



wwPDB EM Validation Summary Report ⓘ

Mar 27, 2026 – 01:40 AM UTC

PDB ID : 8OLU / pdb_00008olu
EMDB ID : EMD-16963
Title : Leishmania tarentolae proteasome 20S subunit in complex with 1-Benzyl-N-(3-(cyclopropylcarbamoyl)phenyl)-6-oxo-1,6-dihydropyridazine-3-carboxamide
Authors : Rowland, P.
Deposited on : 2023-03-30
Resolution : 2.59 Å(reported)
Based on initial model : .

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
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) : 2.49

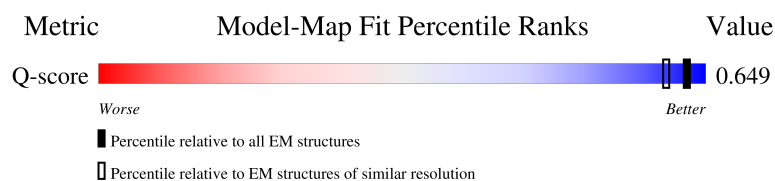
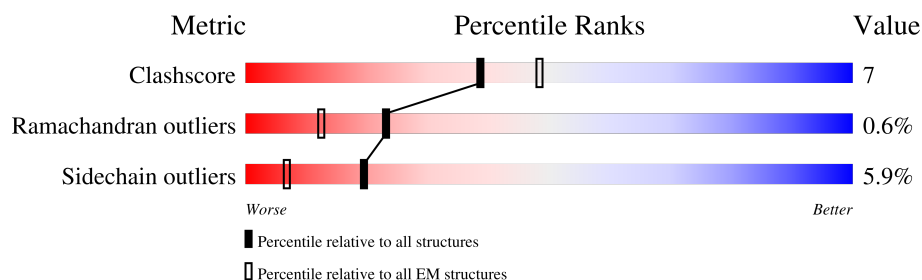
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 2.59 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	7741 (2.09 - 3.09)

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	250	14% 75% 21% ..
1	O	250	14% 74% 22% ..
2	B	231	17% 81% 17% ..
2	P	231	17% 81% 17% ..

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Mol	Chain	Length	Quality of chain
3	C	285	
3	Q	285	
4	D	248	
4	R	248	
5	E	344	
5	S	344	
6	F	428	
6	T	428	
7	G	238	
7	U	238	
8	H	283	
8	V	283	
9	I	254	
9	W	254	
10	J	205	
10	X	205	
11	K	206	
11	Y	206	
12	L	301	
12	Z	301	
13	M	339	
13	a	339	
14	N	220	
14	b	220	

2 Entry composition

There are 15 unique types of molecules in this entry. The entry contains 48930 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 Proteasome subunit alpha type.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	244	Total	C	N	O	S	0	0
			1857	1169	323	353	12		
1	O	244	Total	C	N	O	S	0	0
			1857	1169	323	353	12		

- Molecule 2 is a protein called Proteasome subunit alpha type.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	229	Total	C	N	O	S	0	0
			1754	1112	292	342	8		
2	P	229	Total	C	N	O	S	0	0
			1754	1112	292	342	8		

- Molecule 3 is a protein called Proteasome subunit alpha type.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	271	Total	C	N	O	S	0	0
			2150	1354	370	414	12		
3	Q	271	Total	C	N	O	S	0	0
			2150	1354	370	414	12		

- Molecule 4 is a protein called Proteasome subunit alpha type.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	D	234	Total	C	N	O	S	0	0
			1840	1160	316	356	8		
4	R	234	Total	C	N	O	S	0	0
			1840	1160	316	356	8		

- Molecule 5 is a protein called Proteasome alpha 5 subunit, putative.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	E	229	Total	C	N	O	S	0	0
			1756	1094	302	347	13		
5	S	229	Total	C	N	O	S	0	0
			1756	1094	302	347	13		

- Molecule 6 is a protein called Proteasome alpha 1 subunit, putative.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	F	232	Total	C	N	O	S	0	0
			1819	1140	315	353	11		
6	T	232	Total	C	N	O	S	0	0
			1819	1140	315	353	11		

- Molecule 7 is a protein called Proteasome alpha 7 subunit, putative.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	G	226	Total	C	N	O	S	0	0
			1714	1069	304	331	10		
7	U	226	Total	C	N	O	S	0	0
			1714	1069	304	331	10		

- Molecule 8 is a protein called Proteasome subunit beta.

Mol	Chain	Residues	Atoms					AltConf	Trace
8	H	228	Total	C	N	O	S	0	0
			1705	1060	294	339	12		
8	V	228	Total	C	N	O	S	0	0
			1705	1060	294	339	12		

- Molecule 9 is a protein called Proteasome subunit beta.

Mol	Chain	Residues	Atoms					AltConf	Trace
9	I	219	Total	C	N	O	S	0	0
			1659	1037	292	318	12		
9	W	219	Total	C	N	O	S	0	0
			1659	1037	292	318	12		

- Molecule 10 is a protein called Proteasome subunit beta.

Mol	Chain	Residues	Atoms					AltConf	Trace
10	J	204	Total	C	N	O	S	0	0
			1557	980	259	302	16		

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Mol	Chain	Residues	Atoms					AltConf	Trace
10	X	204	Total	C	N	O	S	0	0
			1557	980	259	302	16		

- Molecule 11 is a protein called Proteasome subunit beta.

Mol	Chain	Residues	Atoms					AltConf	Trace
11	K	206	Total	C	N	O	S	0	0
			1612	1012	280	304	16		
11	Y	206	Total	C	N	O	S	0	0
			1612	1012	280	304	16		

- Molecule 12 is a protein called Proteasome subunit beta.

Mol	Chain	Residues	Atoms					AltConf	Trace
12	L	202	Total	C	N	O	S	0	0
			1579	998	277	297	7		
12	Z	202	Total	C	N	O	S	0	0
			1579	998	277	297	7		

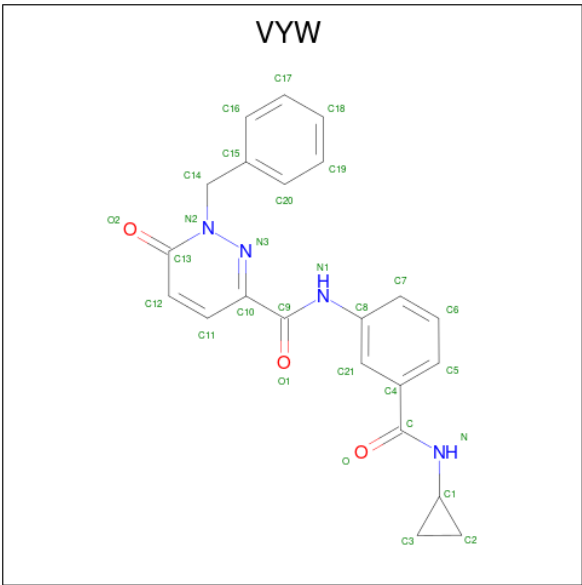
- Molecule 13 is a protein called Proteasome beta 6 subunit, putative.

Mol	Chain	Residues	Atoms					AltConf	Trace
13	M	214	Total	C	N	O	S	0	0
			1702	1079	287	324	12		
13	a	214	Total	C	N	O	S	0	0
			1702	1079	287	324	12		

- Molecule 14 is a protein called Proteasome subunit beta.

Mol	Chain	Residues	Atoms					AltConf	Trace
14	N	220	Total	C	N	O	S	0	0
			1732	1094	297	326	15		
14	b	220	Total	C	N	O	S	0	0
			1732	1094	297	326	15		

- Molecule 15 is {N}-[3-(cyclopropylcarbamoyl)phenyl]-6-oxidanylidene-1-(phenylmethyl)pyridazine-3-carboxamide (CCD ID: VYW) (formula: C₂₂H₂₀N₄O₃).

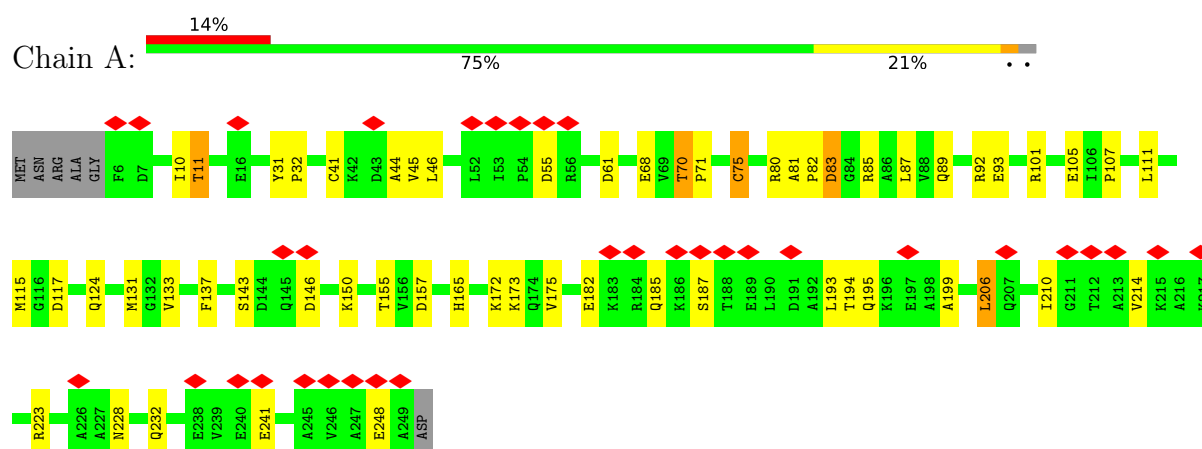


Mol	Chain	Residues	Atoms				AltConf
15	L	1	Total	C	N	O	0
			29	22	4	3	
15	Z	1	Total	C	N	O	0
			29	22	4	3	

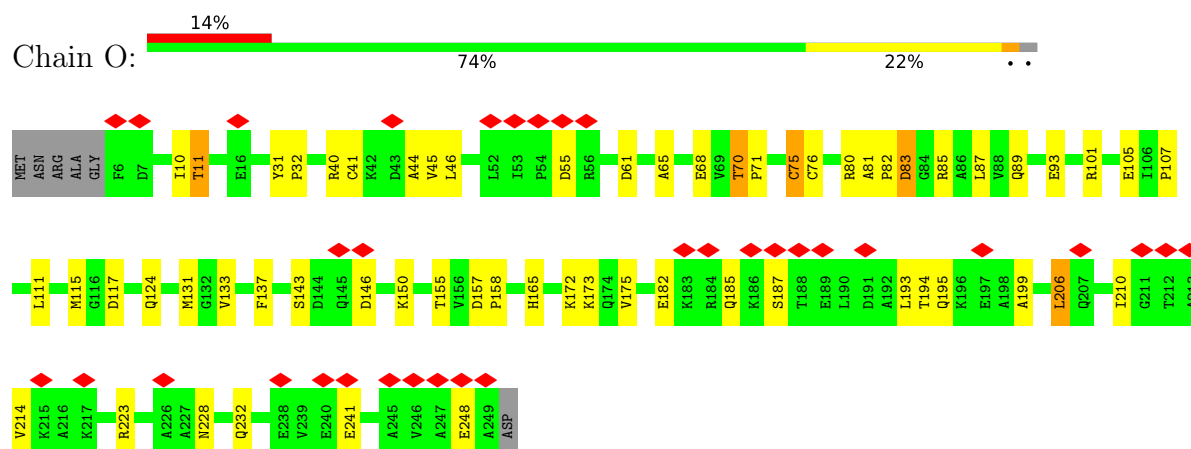
3 Residue-property plots

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.

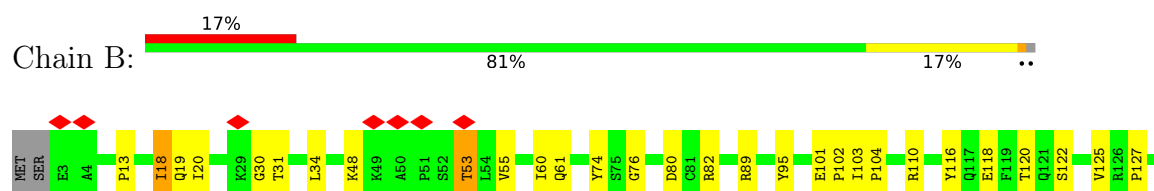
- Molecule 1: Proteasome subunit alpha type

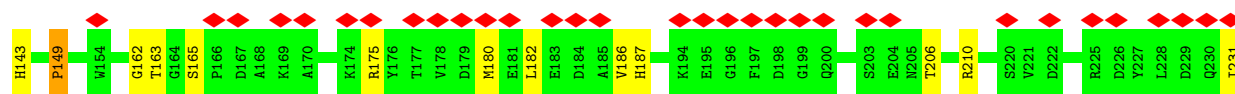


- Molecule 1: Proteasome subunit alpha type

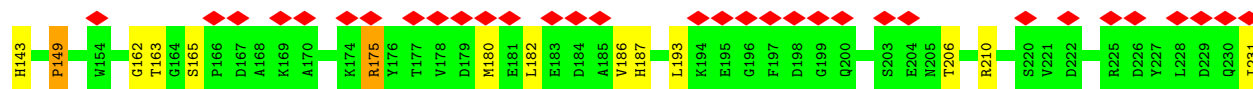
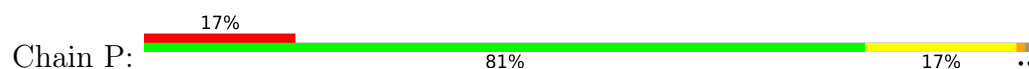


- Molecule 2: Proteasome subunit alpha type

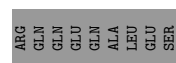
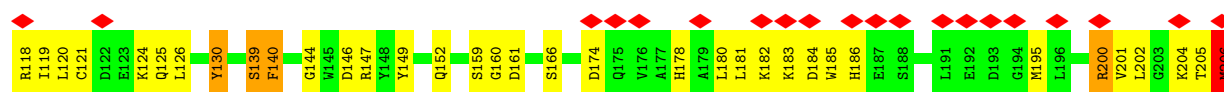




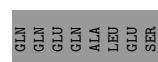
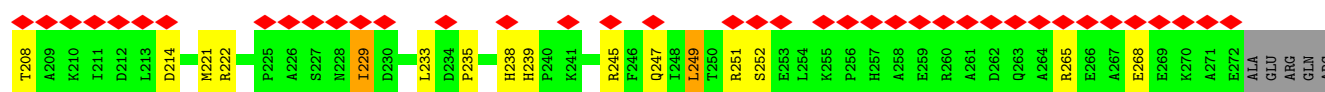
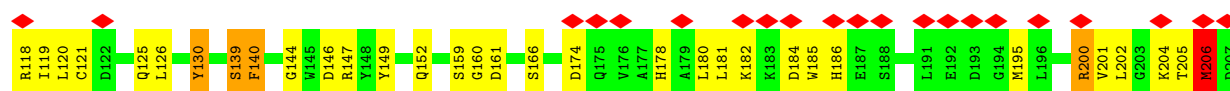
• Molecule 2: Proteasome subunit alpha type



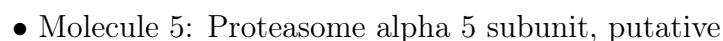
• Molecule 3: Proteasome subunit alpha type

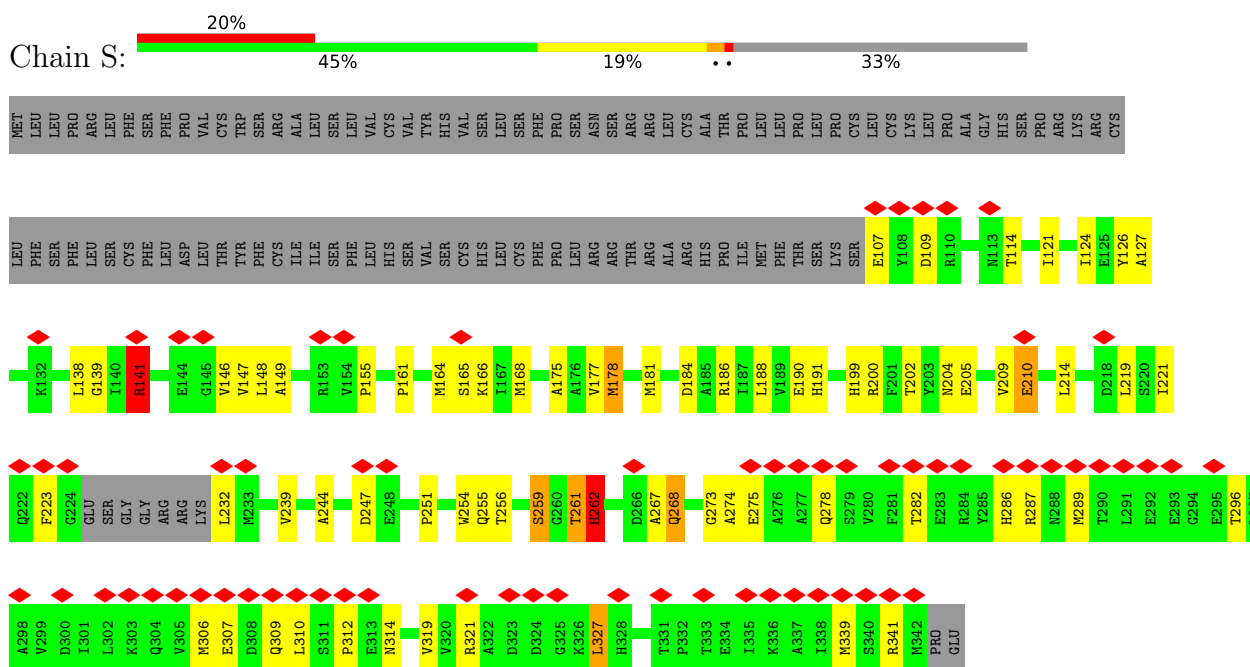


• Molecule 3: Proteasome subunit alpha type

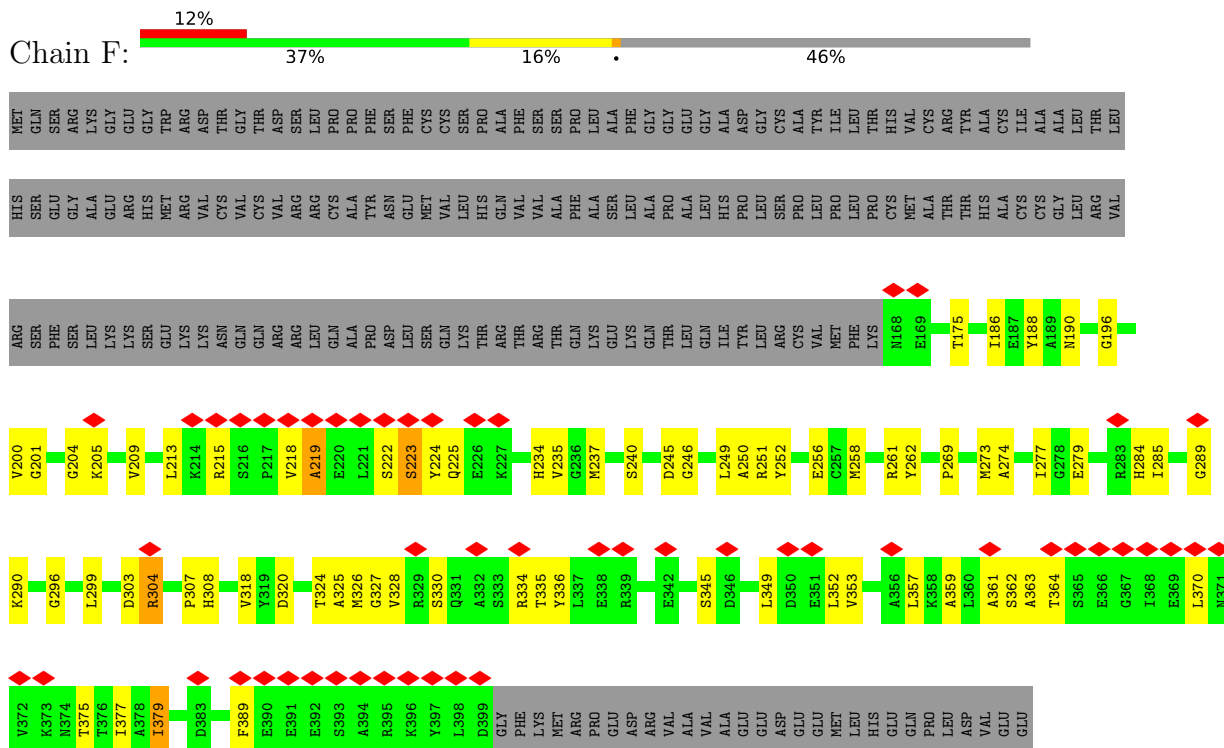


• Molecule 4: Proteasome subunit alpha type

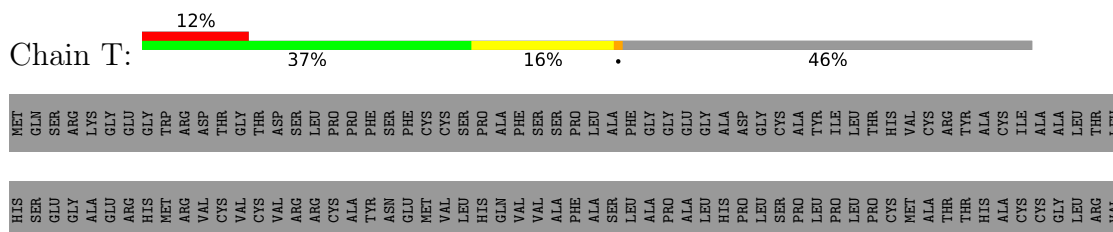


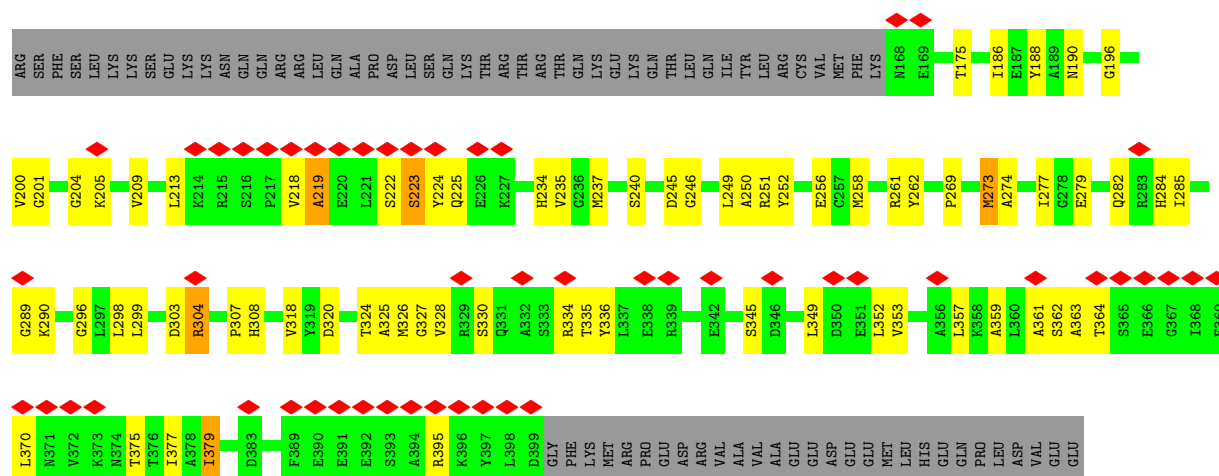


- Molecule 6: Proteasome alpha 1 subunit, putative

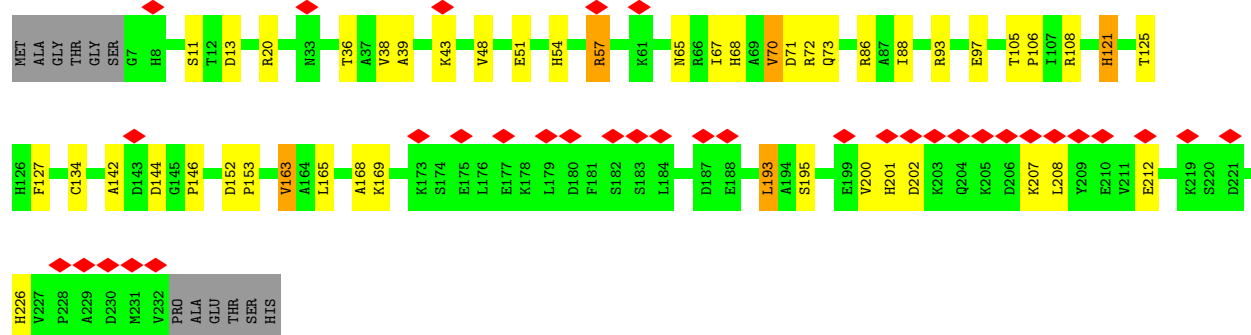
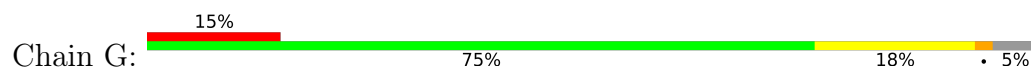


- Molecule 6: Proteasome alpha 1 subunit, putative

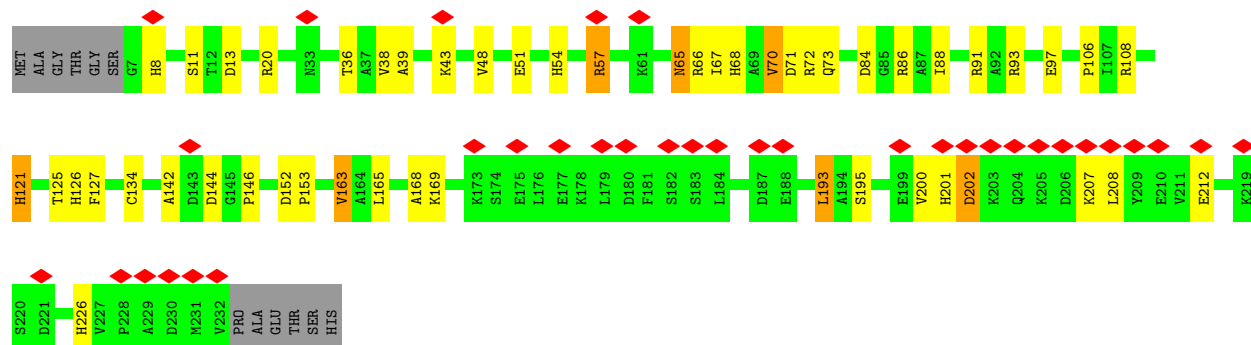
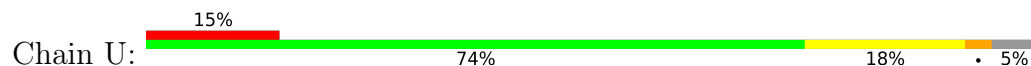




- Molecule 7: Proteasome alpha 7 subunit, putative

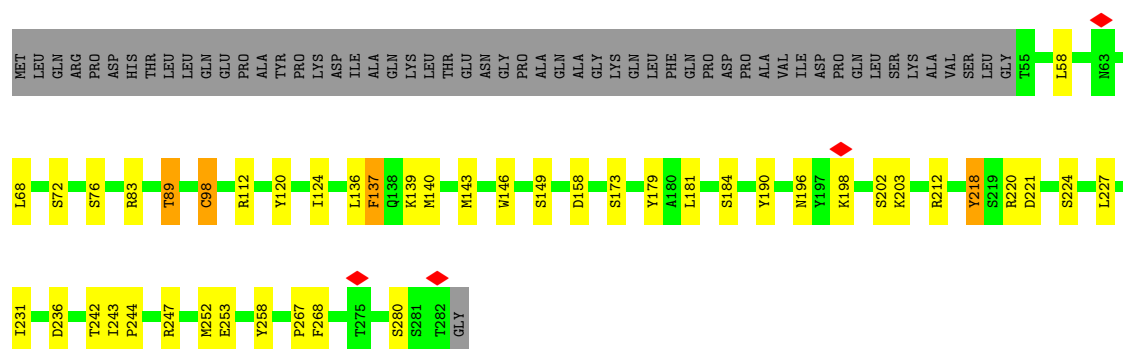


- Molecule 7: Proteasome alpha 7 subunit, putative



- Molecule 8: Proteasome subunit beta





• Molecule 8: Proteasome subunit beta

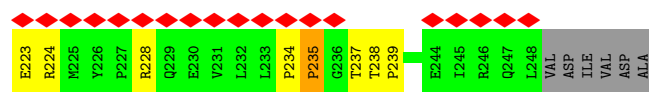


• Molecule 9: Proteasome subunit beta

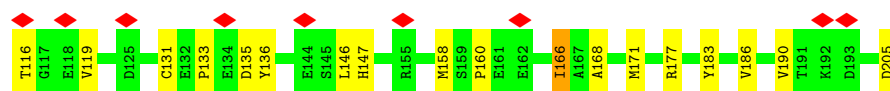
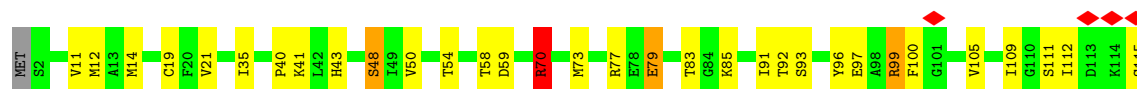
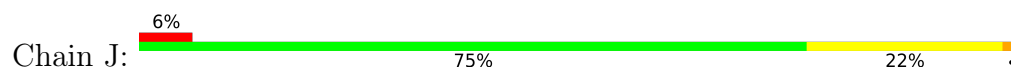


• Molecule 9: Proteasome subunit beta

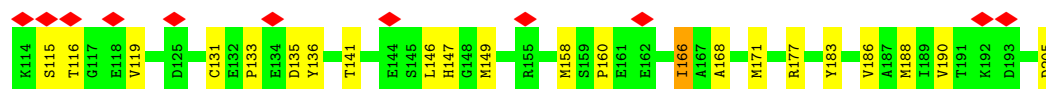
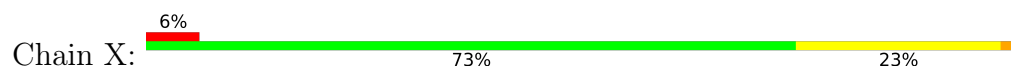




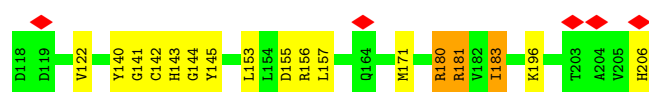
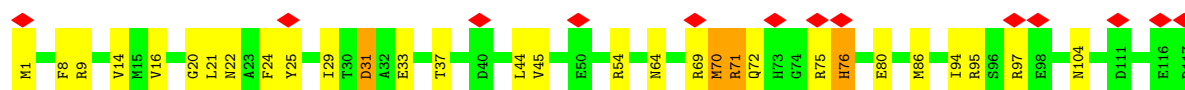
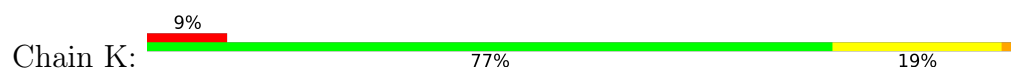
• Molecule 10: Proteasome subunit beta



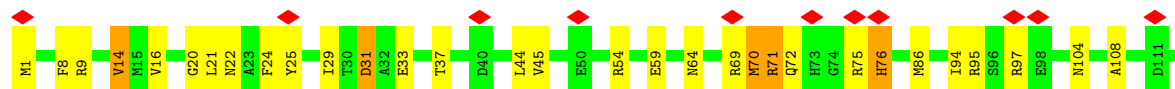
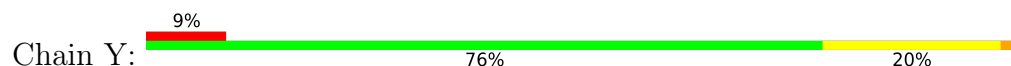
• Molecule 10: Proteasome subunit beta



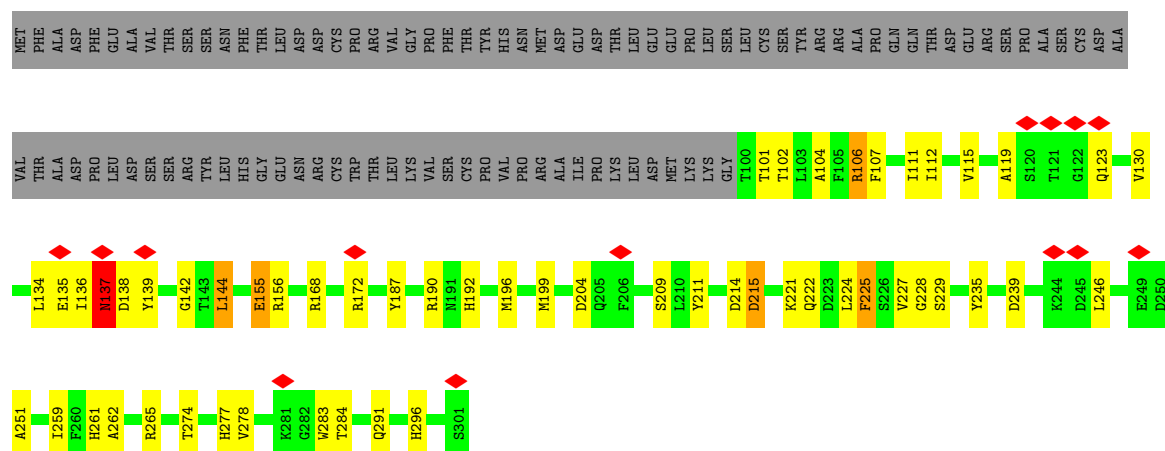
• Molecule 11: Proteasome subunit beta



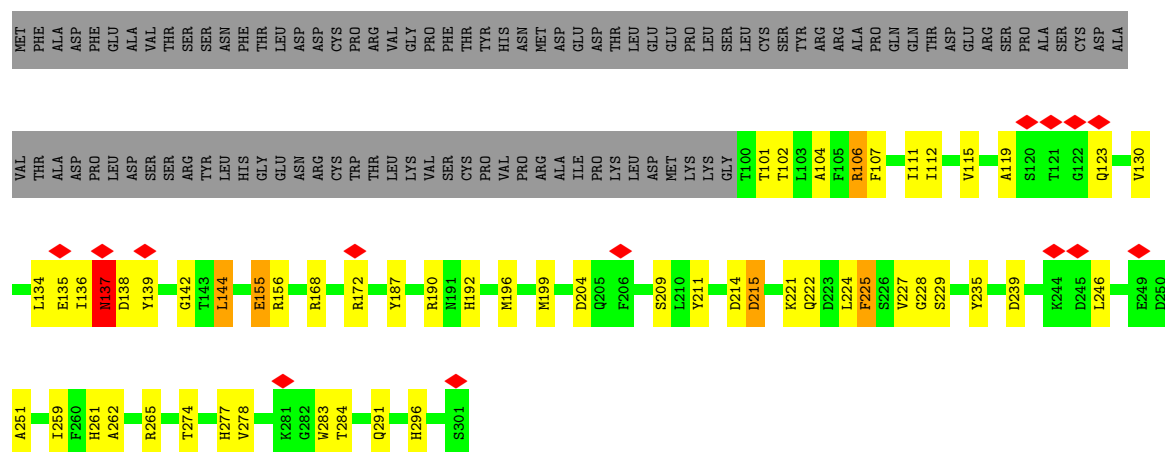
• Molecule 11: Proteasome subunit beta



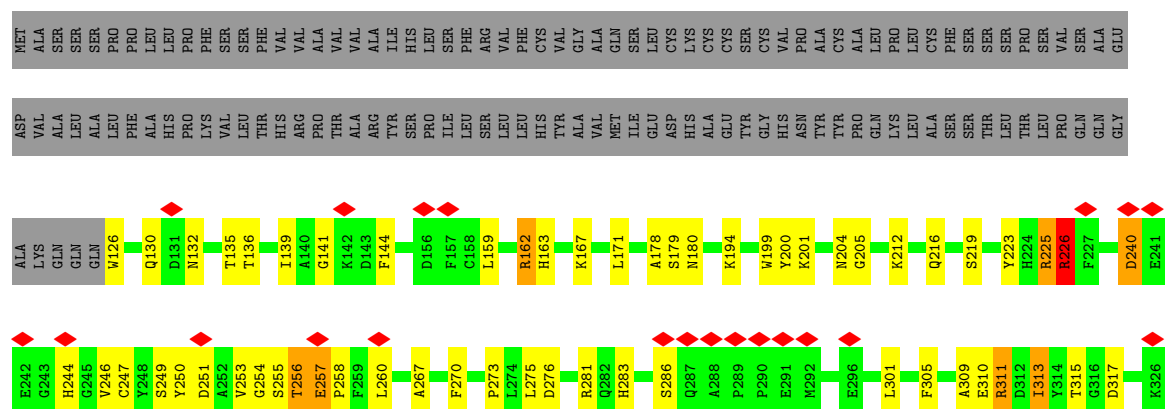
• Molecule 12: Proteasome subunit beta

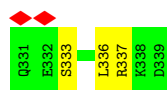


• Molecule 12: Proteasome subunit beta

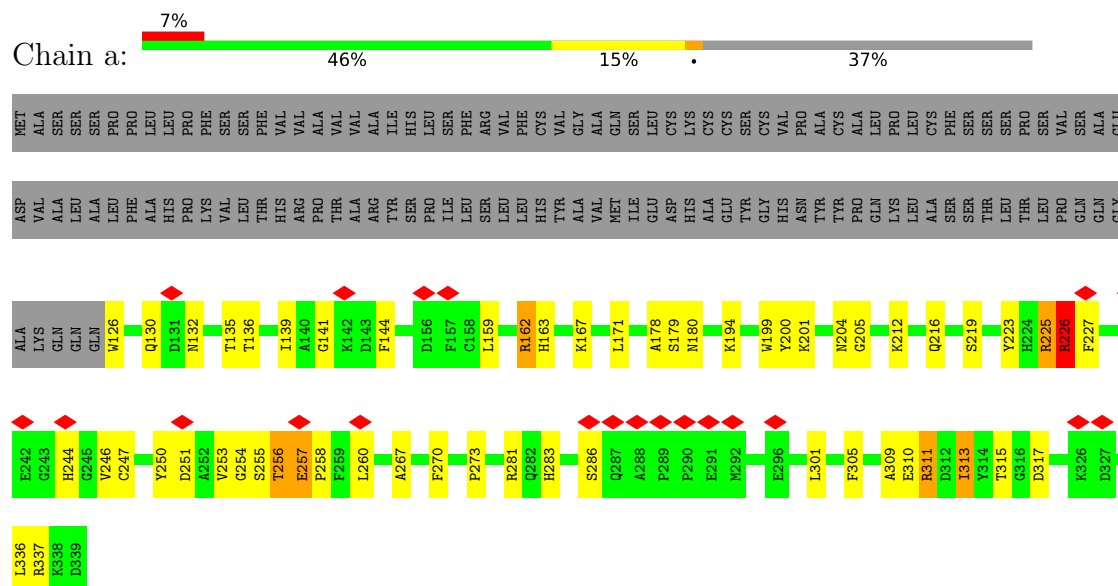


• Molecule 13: Proteasome beta 6 subunit, putative

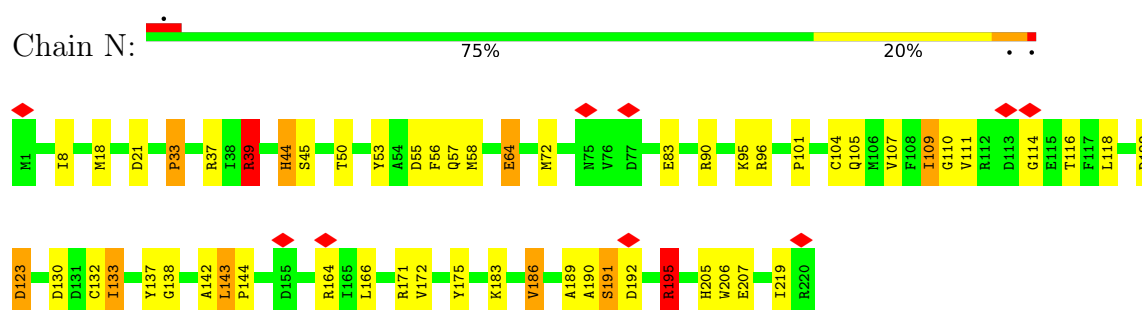




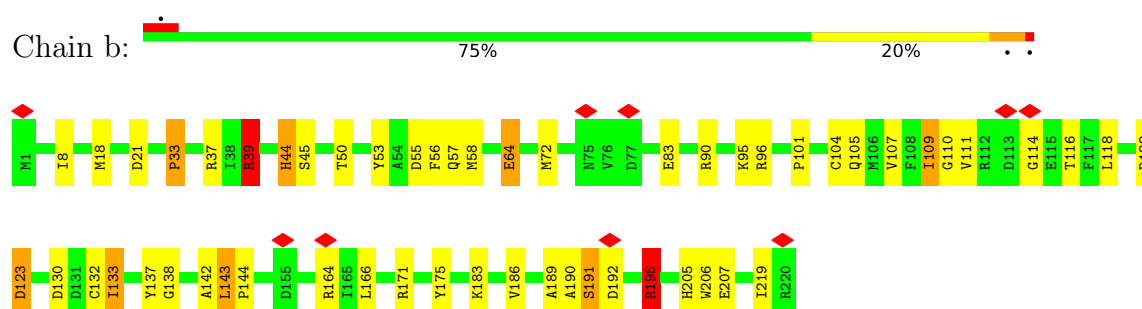
• Molecule 13: Proteasome beta 6 subunit, putative



• Molecule 14: Proteasome subunit beta



• Molecule 14: Proteasome subunit beta



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C2	Depositor
Number of particles used	94595	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 ($e^-/\text{\AA}^2$)	30	Depositor
Minimum defocus (nm)	1800	Depositor
Maximum defocus (nm)	3400	Depositor
Magnification	Not provided	
Image detector	FEI FALCON III (4k x 4k)	Depositor
Maximum map value	0.403	Depositor
Minimum map value	-0.226	Depositor
Average map value	0.001	Depositor
Map value standard deviation	0.014	Depositor
Recommended contour level	0.1	Depositor
Map size (Å)	321.00003, 321.00003, 321.00003	wwPDB
Map dimensions	300, 300, 300	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.07, 1.07, 1.07	Depositor

5 Model quality ⓘ

5.1 Standard geometry ⓘ

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

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	1.12	2/1889 (0.1%)	1.40	12/2562 (0.5%)
1	O	1.12	2/1889 (0.1%)	1.40	11/2562 (0.4%)
2	B	1.14	1/1787 (0.1%)	1.39	10/2421 (0.4%)
2	P	1.14	1/1787 (0.1%)	1.38	10/2421 (0.4%)
3	C	1.06	8/2197 (0.4%)	1.32	3/2975 (0.1%)
3	Q	1.05	8/2197 (0.4%)	1.33	3/2975 (0.1%)
4	D	0.99	2/1869 (0.1%)	1.33	5/2518 (0.2%)
4	R	0.99	2/1869 (0.1%)	1.33	8/2518 (0.3%)
5	E	0.99	4/1784 (0.2%)	1.35	5/2414 (0.2%)
5	S	0.99	4/1784 (0.2%)	1.35	5/2414 (0.2%)
6	F	1.07	3/1855 (0.2%)	1.36	15/2507 (0.6%)
6	T	1.07	3/1855 (0.2%)	1.35	14/2507 (0.6%)
7	G	1.25	6/1745 (0.3%)	1.43	8/2359 (0.3%)
7	U	1.25	8/1745 (0.5%)	1.42	7/2359 (0.3%)
8	H	1.43	4/1737 (0.2%)	1.47	8/2354 (0.3%)
8	V	1.43	4/1737 (0.2%)	1.47	8/2354 (0.3%)
9	I	1.38	8/1685 (0.5%)	1.47	11/2284 (0.5%)
9	W	1.38	7/1685 (0.4%)	1.47	11/2284 (0.5%)
10	J	1.42	3/1583 (0.2%)	1.50	17/2135 (0.8%)
10	X	1.42	3/1583 (0.2%)	1.51	17/2135 (0.8%)
11	K	1.27	2/1643 (0.1%)	1.48	11/2222 (0.5%)
11	Y	1.27	2/1643 (0.1%)	1.48	11/2222 (0.5%)
12	L	1.28	5/1613 (0.3%)	1.48	12/2183 (0.5%)
12	Z	1.28	5/1613 (0.3%)	1.48	12/2183 (0.5%)
13	M	1.18	4/1743 (0.2%)	1.42	12/2354 (0.5%)
13	a	1.18	3/1743 (0.2%)	1.42	12/2354 (0.5%)
14	N	1.56	8/1768 (0.5%)	1.47	6/2387 (0.3%)
14	b	1.56	7/1768 (0.4%)	1.47	6/2387 (0.3%)
All	All	1.23	119/49796 (0.2%)	1.42	270/67350 (0.4%)

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
1	A	0	2
1	O	0	3
2	B	0	3
2	P	0	4
3	C	0	12
3	Q	0	12
4	D	0	5
4	R	0	5
5	E	0	4
5	S	0	4
6	F	0	6
6	T	0	7
7	G	0	5
7	U	0	6
8	H	0	2
8	V	0	2
9	I	0	6
9	W	0	6
10	J	0	4
10	X	0	4
11	K	0	6
11	Y	0	6
12	L	0	3
12	Z	0	3
13	M	0	7
13	a	0	7
14	N	0	3
14	b	0	3
All	All	0	140

The worst 5 of 119 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
14	b	44	HIS	CE1-NE2	11.33	1.43	1.32
14	N	44	HIS	CE1-NE2	11.22	1.43	1.32
9	I	145	HIS	CE1-NE2	8.91	1.41	1.32
9	W	145	HIS	CE1-NE2	8.86	1.41	1.32
10	X	147	HIS	CE1-NE2	8.54	1.41	1.32

The worst 5 of 270 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
12	L	137	ASN	CA-CB-CG	13.38	125.98	112.60
12	Z	137	ASN	CA-CB-CG	13.33	125.93	112.60
13	a	270	PHE	CB-CA-C	-11.85	90.00	109.56
13	M	270	PHE	CB-CA-C	-11.77	90.14	109.56
7	U	144	ASP	CA-CB-CG	10.04	122.64	112.60

There are no chirality outliers.

5 of 140 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	101	ARG	Sidechain
1	A	85	ARG	Sidechain
2	B	110	ARG	Sidechain
2	B	210	ARG	Sidechain
2	B	89	ARG	Sidechain

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	1857	0	1871	30	0
1	O	1857	0	1871	31	0
2	B	1754	0	1741	15	0
2	P	1754	0	1741	15	0
3	C	2150	0	2097	43	0
3	Q	2150	0	2097	39	0
4	D	1840	0	1834	44	0
4	R	1840	0	1834	43	0
5	E	1756	0	1736	39	0
5	S	1756	0	1736	38	0
6	F	1819	0	1769	25	0
6	T	1819	0	1769	29	0
7	G	1714	0	1679	14	0
7	U	1714	0	1679	17	0
8	H	1705	0	1662	21	0
8	V	1705	0	1662	20	0
9	I	1659	0	1684	26	0
9	W	1659	0	1684	27	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
10	J	1557	0	1552	26	0
10	X	1557	0	1552	31	0
11	K	1612	0	1571	27	0
11	Y	1612	0	1571	27	0
12	L	1579	0	1538	29	0
12	Z	1579	0	1538	28	0
13	M	1702	0	1638	26	0
13	a	1702	0	1638	26	0
14	N	1732	0	1693	29	0
14	b	1732	0	1693	27	0
15	L	29	0	0	1	0
15	Z	29	0	0	1	0
All	All	48930	0	48130	706	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 7.

The worst 5 of 706 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)
3:Q:101:LEU:HD12	10:X:73:MET:HE2	1.35	1.07
3:C:101:LEU:HD12	10:J:73:MET:HE2	1.35	1.03
1:O:228:ASN:HD21	1:O:232:GLN:HE22	1.17	0.91
1:A:228:ASN:HD21	1:A:232:GLN:NE2	1.69	0.89
1:A:228:ASN:HD21	1:A:232:GLN:HE22	1.17	0.89

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	242/250 (97%)	235 (97%)	5 (2%)	2 (1%)	16	34
1	O	242/250 (97%)	235 (97%)	5 (2%)	2 (1%)	16	34
2	B	227/231 (98%)	219 (96%)	8 (4%)	0	100	100
2	P	227/231 (98%)	219 (96%)	8 (4%)	0	100	100
3	C	269/285 (94%)	254 (94%)	14 (5%)	1 (0%)	30	51
3	Q	269/285 (94%)	253 (94%)	15 (6%)	1 (0%)	30	51
4	D	232/248 (94%)	213 (92%)	18 (8%)	1 (0%)	30	51
4	R	232/248 (94%)	214 (92%)	17 (7%)	1 (0%)	30	51
5	E	225/344 (65%)	214 (95%)	10 (4%)	1 (0%)	30	51
5	S	225/344 (65%)	214 (95%)	10 (4%)	1 (0%)	30	51
6	F	230/428 (54%)	220 (96%)	8 (4%)	2 (1%)	14	30
6	T	230/428 (54%)	220 (96%)	8 (4%)	2 (1%)	14	30
7	G	224/238 (94%)	216 (96%)	8 (4%)	0	100	100
7	U	224/238 (94%)	216 (96%)	8 (4%)	0	100	100
8	H	226/283 (80%)	217 (96%)	9 (4%)	0	100	100
8	V	226/283 (80%)	217 (96%)	9 (4%)	0	100	100
9	I	217/254 (85%)	205 (94%)	9 (4%)	3 (1%)	9	19
9	W	217/254 (85%)	205 (94%)	9 (4%)	3 (1%)	9	19
10	J	202/205 (98%)	195 (96%)	6 (3%)	1 (0%)	24	46
10	X	202/205 (98%)	194 (96%)	7 (4%)	1 (0%)	24	46
11	K	204/206 (99%)	194 (95%)	9 (4%)	1 (0%)	24	46
11	Y	204/206 (99%)	194 (95%)	9 (4%)	1 (0%)	24	46
12	L	200/301 (66%)	191 (96%)	8 (4%)	1 (0%)	24	46
12	Z	200/301 (66%)	190 (95%)	9 (4%)	1 (0%)	24	46
13	M	212/339 (62%)	203 (96%)	6 (3%)	3 (1%)	9	19
13	a	212/339 (62%)	203 (96%)	6 (3%)	3 (1%)	9	19
14	N	218/220 (99%)	210 (96%)	6 (3%)	2 (1%)	14	30
14	b	218/220 (99%)	209 (96%)	7 (3%)	2 (1%)	14	30
All	All	6256/7664 (82%)	5969 (95%)	251 (4%)	36 (1%)	23	42

5 of 36 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
4	D	49	SER
6	F	223	SER
13	M	226	ARG
14	N	191	SER
4	R	49	SER

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	193/197 (98%)	182 (94%)	11 (6%)	18	40
1	O	193/197 (98%)	182 (94%)	11 (6%)	18	40
2	B	188/190 (99%)	178 (95%)	10 (5%)	20	43
2	P	188/190 (99%)	178 (95%)	10 (5%)	20	43
3	C	229/241 (95%)	213 (93%)	16 (7%)	14	31
3	Q	229/241 (95%)	213 (93%)	16 (7%)	14	31
4	D	198/208 (95%)	185 (93%)	13 (7%)	15	34
4	R	198/208 (95%)	183 (92%)	15 (8%)	12	27
5	E	193/301 (64%)	172 (89%)	21 (11%)	6	13
5	S	193/301 (64%)	172 (89%)	21 (11%)	6	13
6	F	195/363 (54%)	185 (95%)	10 (5%)	21	45
6	T	195/363 (54%)	185 (95%)	10 (5%)	21	45
7	G	182/190 (96%)	170 (93%)	12 (7%)	15	34
7	U	182/190 (96%)	169 (93%)	13 (7%)	13	31
8	H	184/229 (80%)	173 (94%)	11 (6%)	17	37
8	V	184/229 (80%)	173 (94%)	11 (6%)	17	37
9	I	180/209 (86%)	176 (98%)	4 (2%)	45	72
9	W	180/209 (86%)	176 (98%)	4 (2%)	45	72
10	J	167/168 (99%)	160 (96%)	7 (4%)	26	52
10	X	167/168 (99%)	160 (96%)	7 (4%)	26	52

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
11	K	172/172 (100%)	164 (95%)	8 (5%)	23	48
11	Y	172/172 (100%)	164 (95%)	8 (5%)	23	48
12	L	163/252 (65%)	155 (95%)	8 (5%)	22	47
12	Z	163/252 (65%)	155 (95%)	8 (5%)	22	47
13	M	181/288 (63%)	171 (94%)	10 (6%)	19	41
13	a	181/288 (63%)	171 (94%)	10 (6%)	19	41
14	N	183/183 (100%)	171 (93%)	12 (7%)	15	34
14	b	183/183 (100%)	171 (93%)	12 (7%)	15	34
All	All	5216/6382 (82%)	4907 (94%)	309 (6%)	19	38

5 of 309 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
6	T	307	PRO
12	Z	291	GLN
7	U	51	GLU
9	W	32	ILE
14	b	95	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 79 such sidechains are listed below:

Mol	Chain	Res	Type
6	T	225	GLN
11	Y	102	GLN
6	T	305	GLN
9	W	115	HIS
13	a	160	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates

There are no oligosaccharides in this entry.

5.6 Ligand geometry

2 ligands are modelled in this entry.

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
15	VYW	Z	4000	-	32,32,32	0.60	1 (3%)	41,44,44	0.51	0
15	VYW	L	4000	-	32,32,32	0.61	1 (3%)	41,44,44	0.52	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
15	VYW	Z	4000	-	-	1/20/22/22	0/4/4/4
15	VYW	L	4000	-	-	1/20/22/22	0/4/4/4

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
15	L	4000	VYW	C12-C13	-2.53	1.37	1.43
15	Z	4000	VYW	C12-C13	-2.47	1.37	1.43

There are no bond angle outliers.

There are no chirality outliers.

All (2) torsion outliers are listed below:

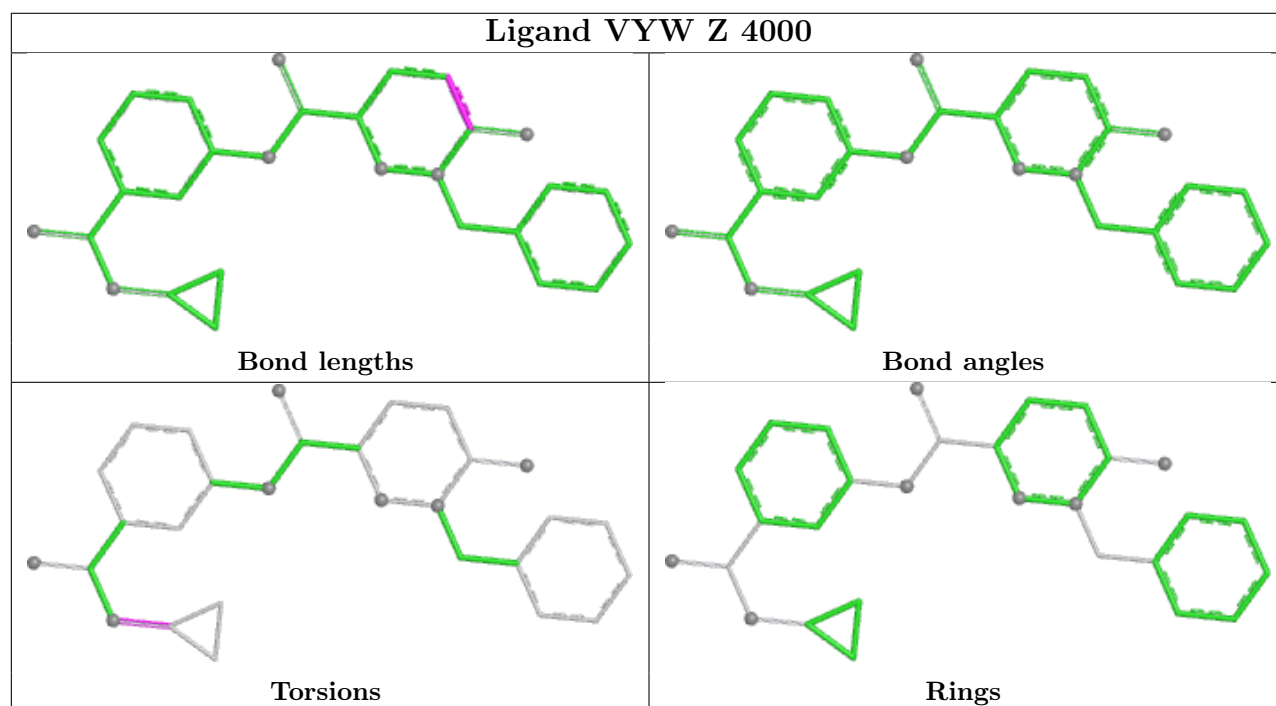
Mol	Chain	Res	Type	Atoms
15	L	4000	VYW	C2-C1-N-C
15	Z	4000	VYW	C2-C1-N-C

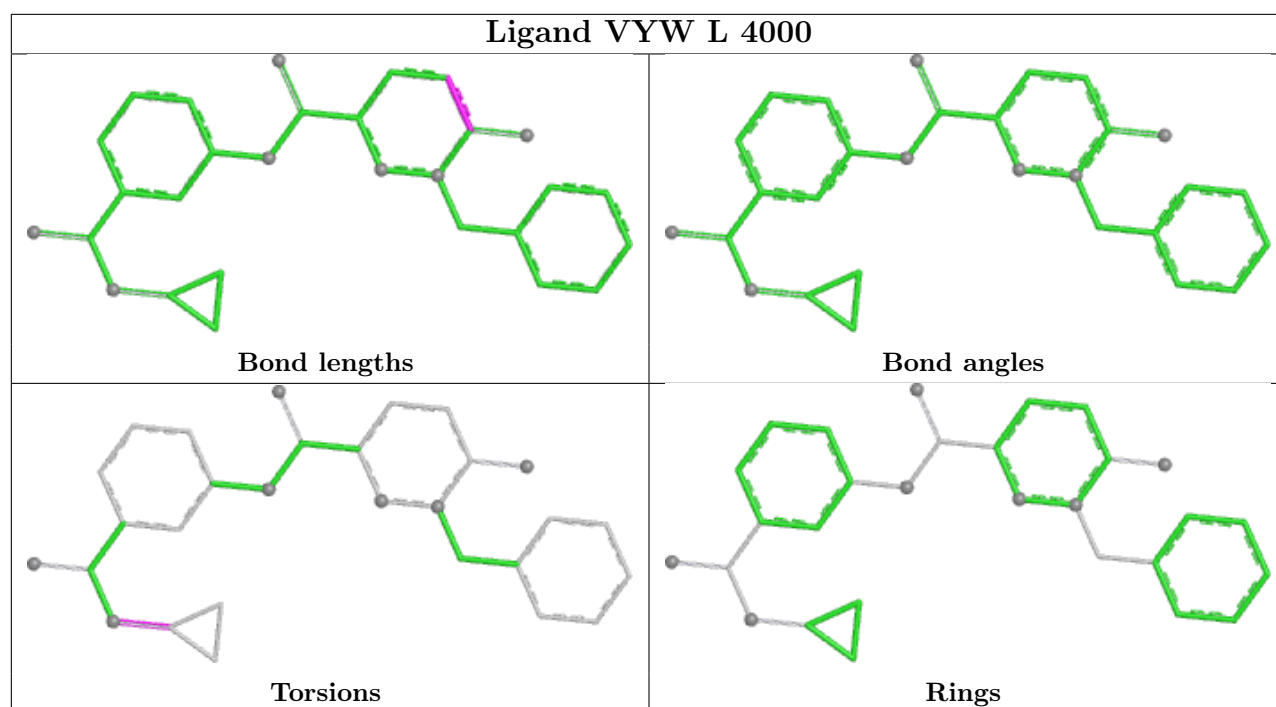
There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
15	Z	4000	VYW	1	0
15	L	4000	VYW	1	0

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





5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

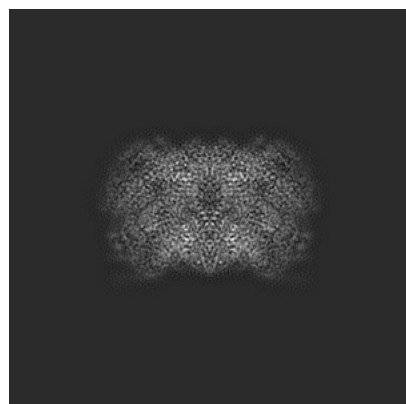
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-16963. These allow visual inspection of the internal detail of the map and identification of artifacts.

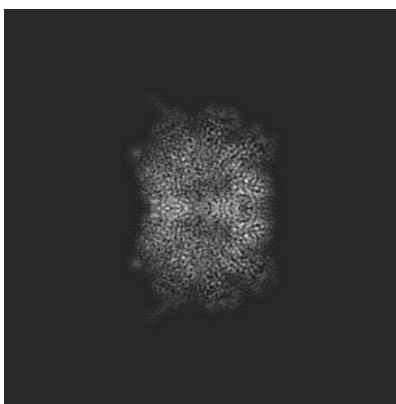
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

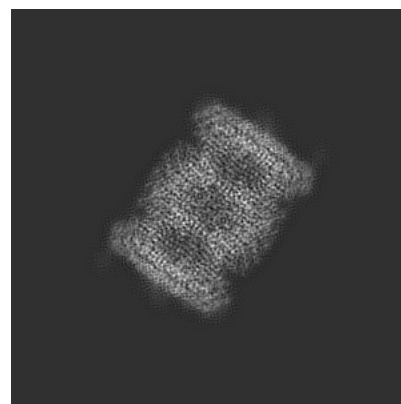
6.1.1 Primary map



X

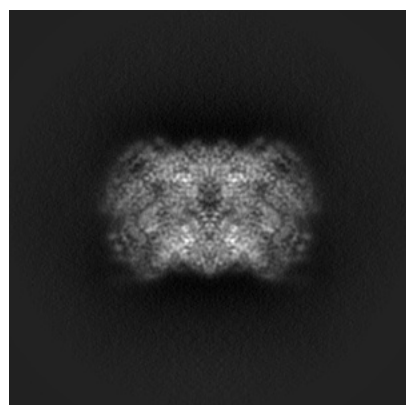


Y

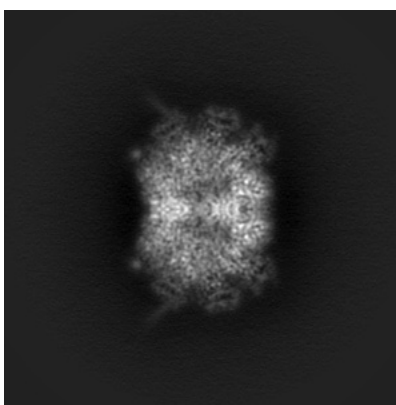


Z

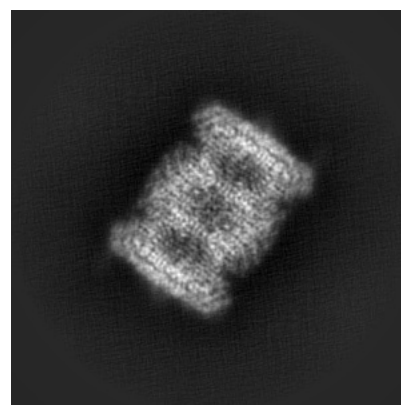
6.1.2 Raw map



X



Y

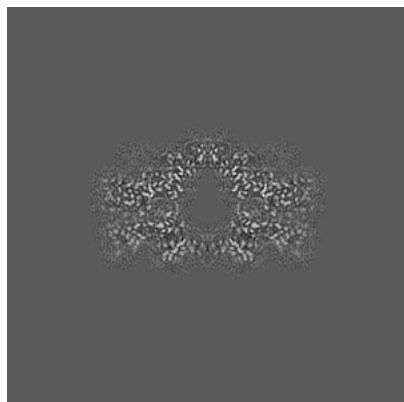


Z

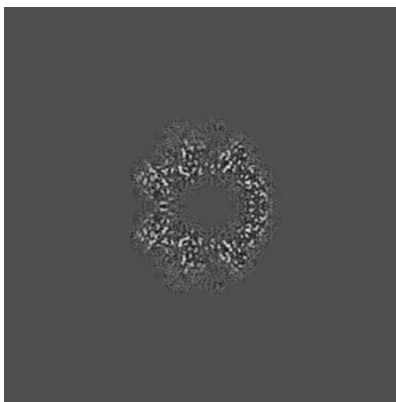
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

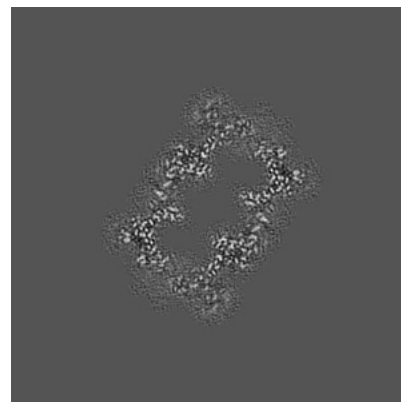
6.2.1 Primary map



X Index: 150

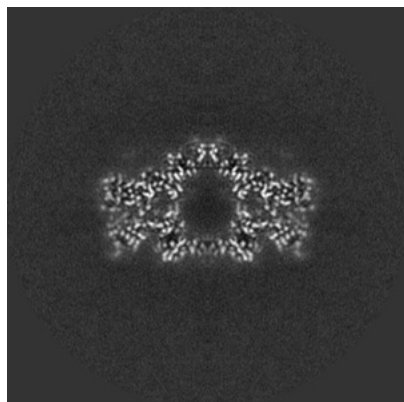


Y Index: 150

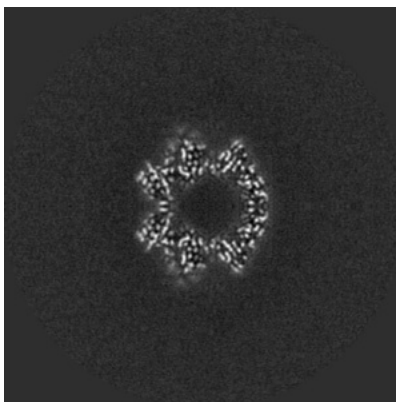


Z Index: 150

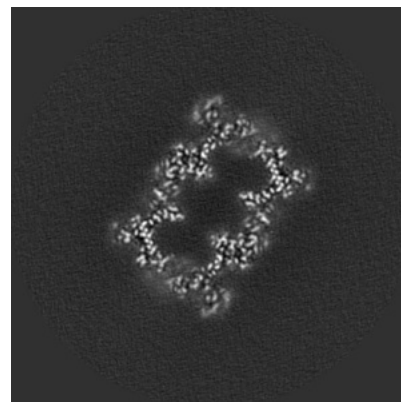
6.2.2 Raw map



X Index: 150



Y Index: 150

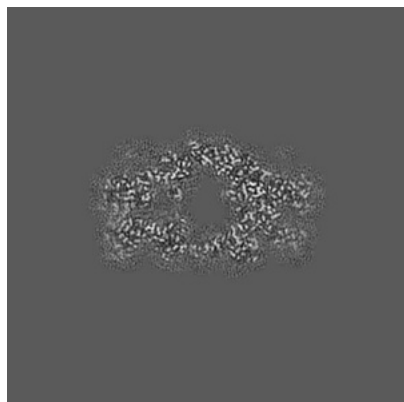


Z Index: 150

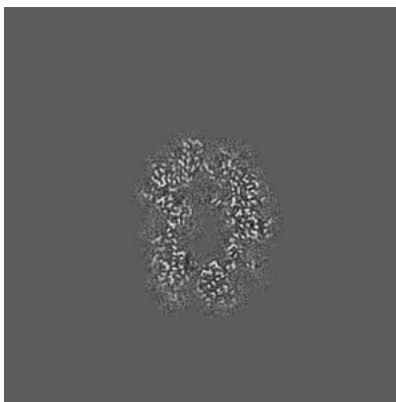
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

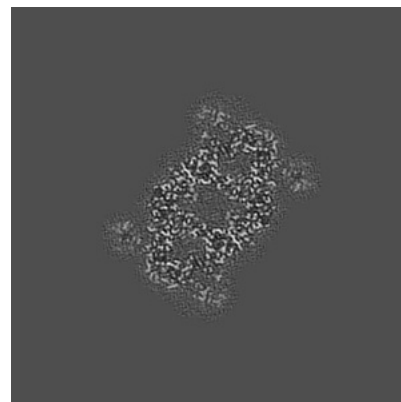
6.3.1 Primary map



X Index: 147

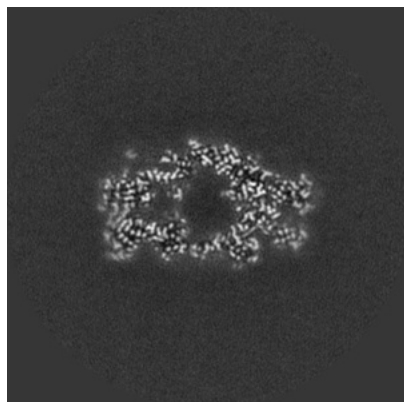


Y Index: 132

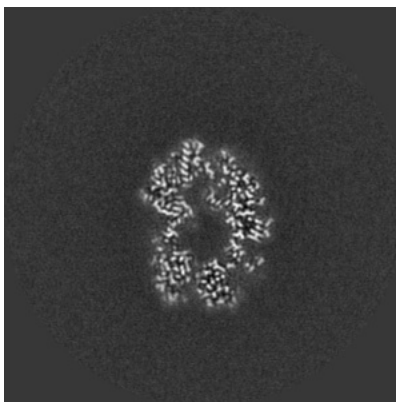


Z Index: 172

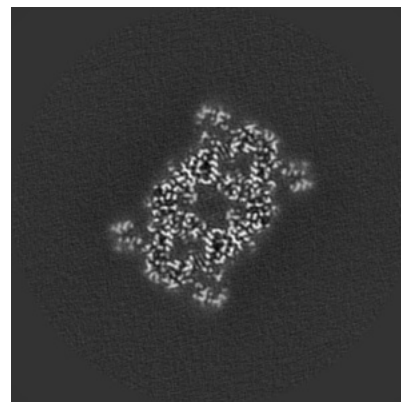
6.3.2 Raw map



X Index: 147



Y Index: 131

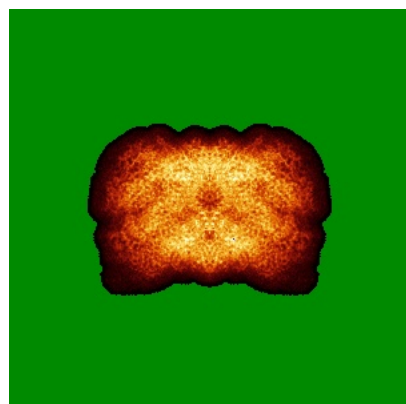


Z Index: 172

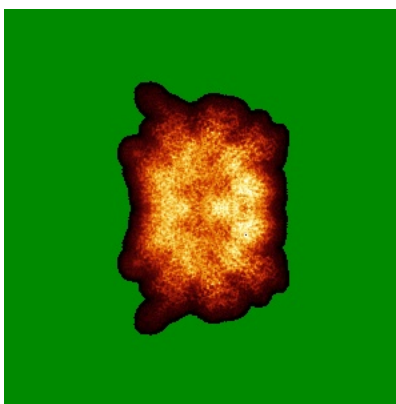
The images above show the largest variance slices of the map in three orthogonal directions.

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

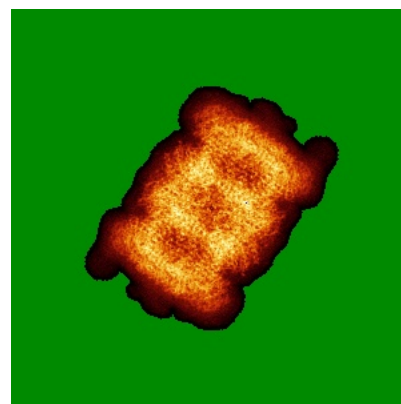
6.4.1 Primary map



X

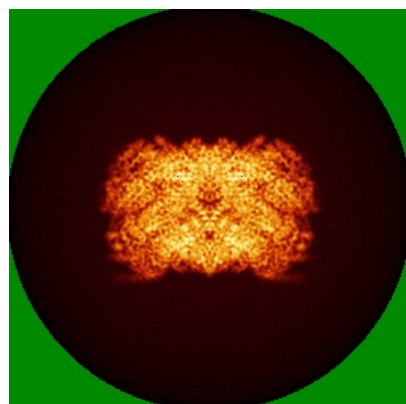


Y

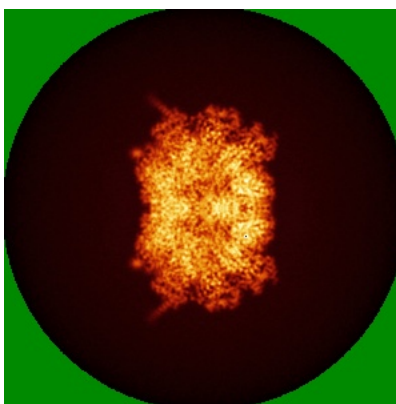


Z

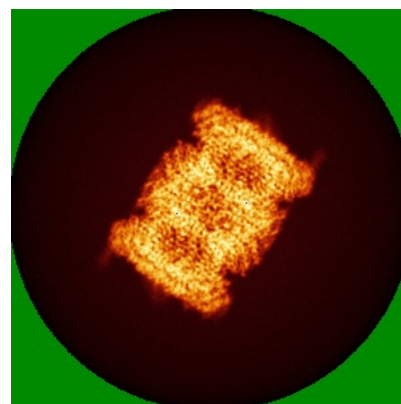
6.4.2 Raw map



X



Y

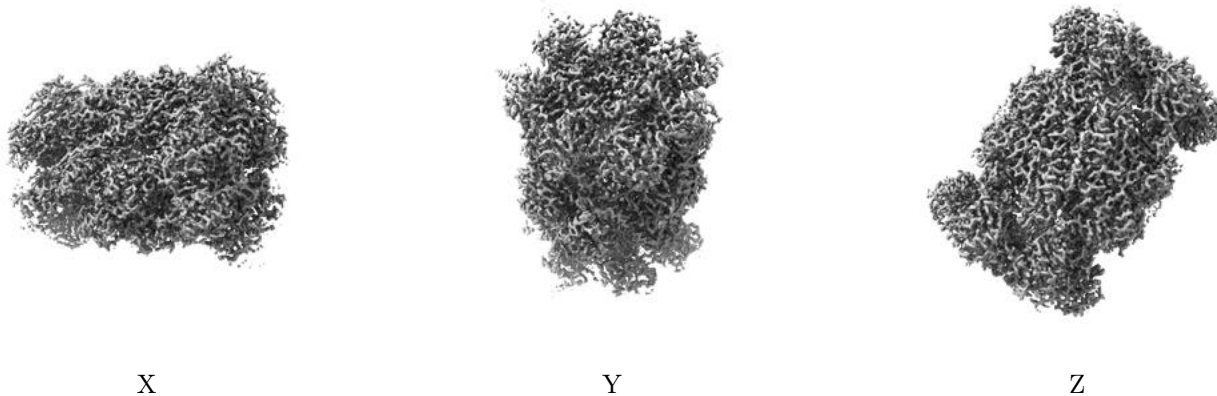


Z

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.

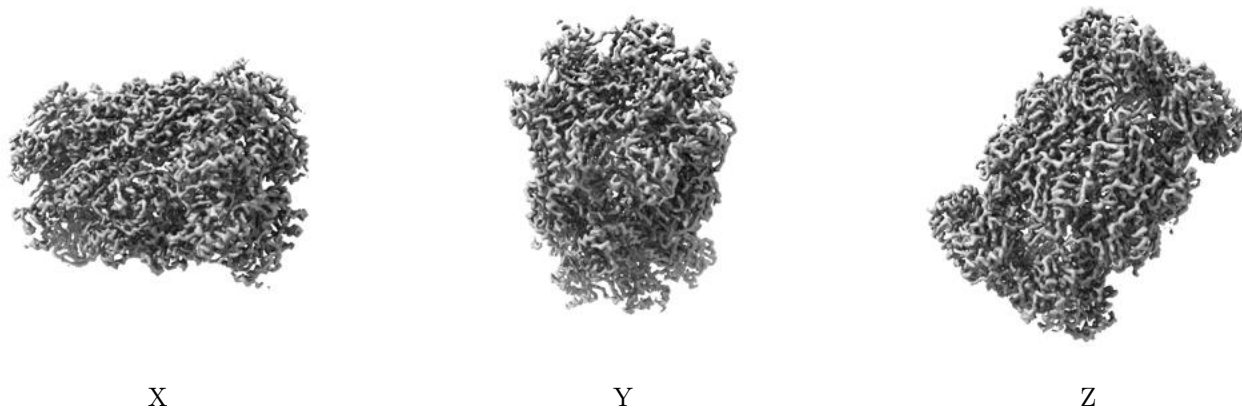
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.1. 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.

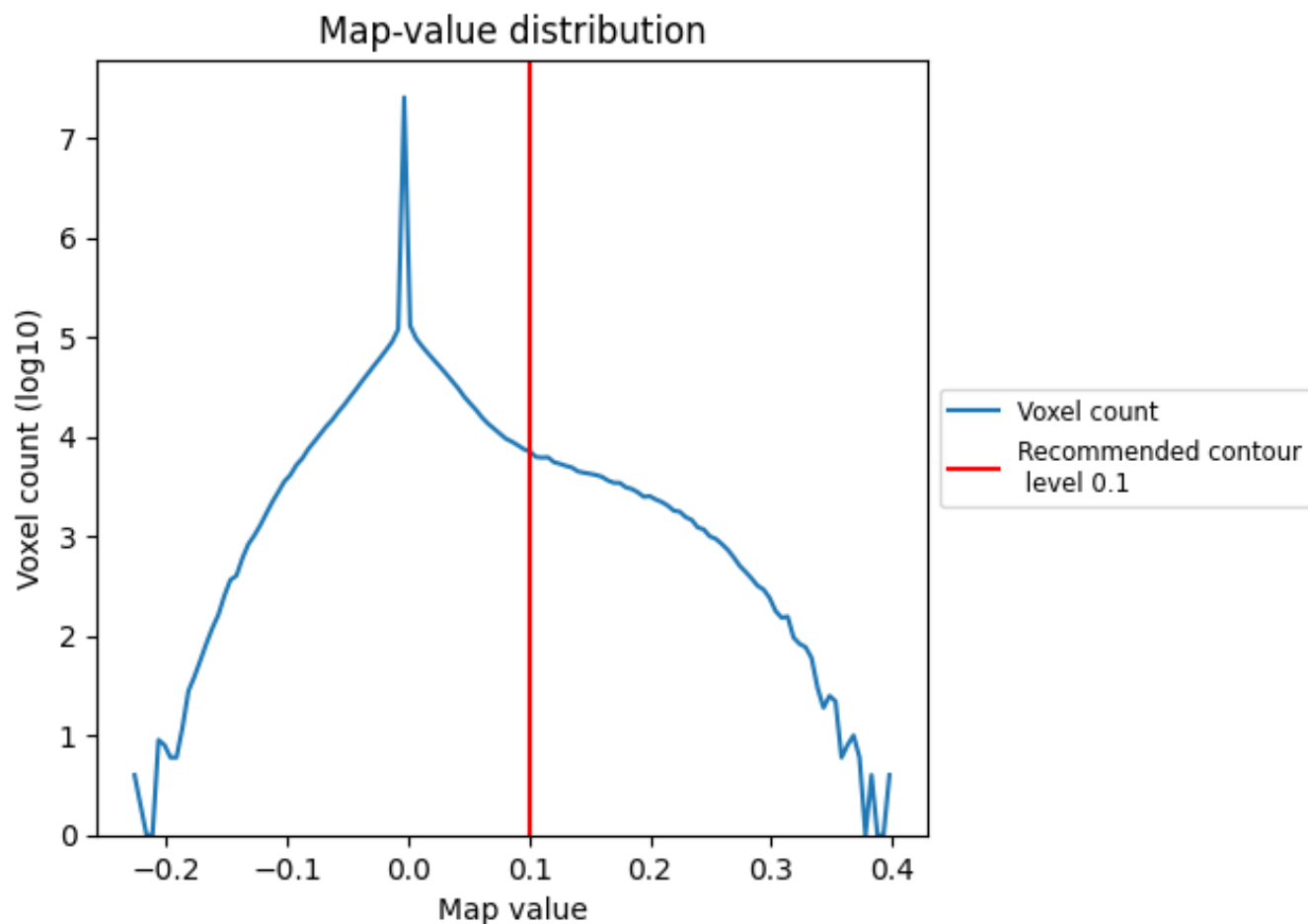
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

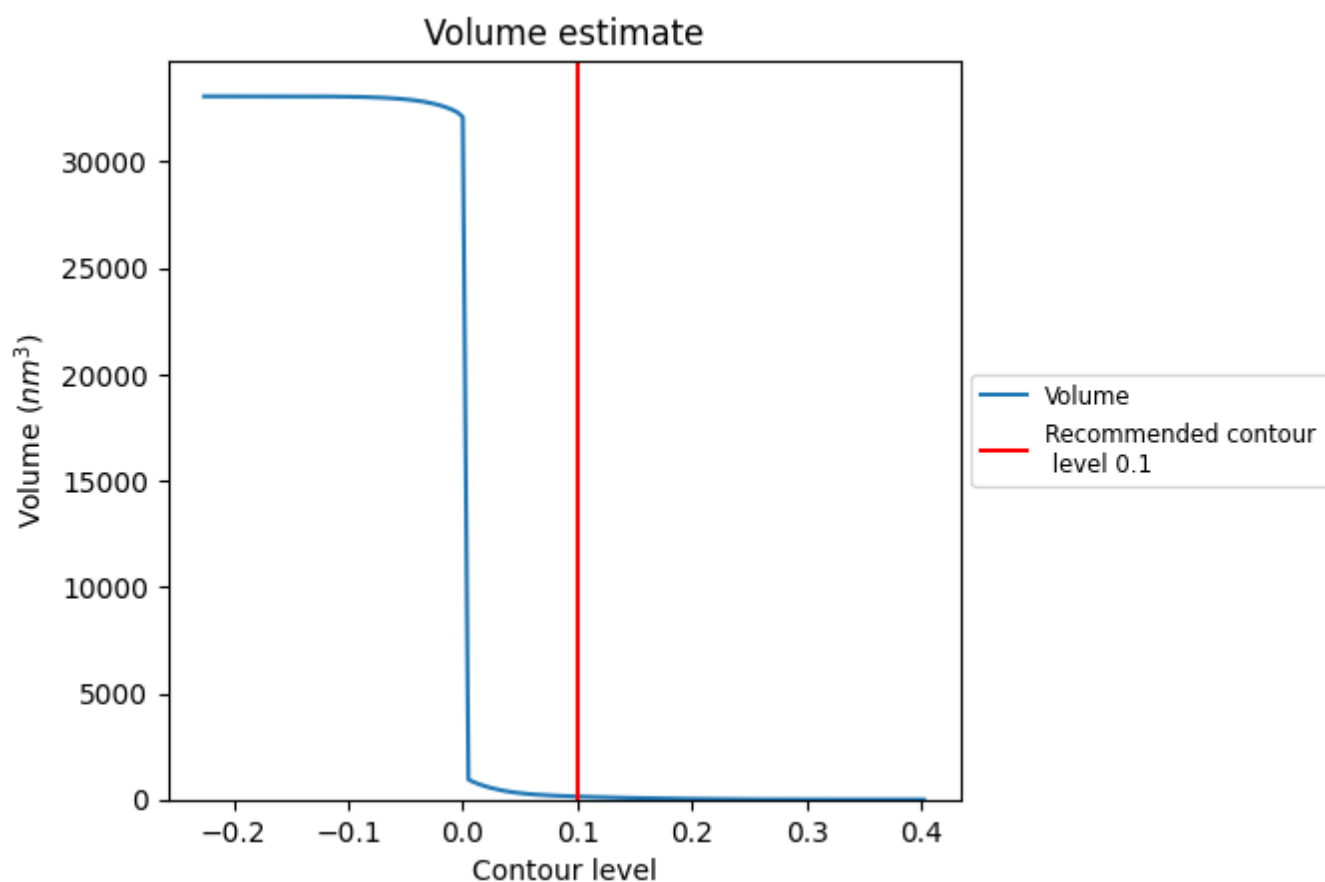
This section contains the results of statistical analysis of the map.

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.

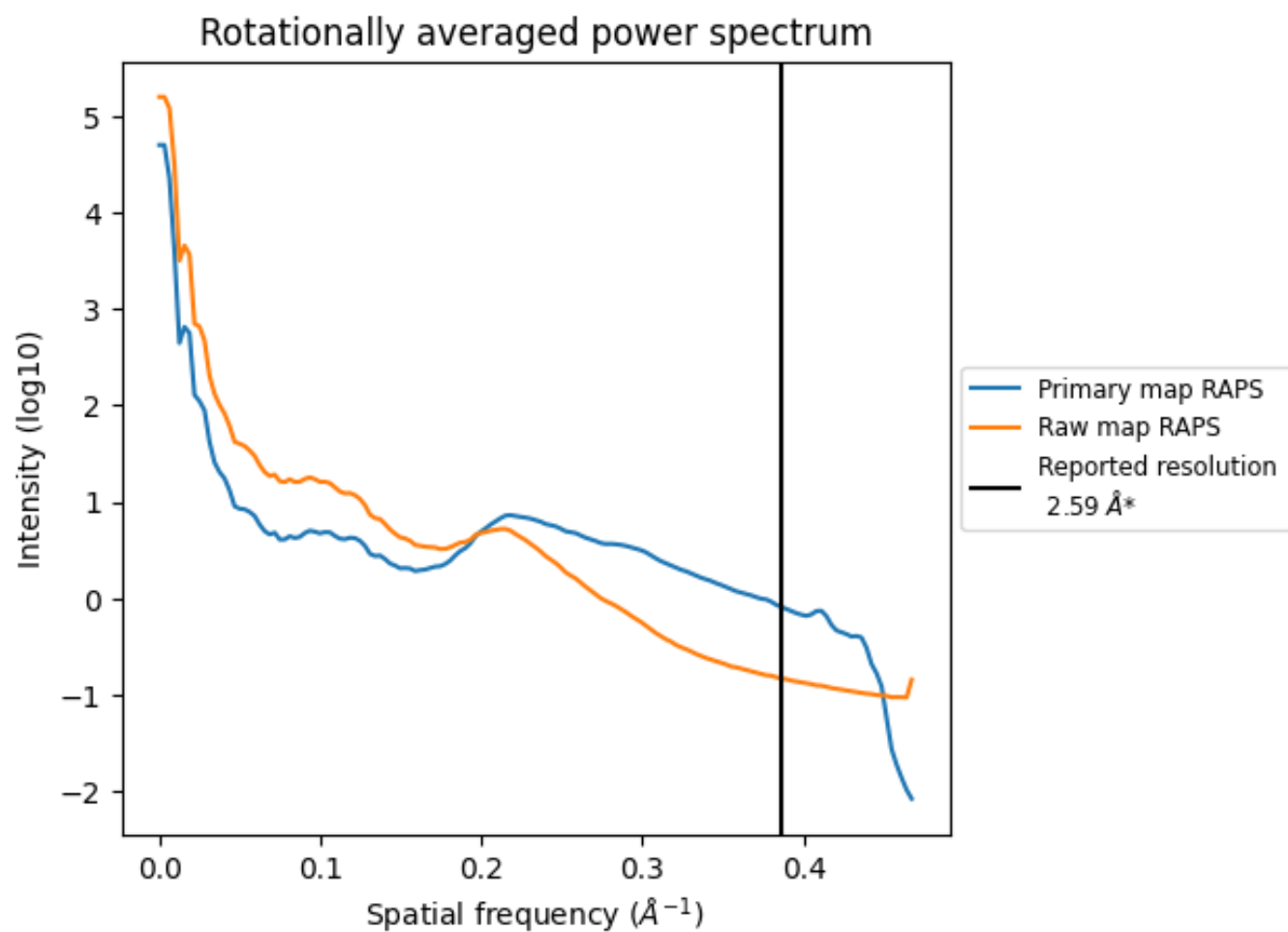
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 142 nm³; this corresponds to an approximate mass of 128 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 ⓘ

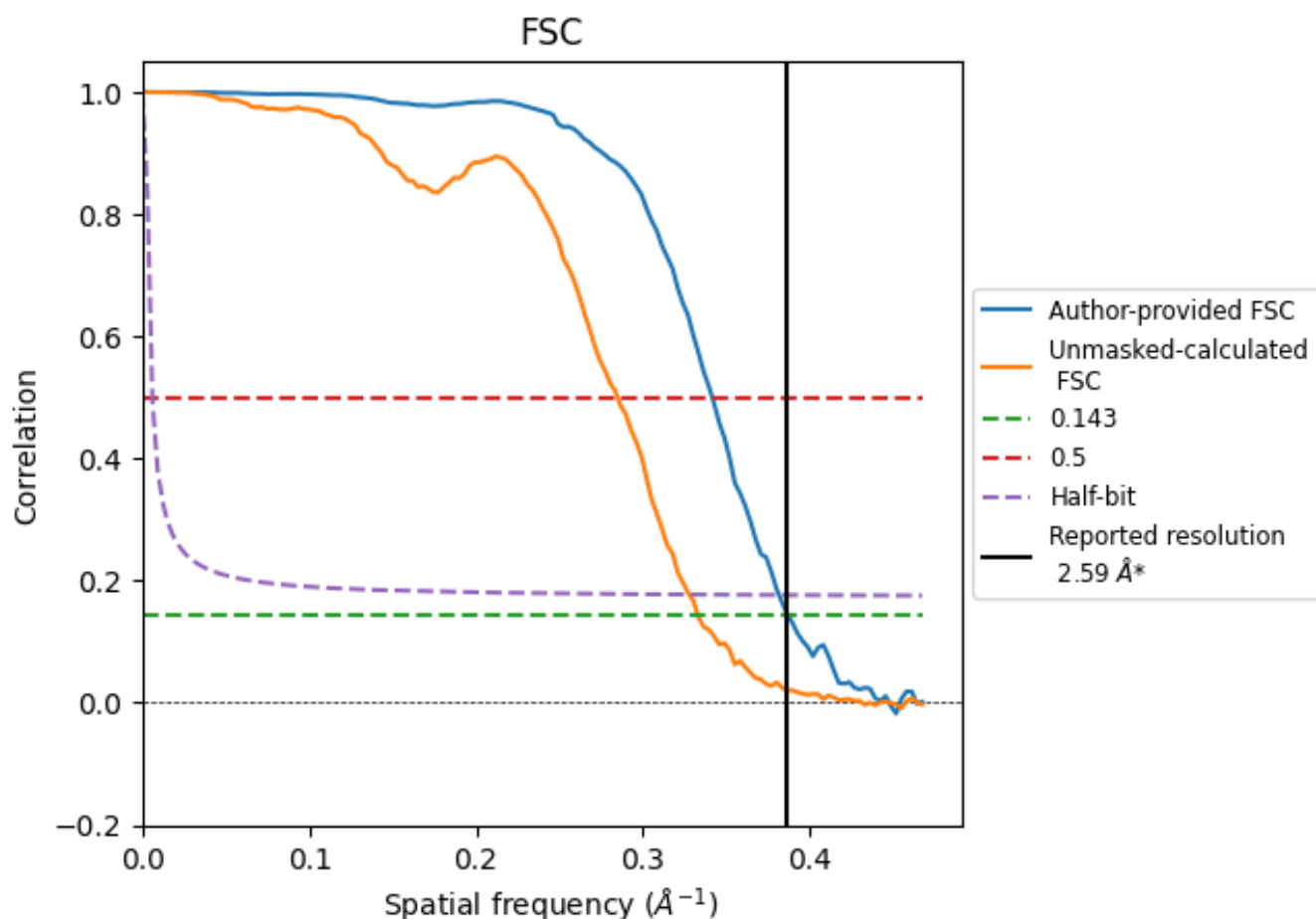


*Reported resolution corresponds to spatial frequency of 0.386 Å⁻¹

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 0.386 $\text{\AA}^{-1}$

8.2 Resolution estimates [i](#)

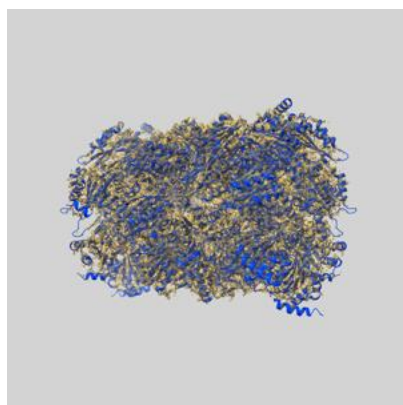
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.59	-	-
Author-provided FSC curve	2.58	2.93	2.62
Unmasked-calculated*	3.00	3.51	3.05

*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 3.00 differs from the reported value 2.59 by more than 10 %

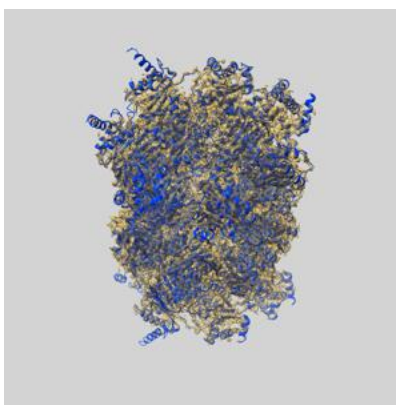
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-16963 and PDB model 8OLU. Per-residue inclusion information can be found in section [3](#) on page [8](#).

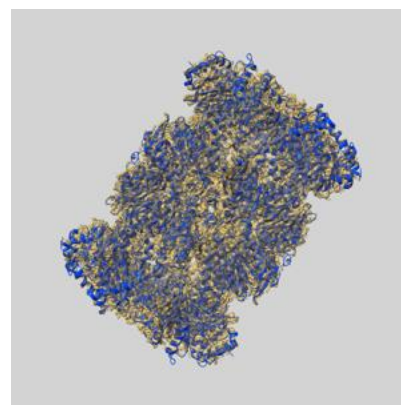
9.1 Map-model overlay [i](#)



X



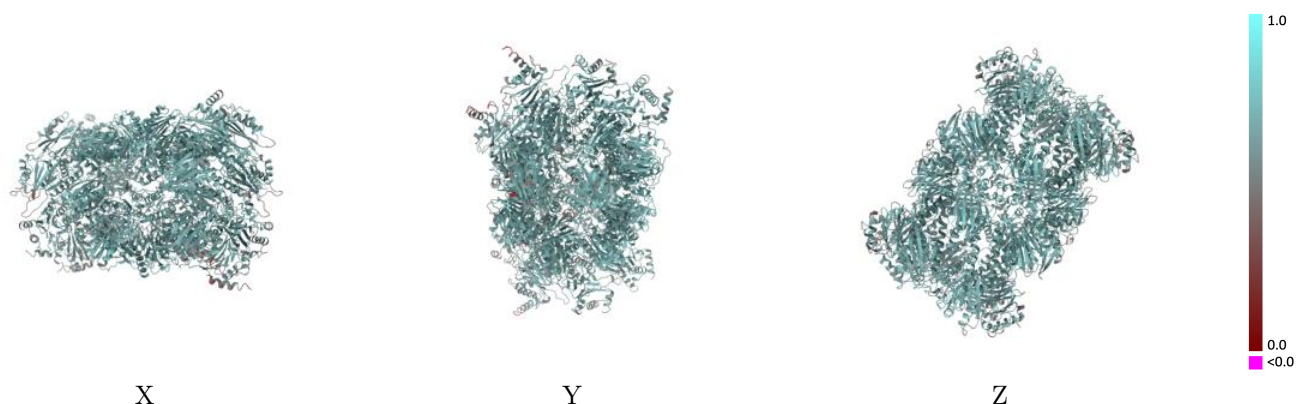
Y



Z

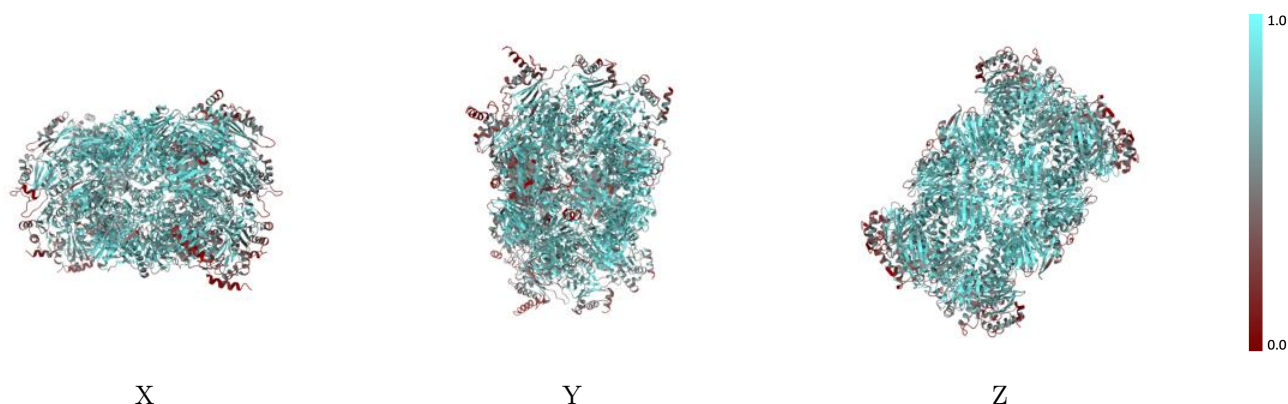
The images above show the 3D surface view of the map at the recommended contour level 0.1 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



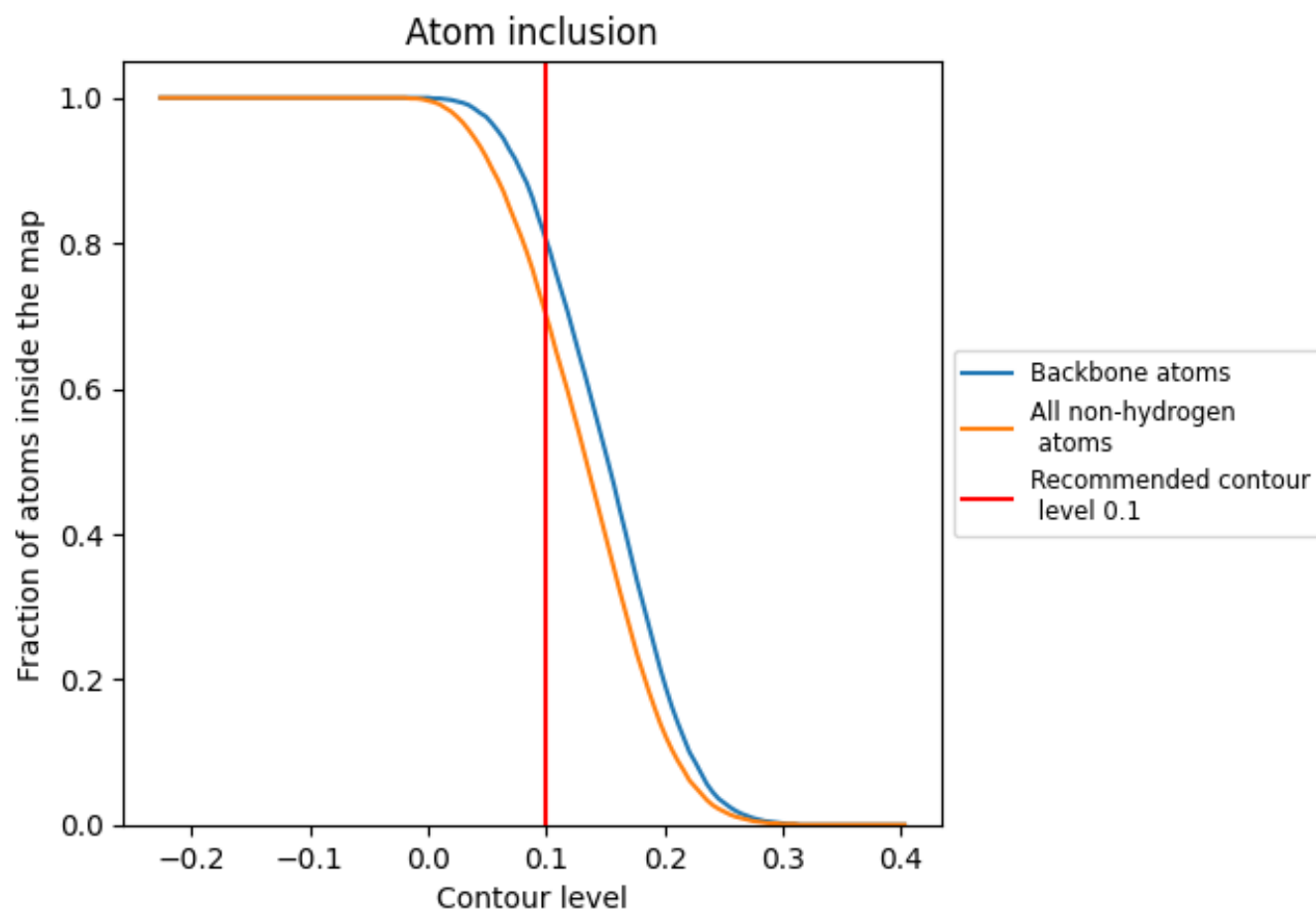
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.1).

9.4 Atom inclusion [i](#)



At the recommended contour level, 80% of all backbone atoms, 70% 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 (0.1) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.7000	 0.6490
A	 0.6890	 0.6470
B	 0.6800	 0.6450
C	 0.5930	 0.6230
D	 0.5650	 0.6060
E	 0.5520	 0.6110
F	 0.6150	 0.6320
G	 0.6970	 0.6520
H	 0.8490	 0.6940
I	 0.7430	 0.6540
J	 0.7940	 0.6720
K	 0.7600	 0.6640
L	 0.7880	 0.6710
M	 0.7210	 0.6560
N	 0.8210	 0.6760
O	 0.6880	 0.6480
P	 0.6780	 0.6440
Q	 0.5920	 0.6220
R	 0.5660	 0.6080
S	 0.5510	 0.6130
T	 0.6150	 0.6320
U	 0.6980	 0.6530
V	 0.8510	 0.6930
W	 0.7440	 0.6580
X	 0.7950	 0.6700
Y	 0.7590	 0.6630
Z	 0.7880	 0.6700
a	 0.7210	 0.6560
b	 0.8190	 0.6760

