A346	K286	Q230	N166
R947	R767	L707	R767	V587	P647	V587	I527	D467	L407	S347	E287	W231	P167
K948	R768	F708	R768	E588	K648	E588	N528	Q468	R408	E348	L288	P232	P168
G949	E769	K709	E769	D589	T649	D589	S529	P469	W409	C349	R289	S233	P169
H950	R770	L710	R770	P590	R650	P590	I530	G470	W409	R410	P290	K234	S170
F951	L771	D831	L771	V591	L651	V591	L531	R471	S411	V351	A291	K235	P171
S952	A772	N832	A772	I592	M652	I592	P532	A472	H412	S352	P292	I236	S172
N953	L773	S833	L773	L593	E653	L593	G533	W473	P413	F353	N293	E237	L173
K954	T774	K834	T774	C594	T654	C594	V534	N474	Y414	I354	D294	P238	D174
V955	A775	W835	A775	R595	F655	R595	C535	L475	L415	A355	V295	L239	H175
K956	R776	P836	R776	V596	D656	V596	D536	P476	L416	N356	Q296	C240	P176
H957	L777	H837	L777	S597	L657	S597	L537	L477	G417	C357	L297	V177	A177
L958	T778	M838	T778	K598	V658	K598	P538	L478	L418	V358	L298	I236	L177
F959	P779	P839	P779	Q599	C659	Q599	L539	R479	T419	P359	P299	E237	P179
E960	I780	K840	I780	T600	E660	T600	D540	D480	K420	P360	P300	G240	M180

[illegible]

4 Experimental information ⓘ

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	52758	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE; Relion	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	50	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	Not provided	
Image detector	FEI FALCON IV (4k x 4k)	Depositor
Maximum map value	0.479	Depositor
Minimum map value	-0.264	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.008	Depositor
Recommended contour level	0.02	Depositor
Map size ($\text{\AA}$)	412.56, 412.56, 412.56	wwPDB
Map dimensions	360, 360, 360	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing ($\text{\AA}$)	1.146, 1.146, 1.146	Depositor

5 Model quality

5.1 Standard geometry

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

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	E	0.20	0/1752	0.54	0/2361
2	H	0.21	0/2112	0.46	0/2842
3	I	0.17	0/1578	0.49	0/2130
4	J	0.17	0/1906	0.48	1/2547 (0.0%)
5	K	0.22	0/1587	0.58	0/2140
6	L	0.20	0/1654	0.43	0/2213
7	M	0.22	0/1489	0.43	0/1993
8	O	0.20	0/1249	0.41	0/1678
9	P	0.17	0/934	0.51	0/1255
10	Q	0.19	0/1205	0.41	0/1627
11	R	0.23	0/1014	0.61	0/1361
12	S	0.18	0/932	0.46	0/1248
13	T	0.17	0/922	0.50	1/1241 (0.1%)
14	V	0.17	0/1012	0.51	0/1360
15	W	0.17	0/1137	0.50	1/1533 (0.1%)
16	Z	0.21	0/1055	0.51	0/1416
17	a	0.21	0/1116	0.46	0/1489
18	b	0.17	0/1020	0.41	0/1361
19	c	0.17	0/550	0.47	0/736
20	e	0.19	0/623	0.51	0/843
21	f	0.18	0/487	0.58	2/653 (0.3%)
22	h	0.42	0/184	0.75	0/242
23	i	0.13	0/535	0.37	0/710
24	A	0.21	0/37742	0.37	4/58803 (0.0%)
25	0	0.15	0/1013	0.39	0/1378
26	1	0.18	0/2043	0.43	0/2753
27	2	0.23	0/5944	0.47	0/8037
28	3	0.28	0/1475	0.53	0/1982
29	4	0.17	0/2205	0.46	0/2990
30	5	0.22	0/666	0.59	0/891
31	7	0.17	0/7862	0.40	0/10681
All	All	0.20	0/85003	0.42	9/122494 (0.0%)

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

Mol	Chain	#Chirality outliers	#Planarity outliers
27	2	0	1

There are no bond length outliers.

The worst 5 of 9 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
24	A	1763	G	C2'-C3'-O3'	-10.52	97.91	113.70
24	A	1763	G	C1'-O4'-C4'	-6.81	103.09	109.90
24	A	1763	G	C4'-C3'-O3'	6.09	122.14	113.00
15	W	111	ILE	N-CA-C	-5.61	107.02	112.29
13	T	76	SER	N-CA-C	-5.54	105.82	113.18

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
27	2	199	GLU	Peptide

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	E	1723	0	1804	24	0
2	H	2072	0	2155	31	0
3	I	1557	0	1608	24	0
4	J	1875	0	1983	33	0
5	K	1562	0	1641	26	0
6	L	1621	0	1645	17	0
7	M	1466	0	1582	17	0
8	O	1222	0	1289	13	0
9	P	923	0	946	11	0
10	Q	1182	0	1264	11	0
11	R	1002	0	1034	22	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
12	S	917	0	978	13	0
13	T	909	0	973	10	0
14	V	998	0	1042	11	0
15	W	1117	0	1133	20	0
16	Z	1037	0	1076	10	0
17	a	1099	0	1169	14	0
18	b	1006	0	1082	13	0
19	c	546	0	591	10	0
20	e	611	0	633	3	0
21	f	484	0	513	13	0
22	h	181	0	207	6	0
23	i	528	0	541	9	0
24	A	33747	0	17006	313	0
25	0	993	0	1018	14	0
26	1	2013	0	2043	28	0
27	2	5822	0	5825	88	0
28	3	1451	0	1524	11	0
29	4	2154	0	2242	30	0
30	5	656	0	645	11	0
31	7	7710	0	7978	74	0
32	Q	1	0	0	0	0
32	a	1	0	0	0	0
33	e	1	0	0	0	0
34	A	3	0	0	0	0
34	Q	1	0	0	0	0
All	All	80191	0	65170	816	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.

The worst 5 of 816 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)
24:A:700:G:N2	24:A:732:A:H2	1.41	1.17
24:A:700:G:N2	24:A:732:A:C2	2.14	1.15
24:A:1650:G:N2	24:A:1742:A:H62	1.60	0.98
24:A:1265:G:H1	24:A:1438:U:H3	1.08	0.97
24:A:1584:G:H1	24:A:1604:U:H3	0.97	0.96

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	E	211/255 (83%)	194 (92%)	16 (8%)	1 (0%)	24	55
2	H	259/264 (98%)	248 (96%)	11 (4%)	0	100	100
3	I	197/212 (93%)	187 (95%)	10 (5%)	0	100	100
4	J	230/239 (96%)	216 (94%)	14 (6%)	0	100	100
5	K	193/203 (95%)	186 (96%)	7 (4%)	0	100	100
6	L	199/202 (98%)	192 (96%)	7 (4%)	0	100	100
7	M	177/190 (93%)	170 (96%)	7 (4%)	0	100	100
8	O	148/161 (92%)	141 (95%)	7 (5%)	0	100	100
9	P	116/144 (81%)	105 (90%)	11 (10%)	0	100	100
10	Q	148/151 (98%)	147 (99%)	1 (1%)	0	100	100
11	R	133/150 (89%)	123 (92%)	10 (8%)	0	100	100
12	S	113/153 (74%)	109 (96%)	4 (4%)	0	100	100
13	T	115/143 (80%)	108 (94%)	7 (6%)	0	100	100
14	V	120/156 (77%)	113 (94%)	6 (5%)	1 (1%)	16	45
15	W	140/153 (92%)	133 (95%)	7 (5%)	0	100	100
16	Z	127/130 (98%)	118 (93%)	9 (7%)	0	100	100
17	a	140/145 (97%)	134 (96%)	6 (4%)	0	100	100
18	b	123/136 (90%)	121 (98%)	2 (2%)	0	100	100
19	c	67/99 (68%)	66 (98%)	1 (2%)	0	100	100
20	e	79/82 (96%)	75 (95%)	4 (5%)	0	100	100
21	f	59/68 (87%)	54 (92%)	5 (8%)	0	100	100
22	h	19/62 (31%)	17 (90%)	1 (5%)	1 (5%)	1	10
23	i	61/154 (40%)	53 (87%)	8 (13%)	0	100	100
25	0	125/127 (98%)	125 (100%)	0	0	100	100
26	1	263/282 (93%)	254 (97%)	9 (3%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
27	2	720/830 (87%)	687 (95%)	32 (4%)	1 (0%)	48	75
28	3	182/259 (70%)	178 (98%)	4 (2%)	0	100	100
29	4	268/480 (56%)	262 (98%)	6 (2%)	0	100	100
30	5	76/445 (17%)	72 (95%)	4 (5%)	0	100	100
31	7	983/1235 (80%)	967 (98%)	16 (2%)	0	100	100
All	All	5791/7310 (79%)	5555 (96%)	232 (4%)	4 (0%)	49	75

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	E	35	PRO
14	V	93	VAL
27	2	372	ASP
22	h	27	PRO

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	E	187/223 (84%)	187 (100%)	0	100	100
2	H	219/221 (99%)	219 (100%)	0	100	100
3	I	167/178 (94%)	167 (100%)	0	100	100
4	J	198/204 (97%)	197 (100%)	1 (0%)	81	83
5	K	169/177 (96%)	168 (99%)	1 (1%)	78	81
6	L	163/164 (99%)	163 (100%)	0	100	100
7	M	154/162 (95%)	153 (99%)	1 (1%)	78	81
8	O	133/143 (93%)	133 (100%)	0	100	100
9	P	101/121 (84%)	101 (100%)	0	100	100
10	Q	129/130 (99%)	129 (100%)	0	100	100
11	R	102/117 (87%)	102 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
12	S	99/132 (75%)	99 (100%)	0	100	100
13	T	95/115 (83%)	95 (100%)	0	100	100
14	V	108/135 (80%)	108 (100%)	0	100	100
15	W	114/124 (92%)	114 (100%)	0	100	100
16	Z	112/113 (99%)	112 (100%)	0	100	100
17	a	113/116 (97%)	113 (100%)	0	100	100
18	b	107/115 (93%)	107 (100%)	0	100	100
19	c	60/80 (75%)	60 (100%)	0	100	100
20	e	70/71 (99%)	70 (100%)	0	100	100
21	f	54/61 (88%)	54 (100%)	0	100	100
22	h	19/52 (36%)	16 (84%)	3 (16%)	2	12
23	i	57/139 (41%)	57 (100%)	0	100	100
25	0	113/113 (100%)	113 (100%)	0	100	100
26	1	215/227 (95%)	215 (100%)	0	100	100
27	2	631/714 (88%)	627 (99%)	4 (1%)	78	81
28	3	155/215 (72%)	154 (99%)	1 (1%)	78	81
29	4	229/411 (56%)	229 (100%)	0	100	100
30	5	70/373 (19%)	70 (100%)	0	100	100
31	7	850/1049 (81%)	850 (100%)	0	100	100
All	All	4993/6195 (81%)	4982 (100%)	11 (0%)	85	88

5 of 11 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
27	2	17	LYS
27	2	19	LYS
28	3	240	GLN
27	2	30	LYS
22	h	26	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 39 such sidechains are listed below:

Mol	Chain	Res	Type
27	2	166	HIS

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Mol	Chain	Res	Type
30	5	382	GLN
27	2	236	ASN
27	2	789	GLN
31	7	412	HIS

5.3.3 RNA [i](#)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
24	A	1572/1796 (87%)	367 (23%)	14 (0%)

5 of 367 RNA backbone outliers are listed below:

Mol	Chain	Res	Type
24	A	2	A
24	A	3	C
24	A	4	C
24	A	5	U
24	A	25	C

5 of 14 RNA pucker outliers are listed below:

Mol	Chain	Res	Type
24	A	792	U
24	A	911	G
24	A	1776	G
24	A	1253	A
24	A	1564	C

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 3 ligands modelled in this entry, 3 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.

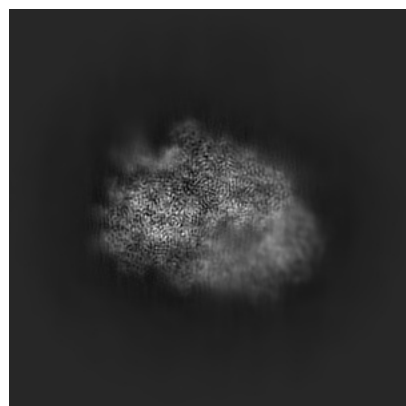
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-66682. These allow visual inspection of the internal detail of the map and identification of artifacts.

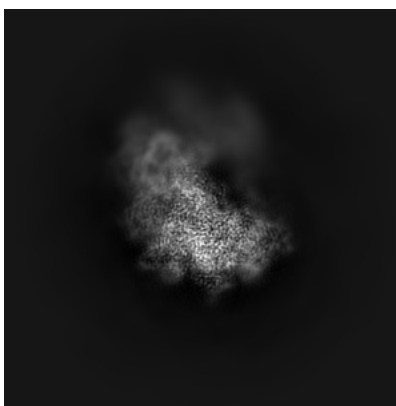
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

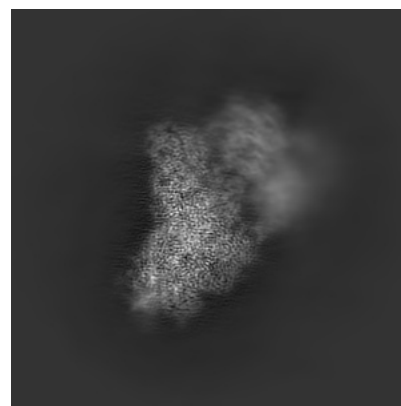
6.1.1 Primary map



X

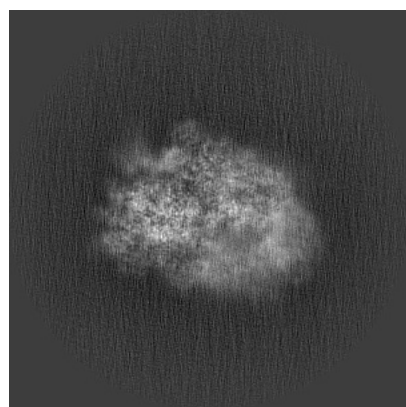


Y

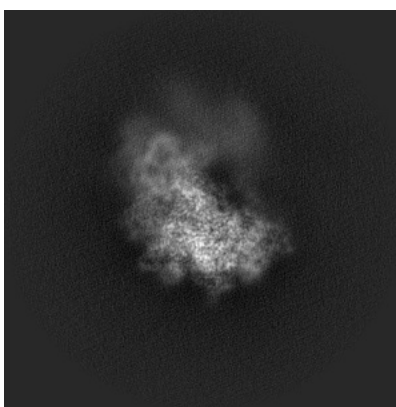


Z

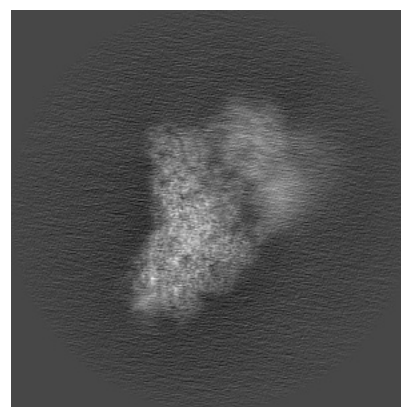
6.1.2 Raw map



X



Y

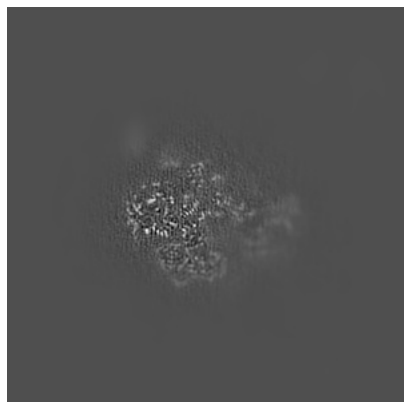


Z

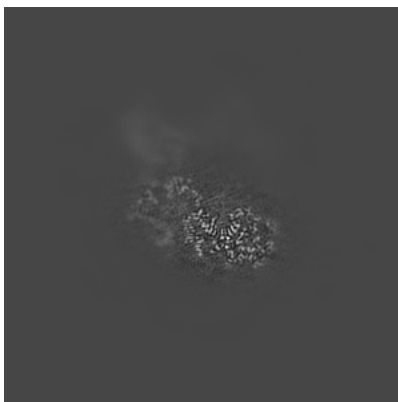
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

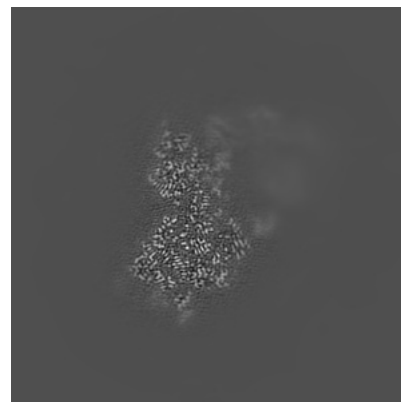
6.2.1 Primary map



X Index: 180

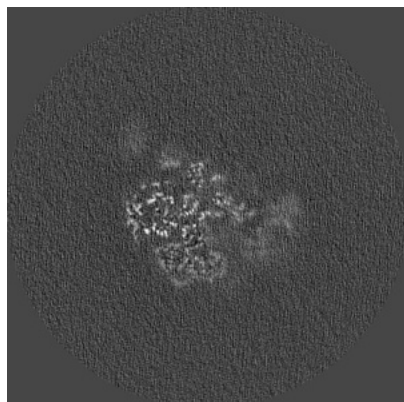


Y Index: 180

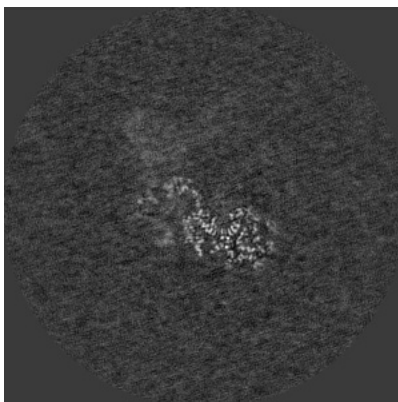


Z Index: 180

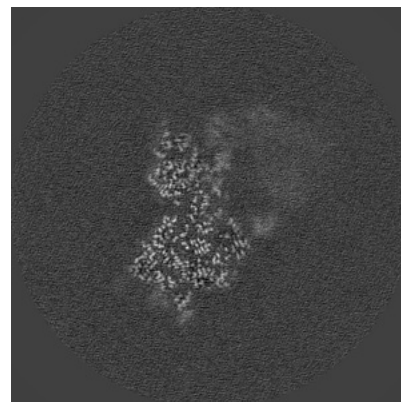
6.2.2 Raw map



X Index: 180



Y Index: 180

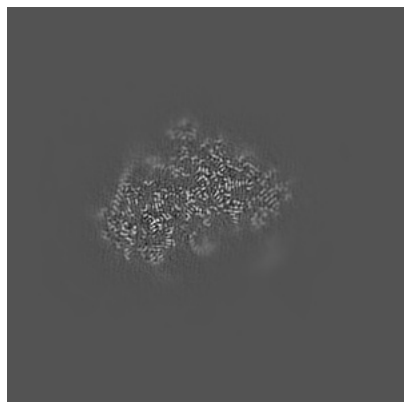


Z Index: 180

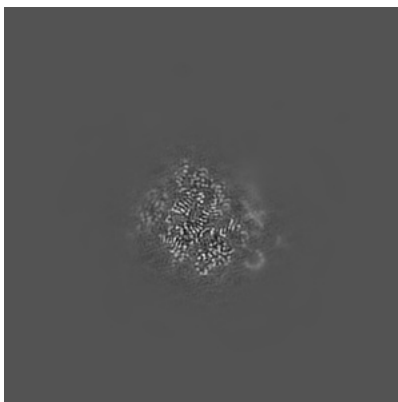
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

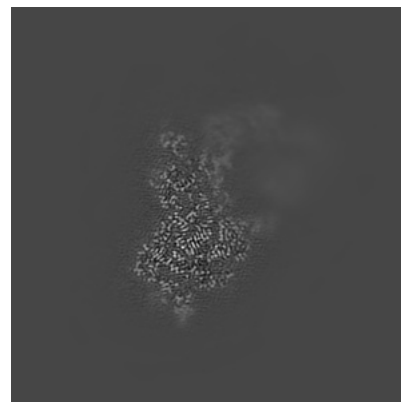
6.3.1 Primary map



X Index: 148

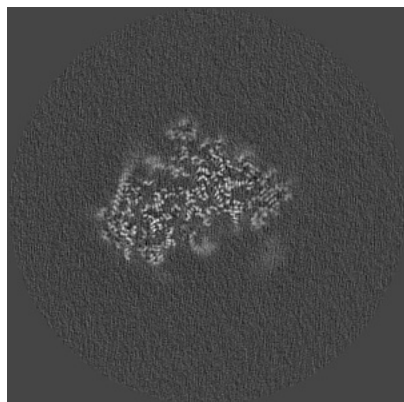


Y Index: 144

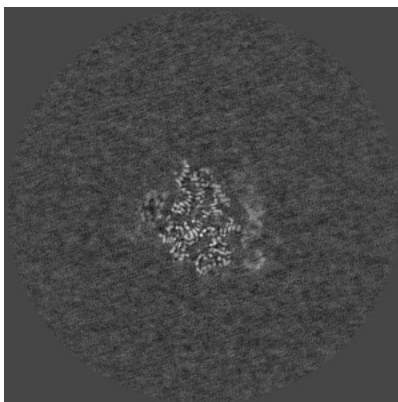


Z Index: 177

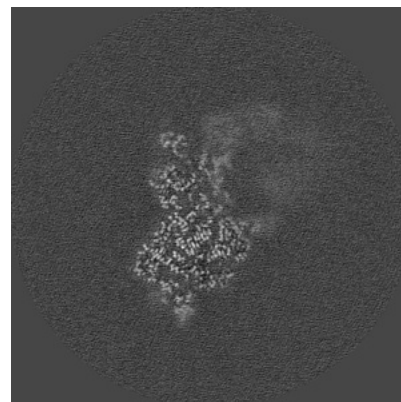
6.3.2 Raw map



X Index: 148



Y Index: 143

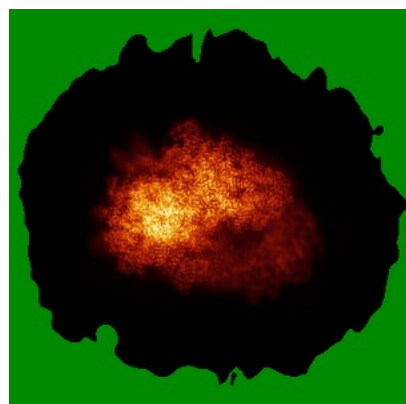


Z Index: 177

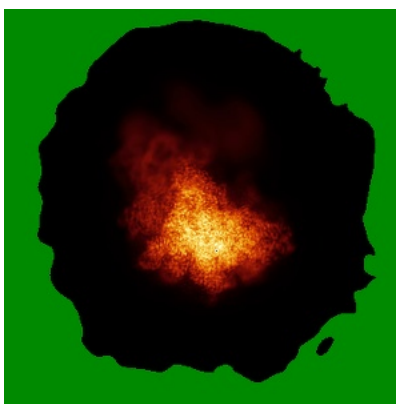
The images above show the largest variance slices of the map in three orthogonal directions.

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

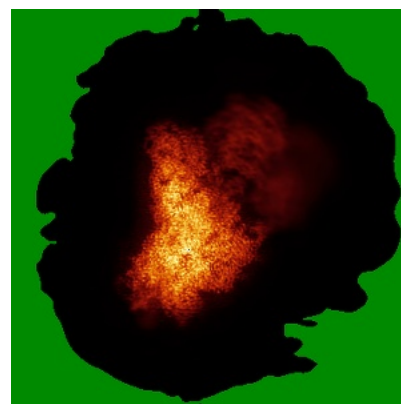
6.4.1 Primary map



X

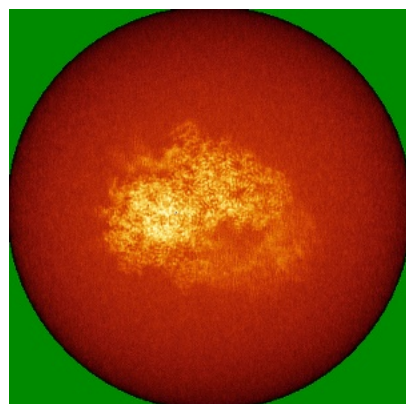


Y

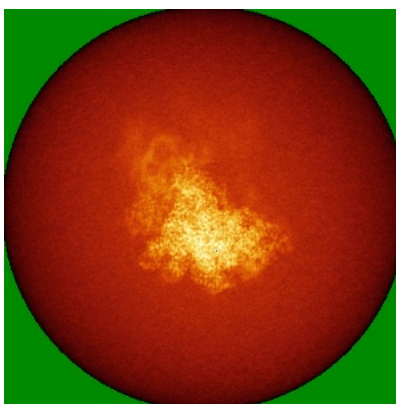


Z

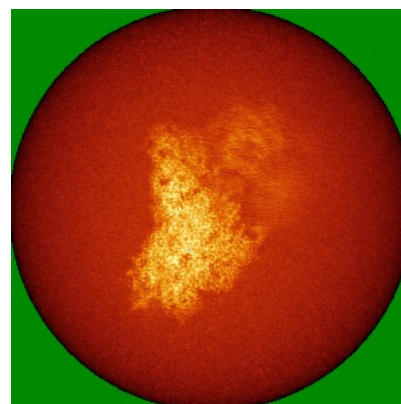
6.4.2 Raw map



X



Y

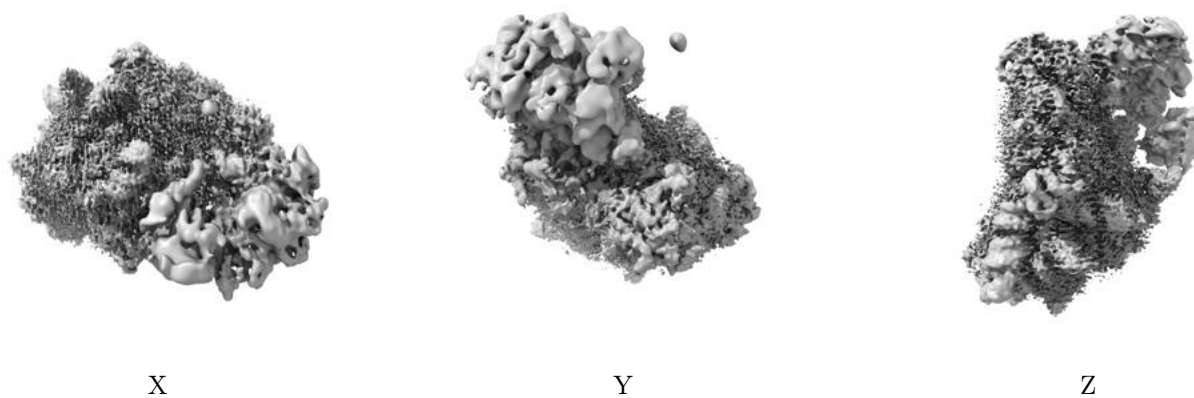


Z

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.

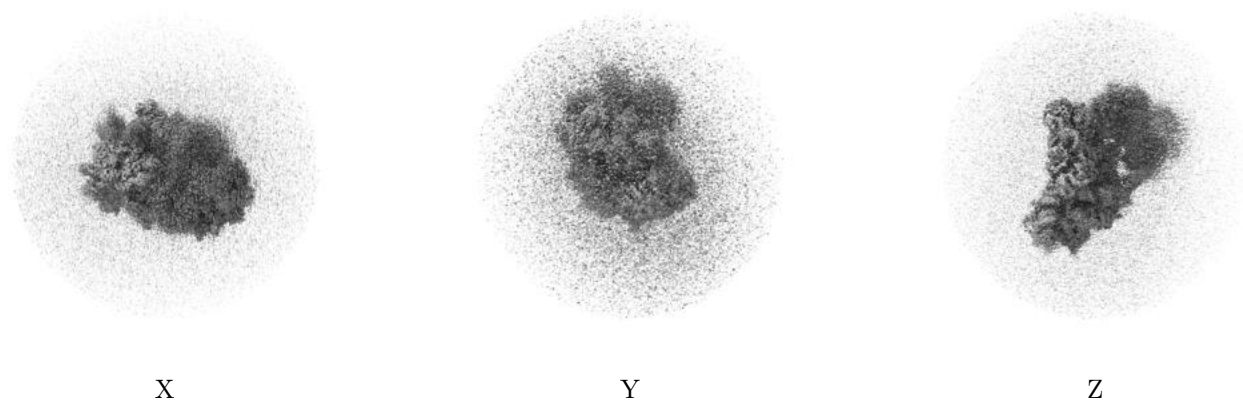
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.02. 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.

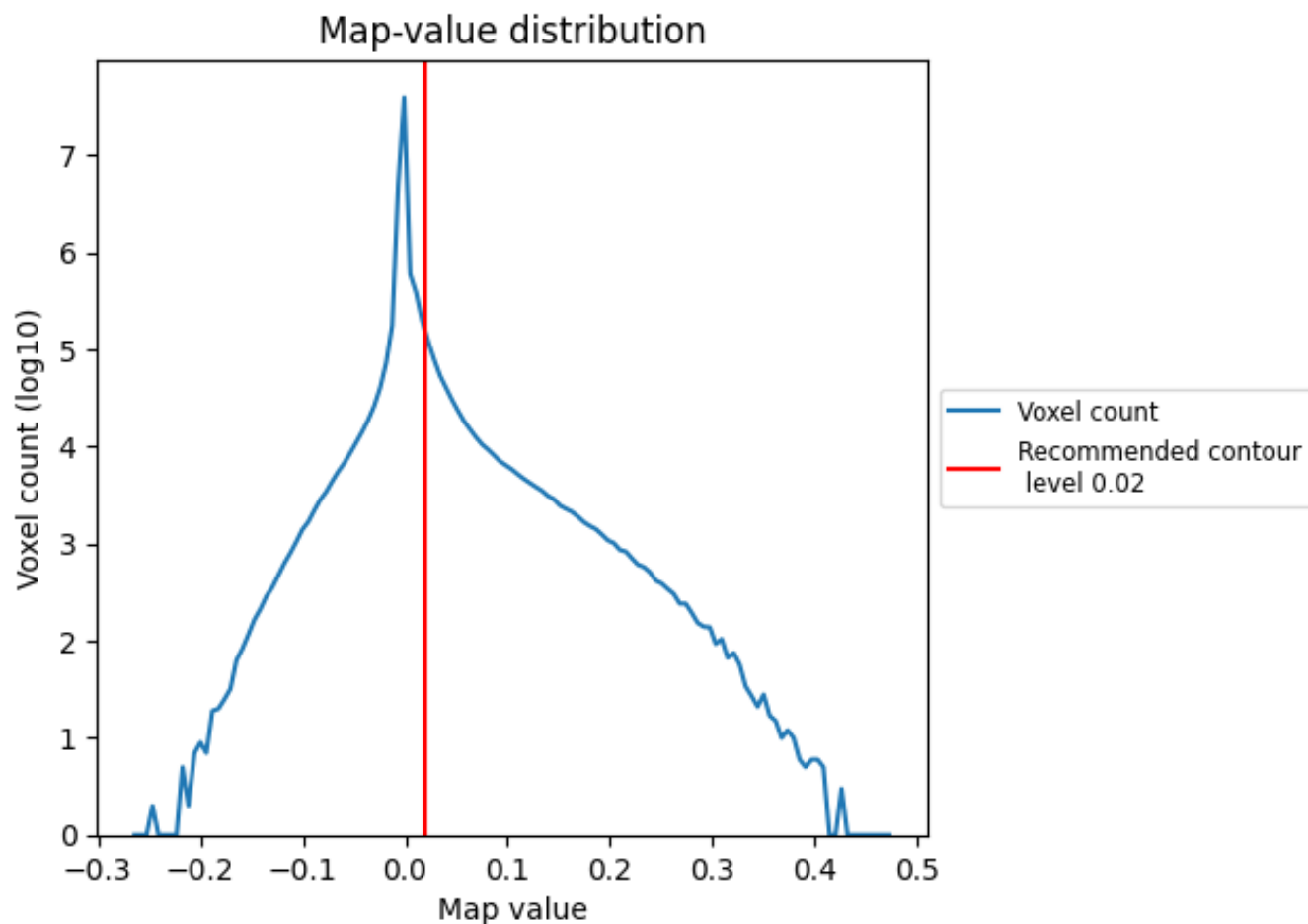
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

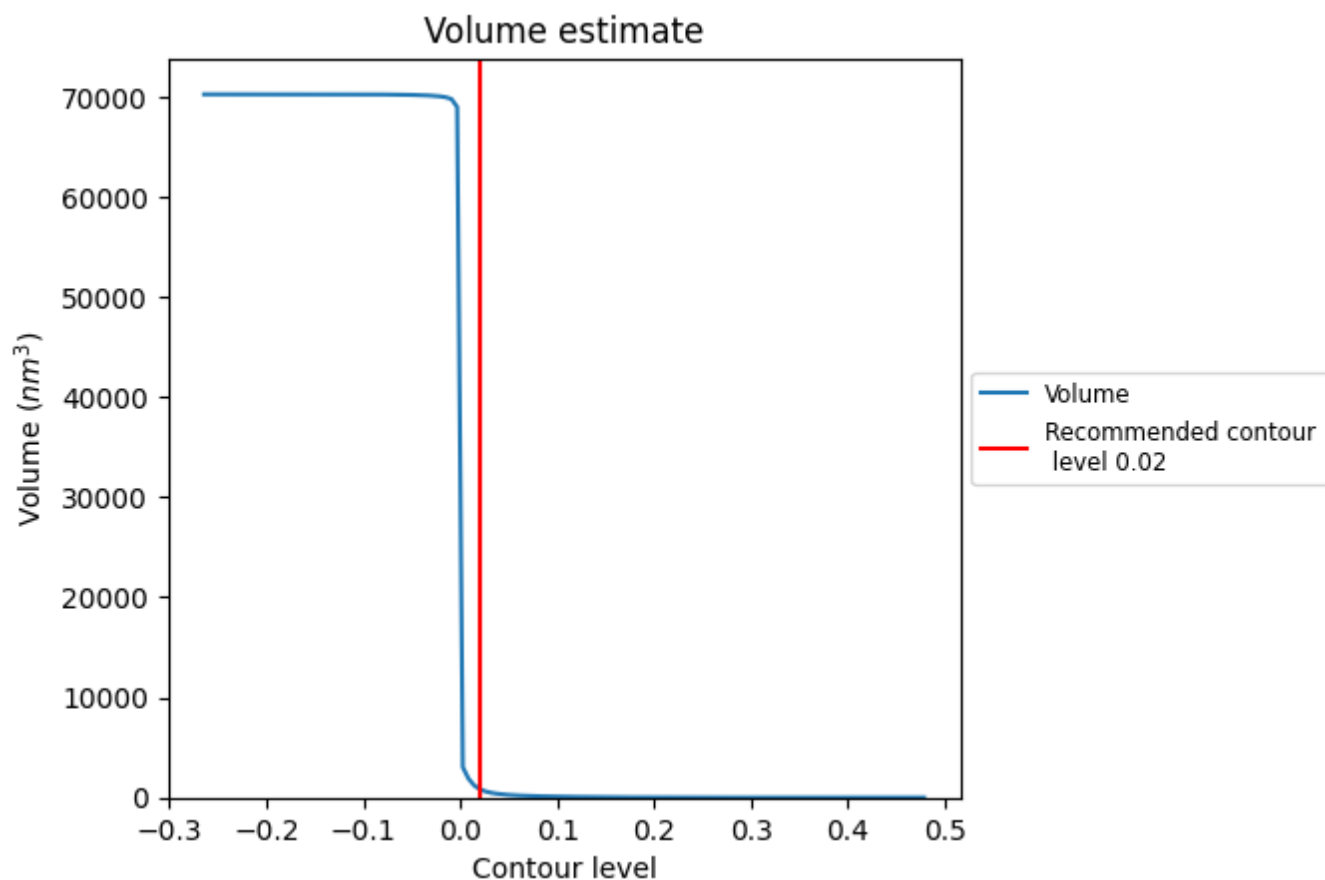
This section contains the results of statistical analysis of the map.

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.

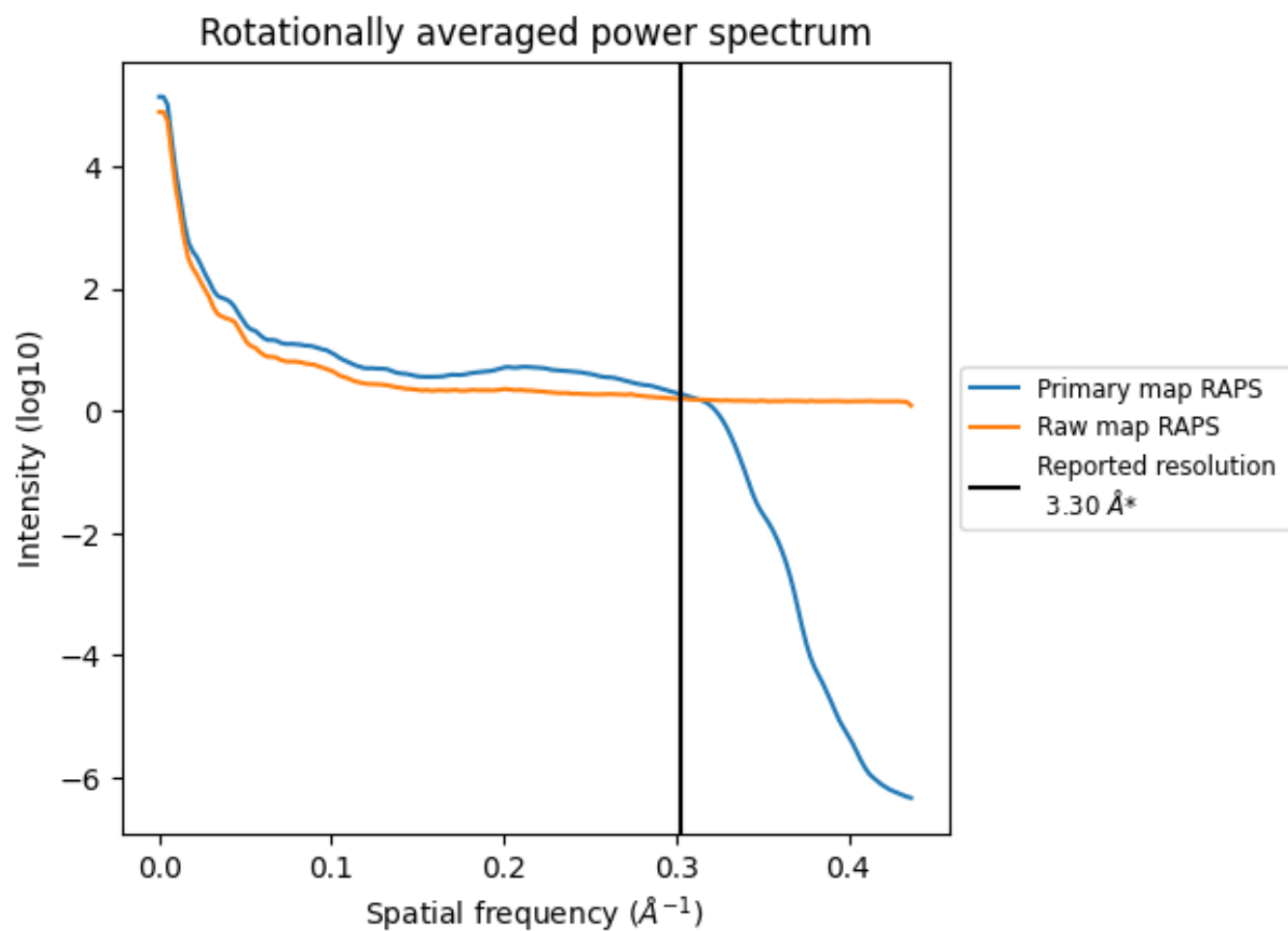
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 845 nm³; this corresponds to an approximate mass of 764 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 ⓘ

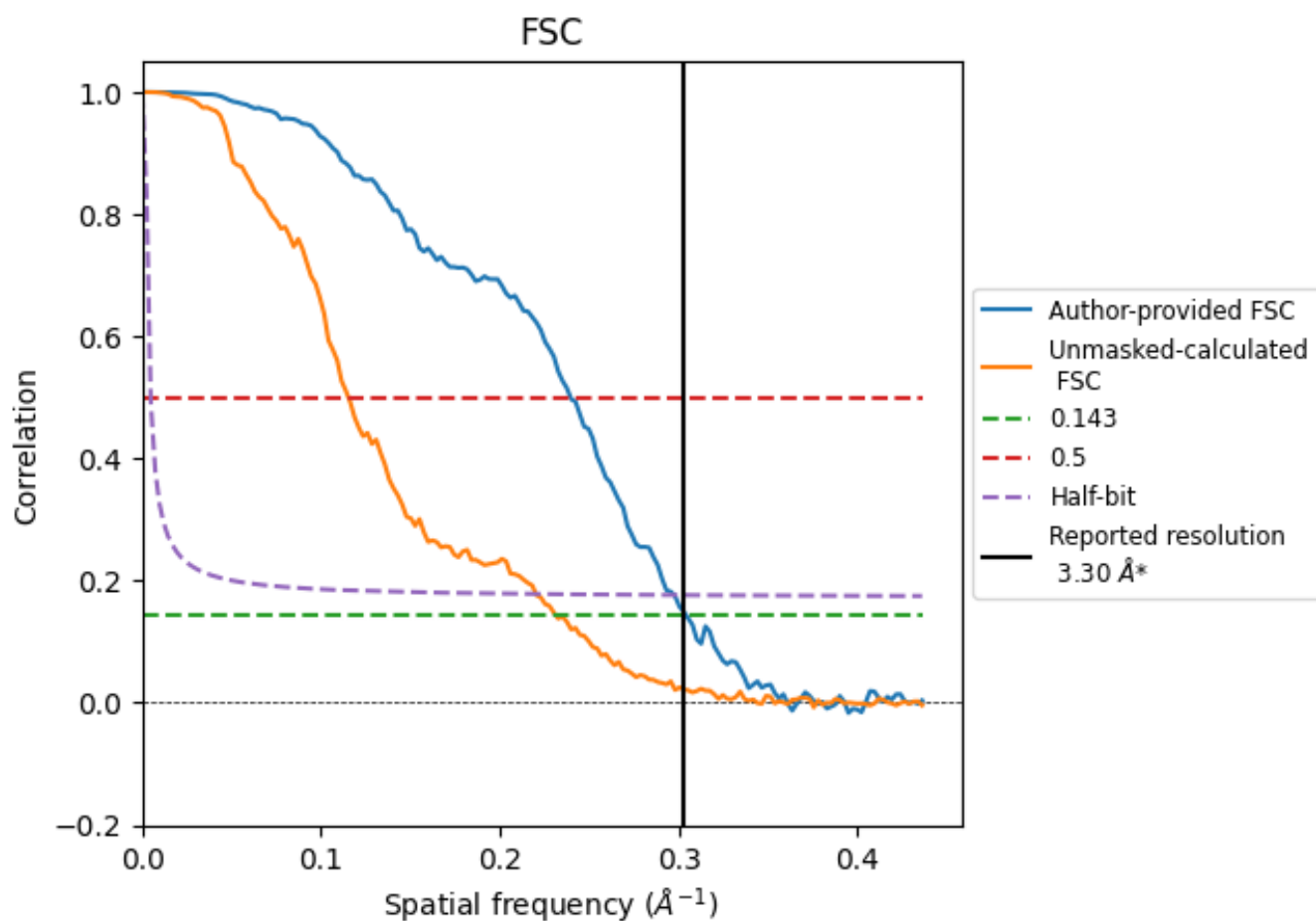


*Reported resolution corresponds to spatial frequency of 0.303 Å⁻¹

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

8.2 Resolution estimates [i](#)

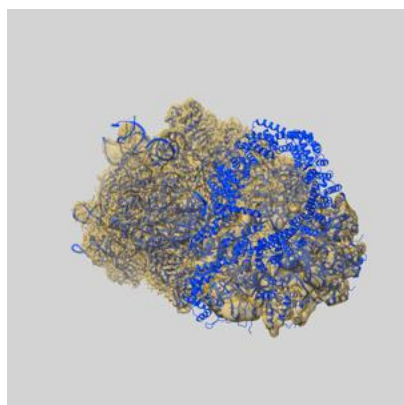
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.30	-	-
Author-provided FSC curve	3.29	4.17	3.36
Unmasked-calculated*	4.32	8.67	4.54

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

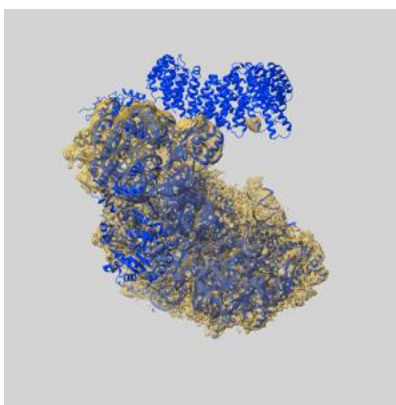
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-66682 and PDB model 9XAC. Per-residue inclusion information can be found in section [3](#) on page [11](#).

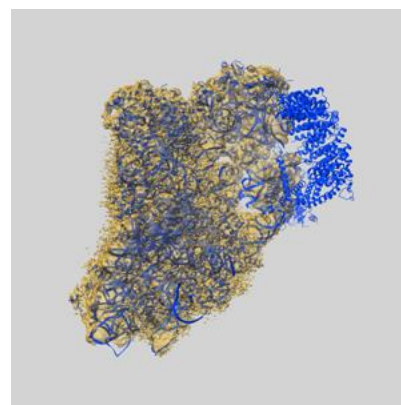
9.1 Map-model overlay [i](#)



X



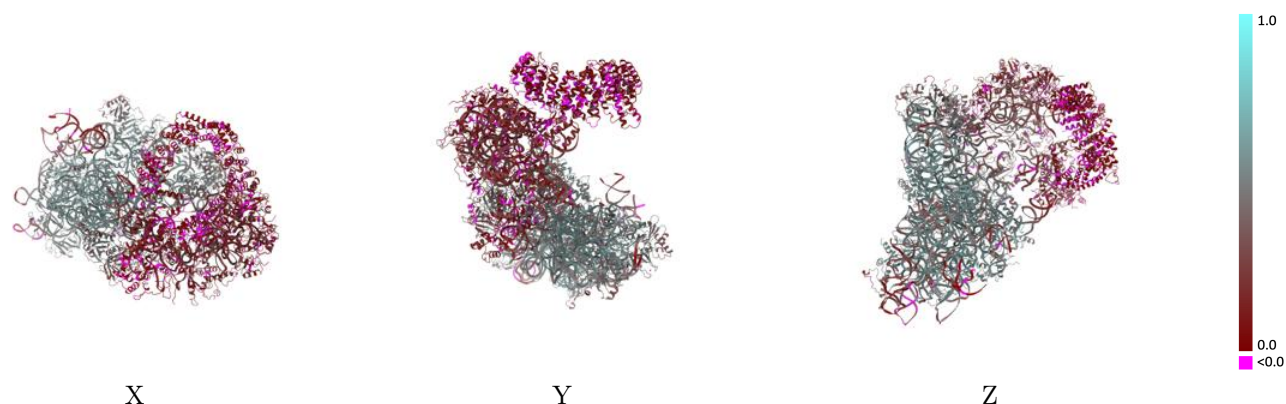
Y



Z

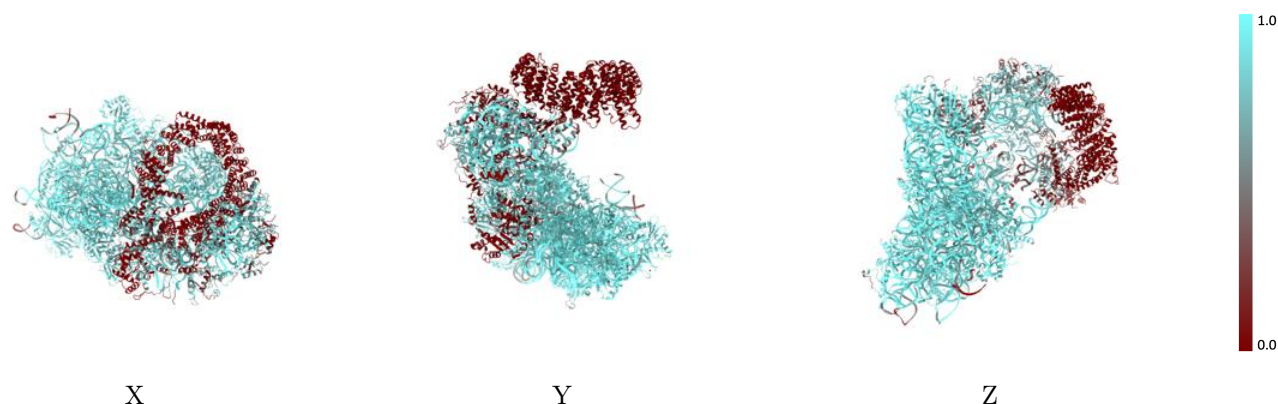
The images above show the 3D surface view of the map at the recommended contour level 0.02 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



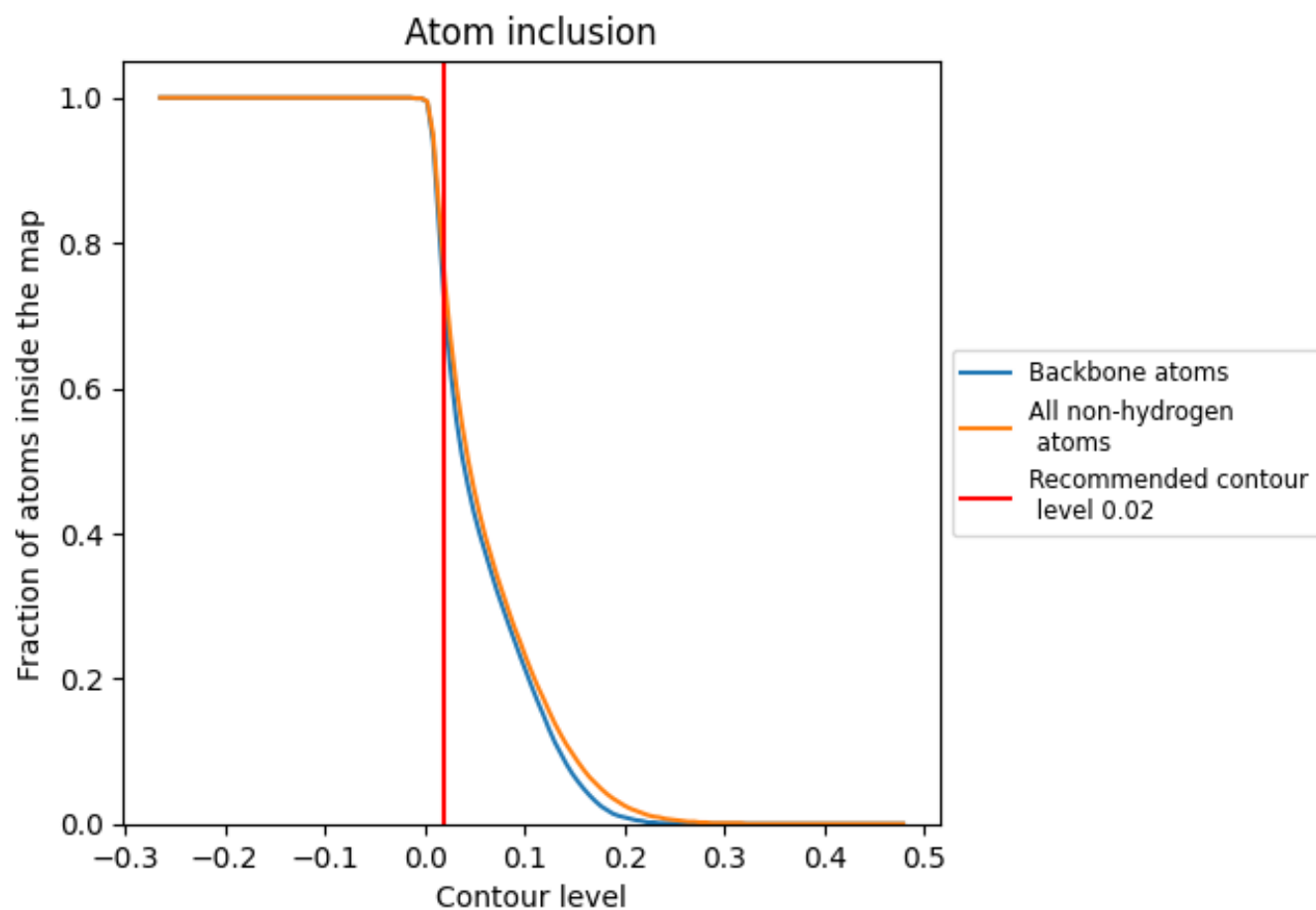
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.02).

9.4 Atom inclusion [i](#)



At the recommended contour level, 71% of all backbone atoms, 75% 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 (0.02) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.7510	 0.3620
0	 0.0350	 0.1250
1	 0.3560	 0.1760
2	 0.7990	 0.3750
3	 0.9000	 0.4570
4	 0.3490	 0.1320
5	 0.1110	 0.0870
7	 0.0010	 0.0490
A	 0.9320	 0.4310
E	 0.9360	 0.4850
H	 0.9770	 0.5790
I	 0.7120	 0.1730
J	 0.9530	 0.4890
K	 0.9300	 0.4500
L	 0.9470	 0.5370
M	 0.9600	 0.5430
O	 0.9660	 0.5800
P	 0.0580	 0.0620
Q	 0.9580	 0.5470
R	 0.9080	 0.4650
S	 0.7240	 0.2110
T	 0.5930	 0.1300
V	 0.6830	 0.1770
W	 0.6600	 0.1710
Z	 0.9730	 0.5760
a	 0.9060	 0.5030
b	 0.9780	 0.5440
c	 0.2200	 0.1240
e	 0.9400	 0.5030
f	 0.6720	 0.1840
h	 0.9770	 0.5300
i	 0.4580	 0.0950

