



wwPDB EM Validation Summary Report ⓘ

Jan 29, 2022 – 06:13 am GMT

PDB ID : 7QJ3
EMDB ID : EMD-14008
Title : Structure of recombinant human gamma-Tubulin Ring Complex 8-spoked assembly intermediate (spokes 7-14)
Authors : Zupa, E.; Pfeffer, S.
Deposited on : 2021-12-16
Resolution : 7.60 Å (reported)
Based on initial models : 6L81, 7AS4, 6V6S, 6X0U

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

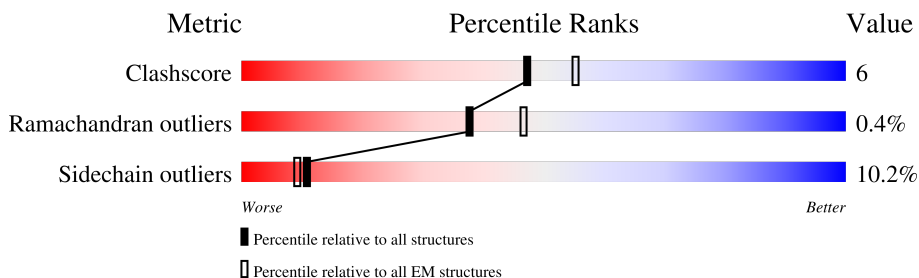
EMDB validation analysis : 0.0.0.dev97
MolProbity : 4.02b-467
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.26

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 7.60 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)
Clashscore	158937	4297
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

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	1	451	
1	2	451	
1	U	451	
1	V	451	
1	W	451	
1	X	451	
1	Y	451	
1	Z	451	

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Mol	Chain	Length	Quality of chain
2	b	82	
2	m	82	
2	o	82	
3	H	907	
3	N	907	
3	a	907	
3	n	907	
4	J	1024	
4	l	1024	
5	G	902	
5	M	902	
6	I	667	
6	K	667	
7	L	1819	

2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 69053 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 Tubulin gamma-1 chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	1	420	3373	2134	586	638	15	0	0
1	2	420	3373	2134	586	638	15	0	0
1	U	420	3373	2134	586	638	15	0	0
1	V	420	3373	2134	586	638	15	0	0
1	W	420	3373	2134	586	638	15	0	0
1	X	420	3373	2134	586	638	15	0	0
1	Y	420	3373	2134	586	638	15	0	0
1	Z	420	3373	2134	586	638	15	0	0

- Molecule 2 is a protein called Mitotic-spindle organizing protein 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	o	65	484	299	85	96	4	0	0
2	m	65	484	299	85	96	4	0	0
2	b	65	484	299	85	96	4	0	0

- Molecule 3 is a protein called Gamma-tubulin complex component 3.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	n	99	803	509	148	144	2	0	0
3	a	116	933	591	171	169	2	0	0

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Mol	Chain	Residues	Atoms					AltConf	Trace
3	H	594	Total	C	N	O	S	0	0
			4907	3130	864	888	25		
3	N	594	Total	C	N	O	S	0	0
			4907	3130	864	888	25		

- Molecule 4 is a protein called Gamma-tubulin complex component 5.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	I	108	Total	C	N	O	S	0	0
			875	556	151	167	1		
4	J	534	Total	C	N	O	S	0	0
			4429	2893	737	776	23		

- Molecule 5 is a protein called Gamma-tubulin complex component 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	G	636	Total	C	N	O	S	0	0
			5186	3342	871	940	33		
5	M	636	Total	C	N	O	S	0	0
			5186	3342	871	940	33		

- Molecule 6 is a protein called Gamma-tubulin complex component 4.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	I	521	Total	C	N	O	S	0	0
			4225	2737	720	750	18		
6	K	562	Total	C	N	O	S	0	0
			4579	2964	781	816	18		

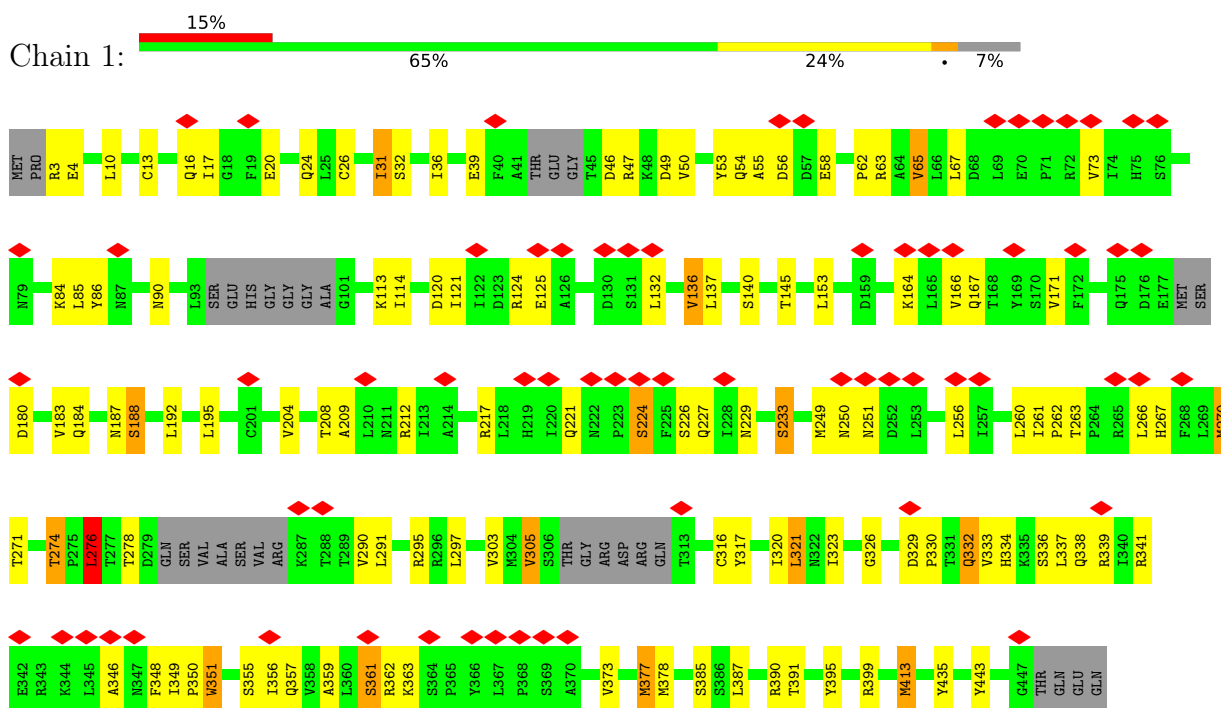
- Molecule 7 is a protein called Gamma-tubulin complex component 6.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	L	566	Total	C	N	O	S	0	0
			4587	3000	773	789	25		

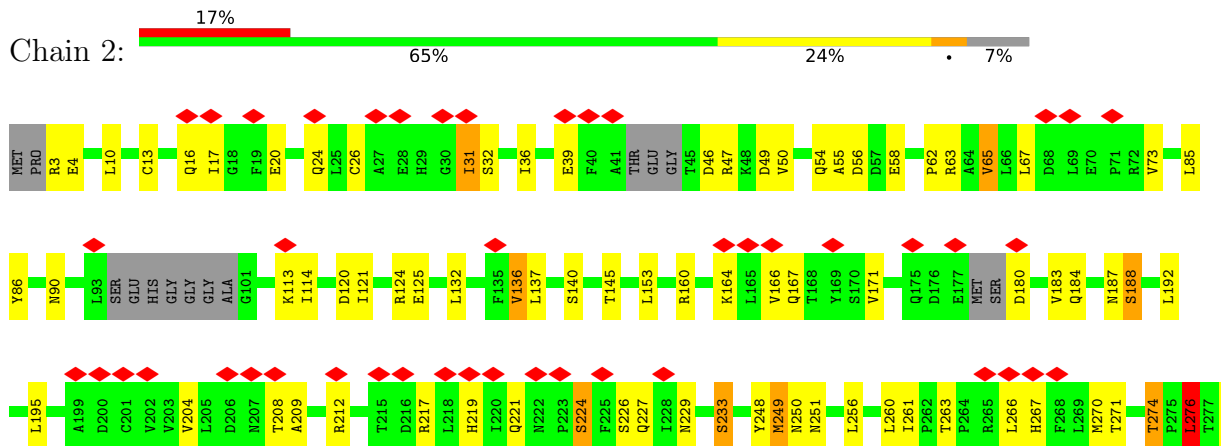
3 Residue-property plots [i](#)

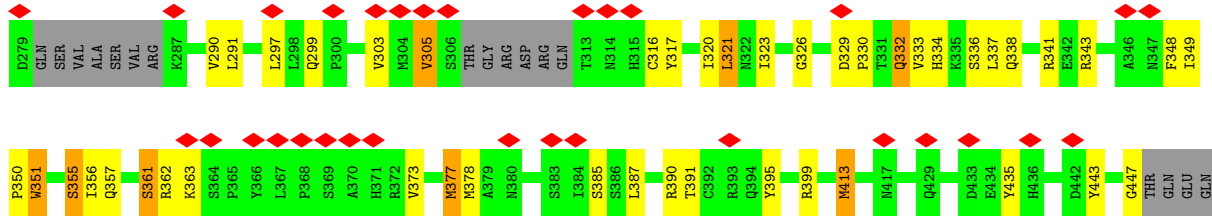
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion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

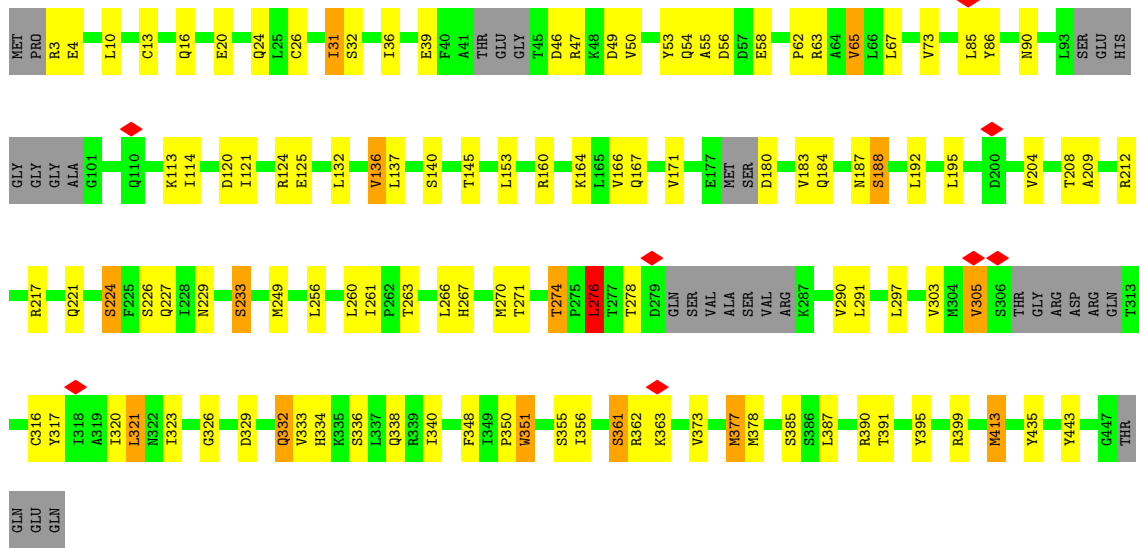


- Molecule 1: Tubulin gamma-1 chain

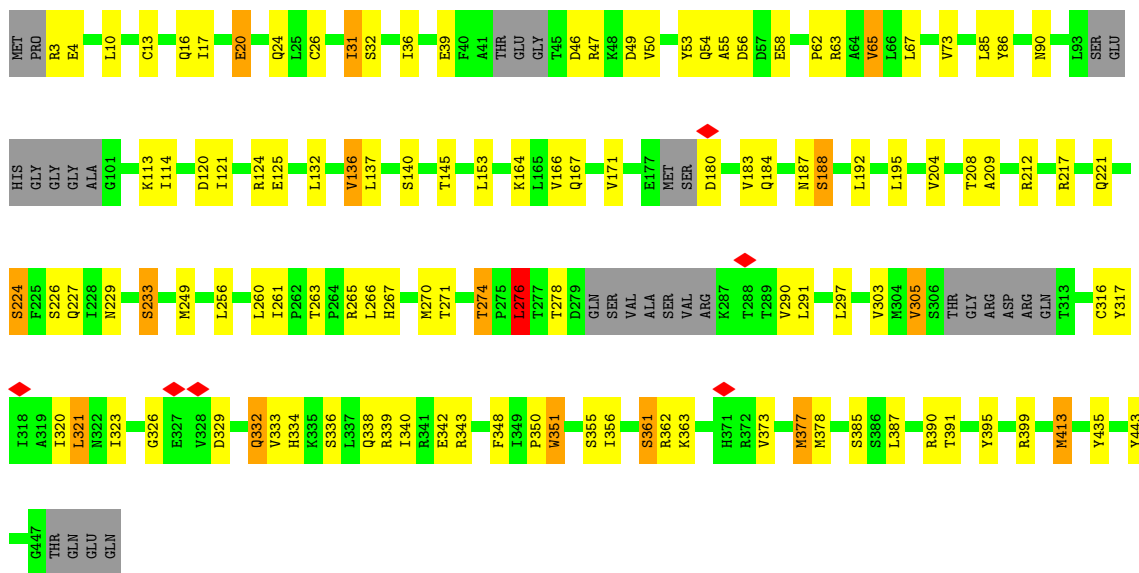




• Molecule 1: Tubulin gamma-1 chain

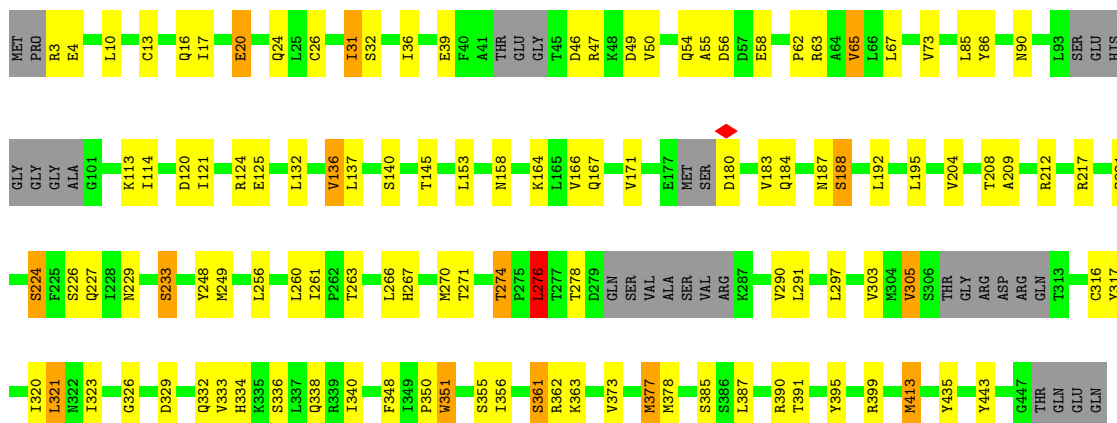


• Molecule 1: Tubulin gamma-1 chain



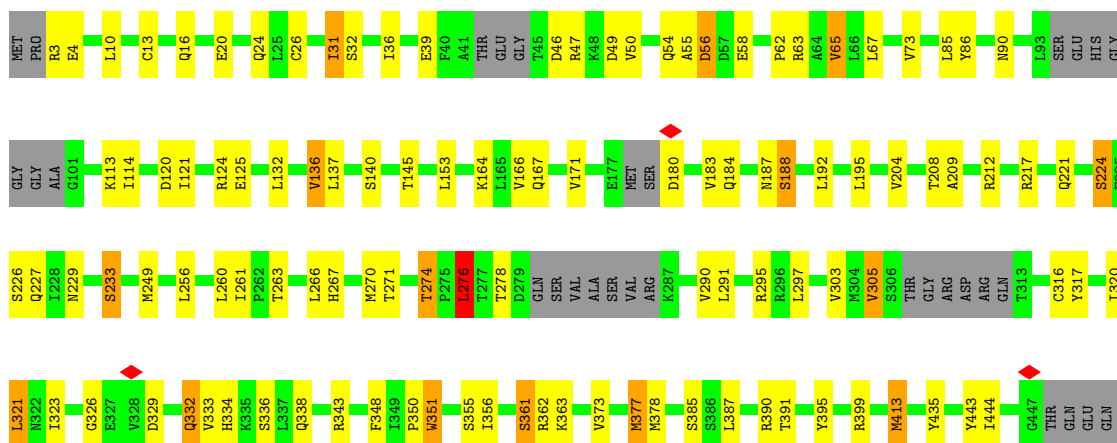
• Molecule 1: Tubulin gamma-1 chain

Chain W:  68% 22% 7%



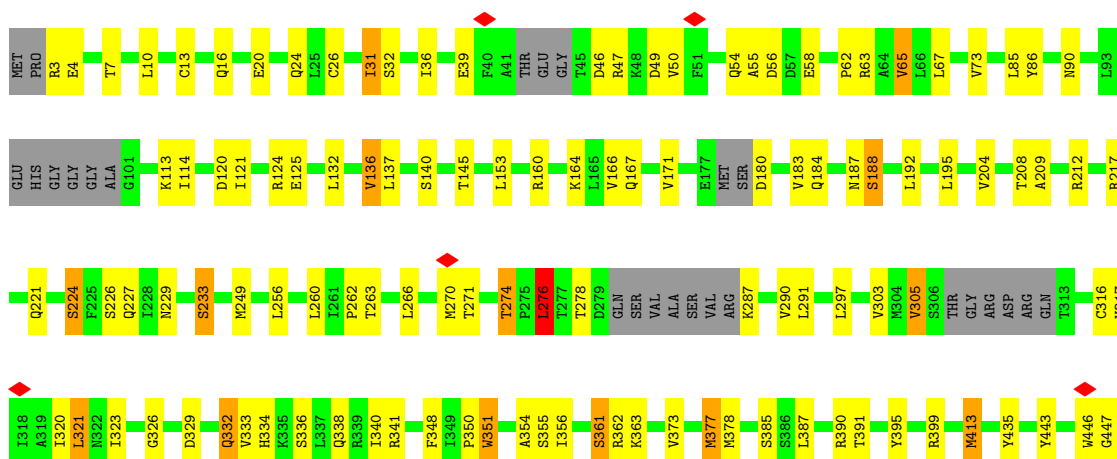
• Molecule 1: Tubulin gamma-1 chain

Chain X:  68% 22% 7%



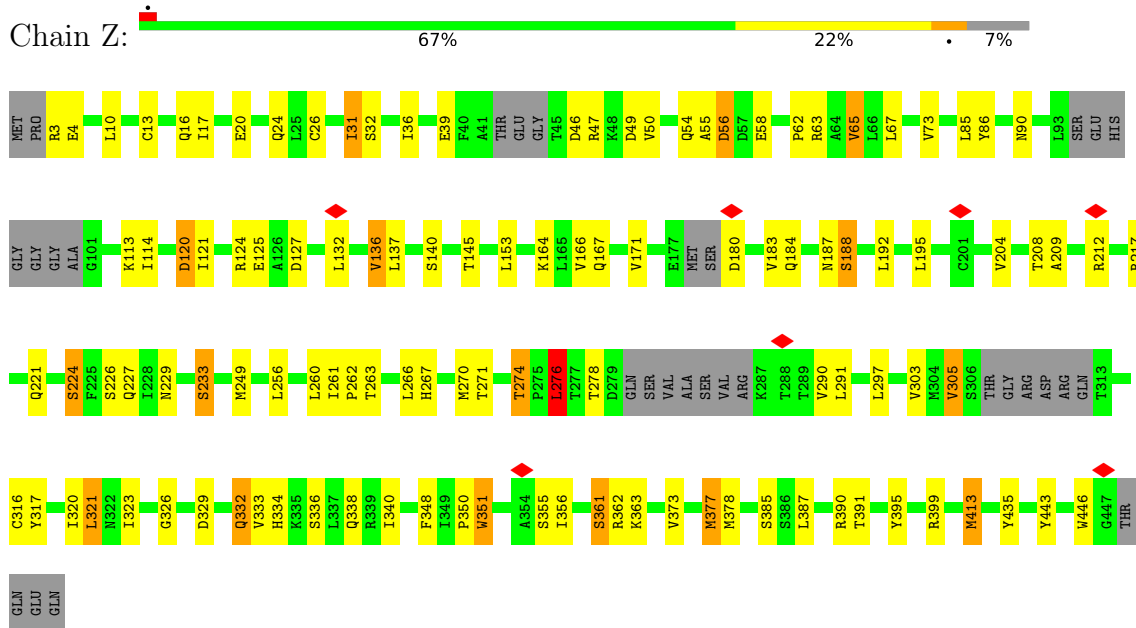
• Molecule 1: Tubulin gamma-1 chain

Chain Y:  67% 23% 7%

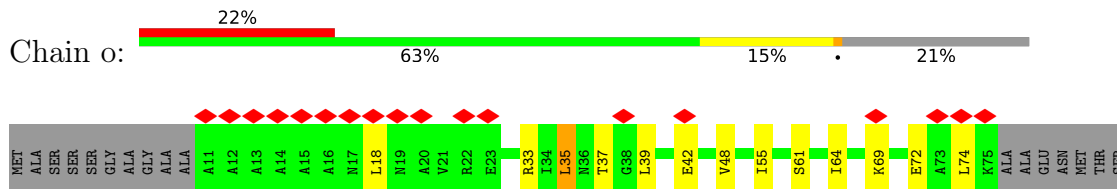


GLN
GLU
GLN

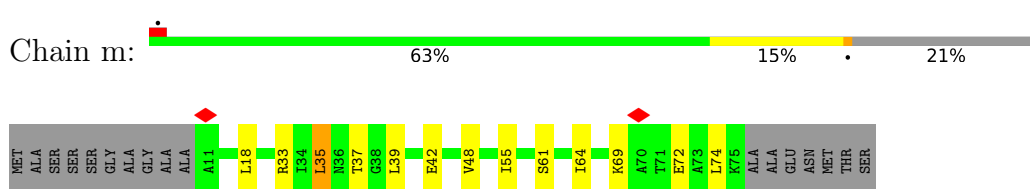
• Molecule 1: Tubulin gamma-1 chain



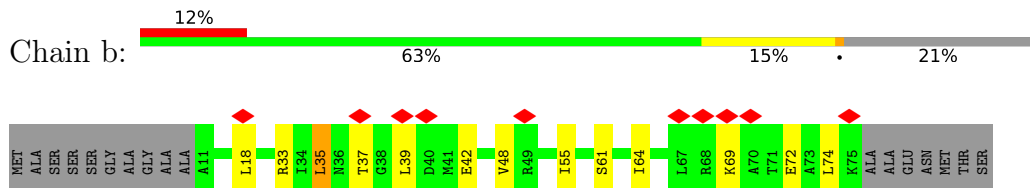
• Molecule 2: Mitotic-spindle organizing protein 1



• Molecule 2: Mitotic-spindle organizing protein 1

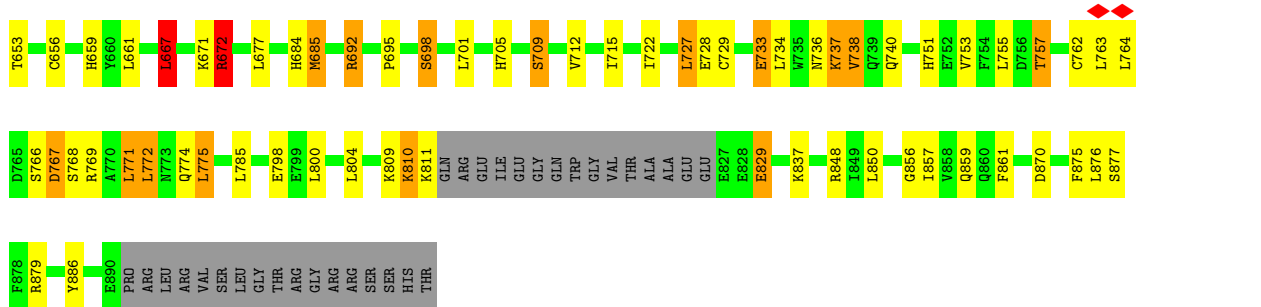


• Molecule 2: Mitotic-spindle organizing protein 1

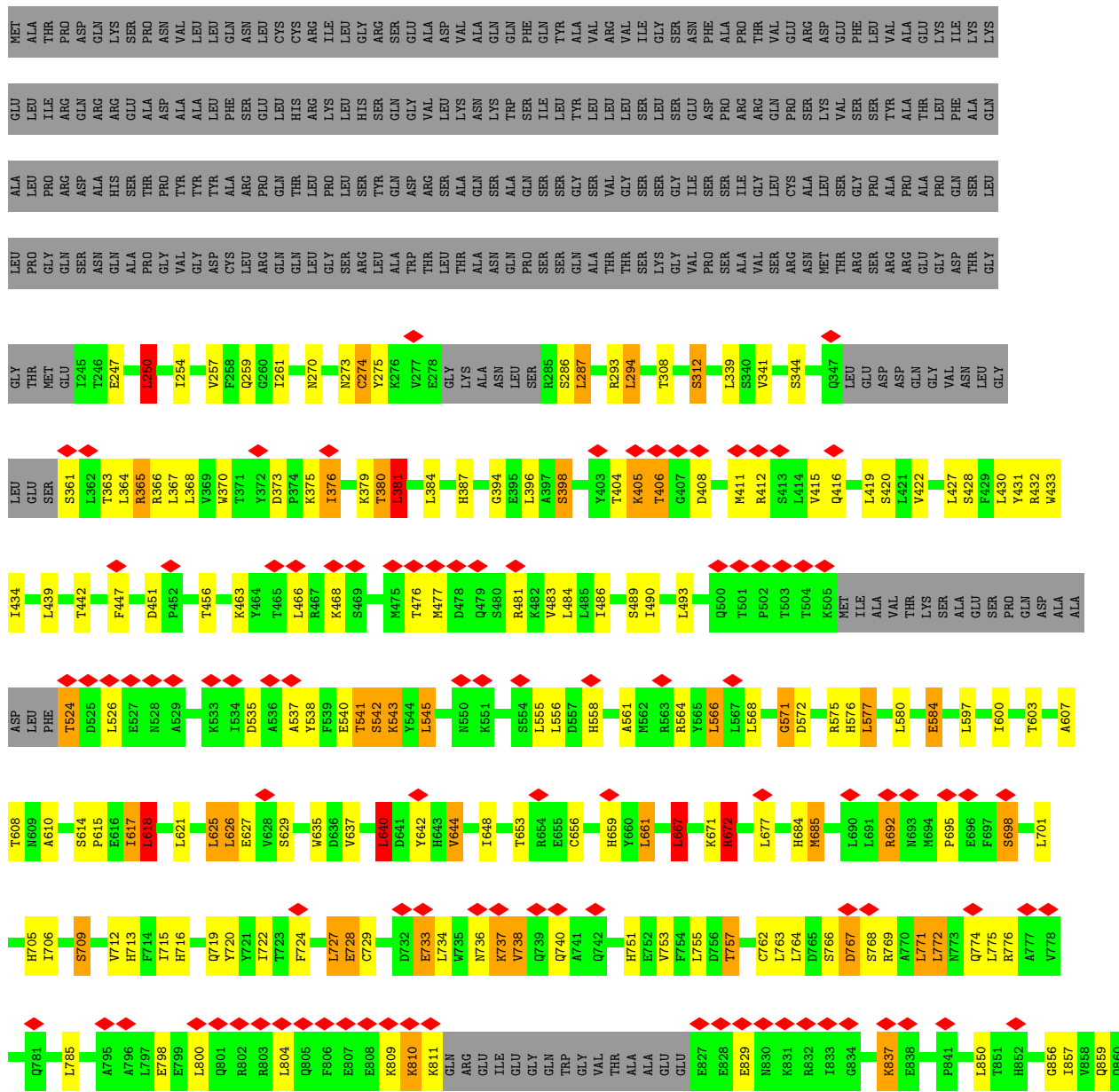
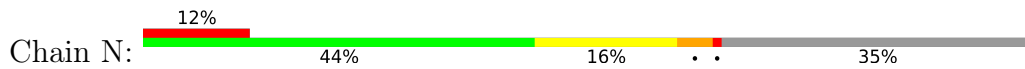


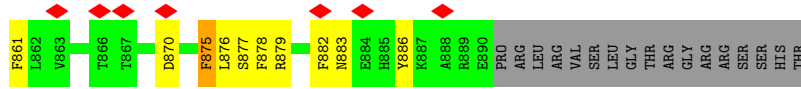
• Molecule 3: Gamma-tubulin complex component 3





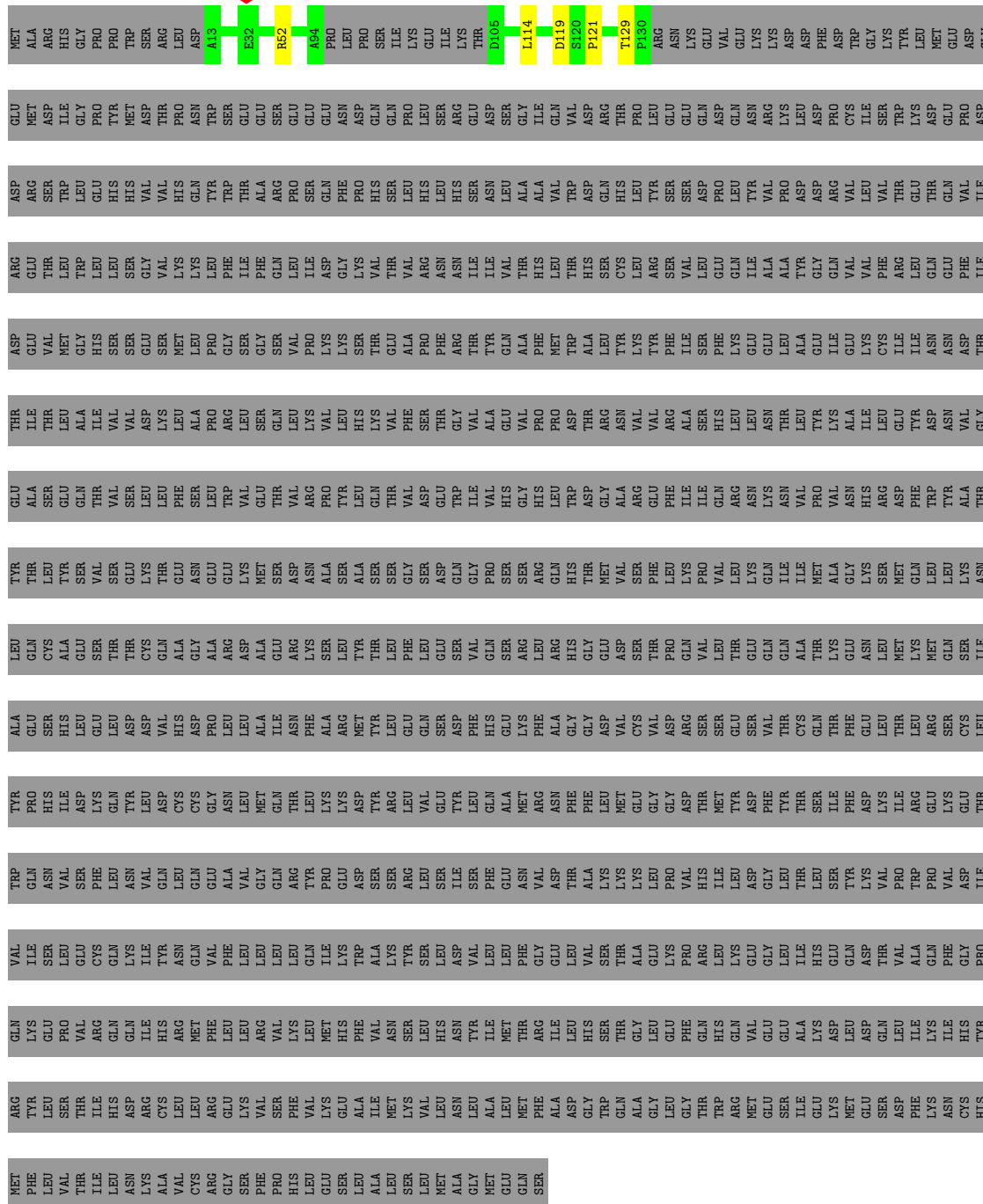
• Molecule 3: Gamma-tubulin complex component 3



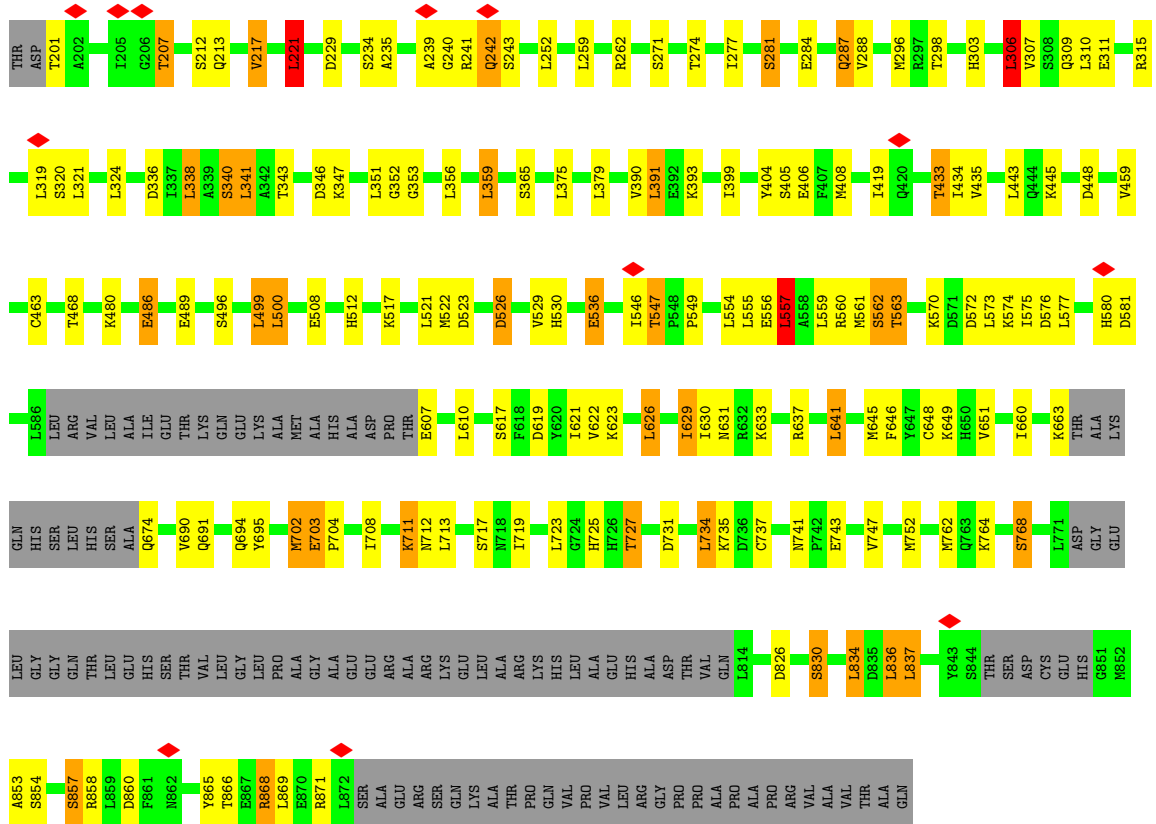


• Molecule 4: Gamma-tubulin complex component 5

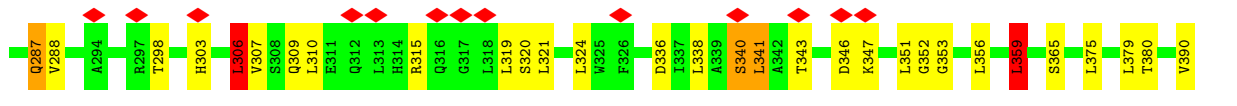
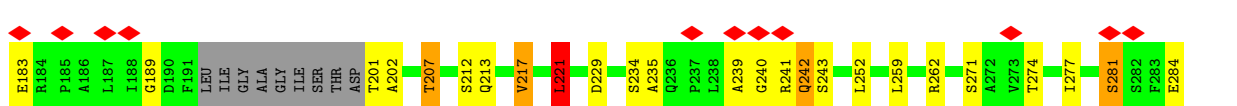
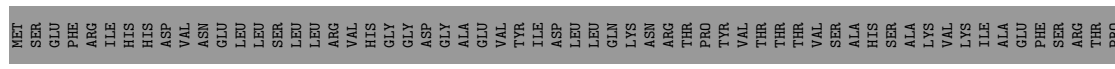
Chain 1: 10% 89%

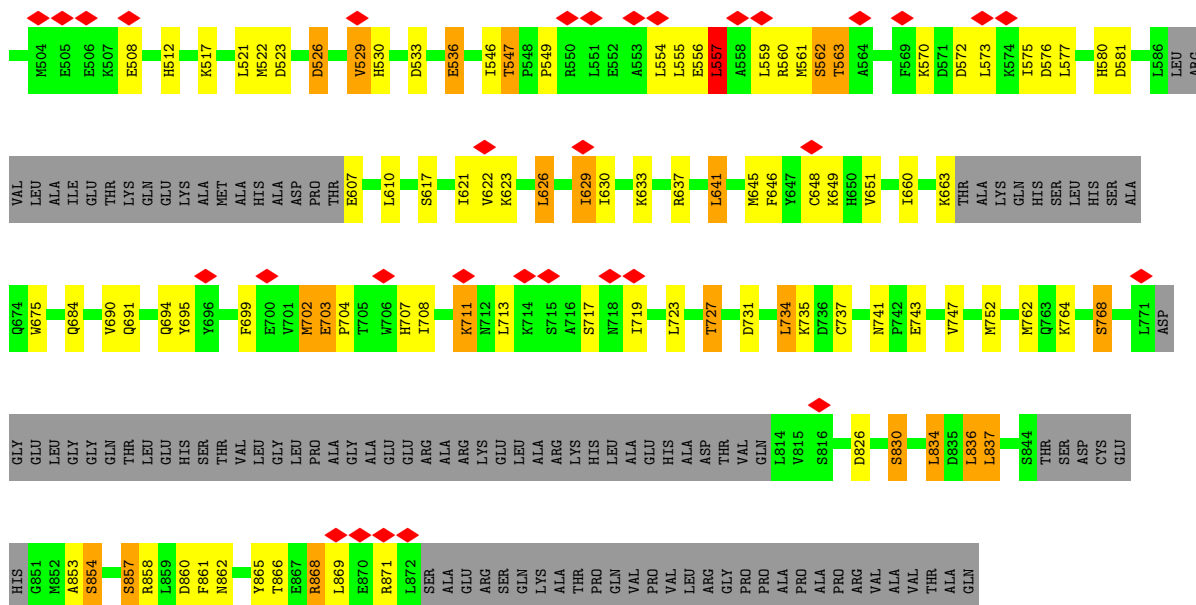


• Molecule 4: Gamma-tubulin complex component 5

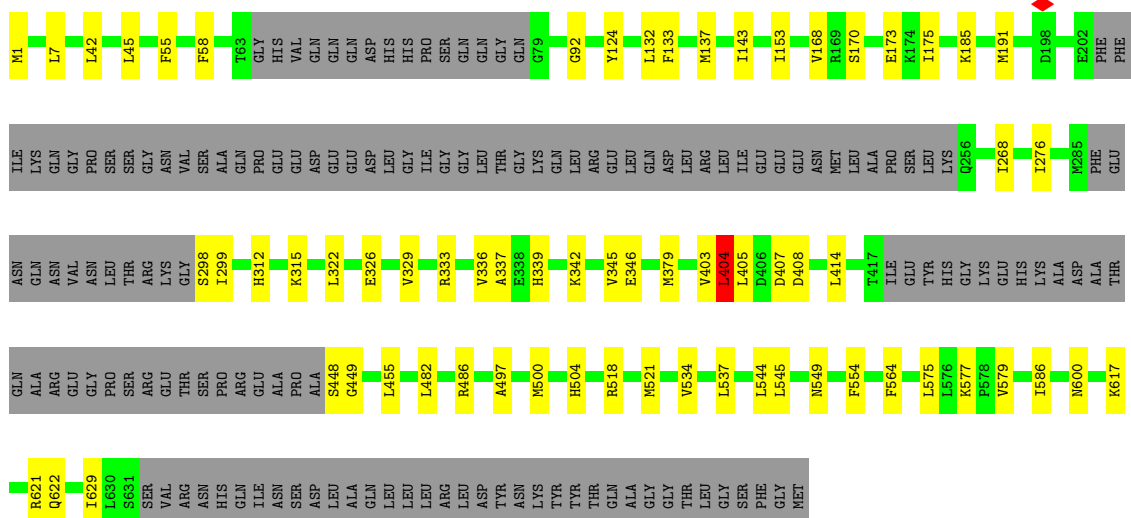


• Molecule 5: Gamma-tubulin complex component 2

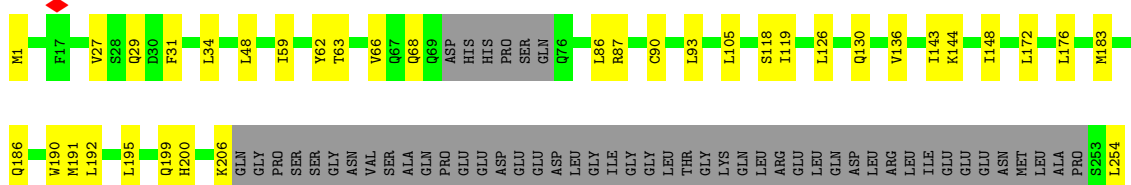




• Molecule 6: Gamma-tubulin complex component 4



• Molecule 6: Gamma-tubulin complex component 4



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	17337	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 ($e^-/\text{\AA}^2$)	35	Depositor
Minimum defocus (nm)	2000	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	0.281	Depositor
Minimum map value	-0.083	Depositor
Average map value	0.001	Depositor
Map value standard deviation	0.008	Depositor
Recommended contour level	0.0379	Depositor
Map size (Å)	532.0, 532.0, 532.0	wwPDB
Map dimensions	200, 200, 200	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	2.66, 2.66, 2.66	Depositor

5 Model quality i

5.1 Standard geometry i

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	1	0.33	0/3441	0.68	6/4661 (0.1%)
1	2	0.33	0/3441	0.68	6/4661 (0.1%)
1	U	0.33	0/3441	0.68	6/4661 (0.1%)
1	V	0.33	0/3441	0.68	6/4661 (0.1%)
1	W	0.33	0/3441	0.68	6/4661 (0.1%)
1	X	0.33	0/3441	0.68	6/4661 (0.1%)
1	Y	0.33	0/3441	0.68	6/4661 (0.1%)
1	Z	0.33	0/3441	0.68	6/4661 (0.1%)
2	b	0.36	0/484	0.82	1/653 (0.2%)
2	m	0.36	0/484	0.82	1/653 (0.2%)
2	o	0.36	0/484	0.81	1/653 (0.2%)
3	H	0.38	0/5009	0.80	17/6761 (0.3%)
3	N	0.38	0/5009	0.80	17/6761 (0.3%)
3	a	0.35	0/948	0.66	1/1277 (0.1%)
3	n	0.35	0/815	0.61	0/1096
4	J	0.35	0/4525	0.67	3/6119 (0.0%)
4	l	0.34	0/894	0.64	3/1209 (0.2%)
5	G	0.40	1/5295 (0.0%)	0.79	18/7147 (0.3%)
5	M	0.40	1/5295 (0.0%)	0.80	18/7147 (0.3%)
6	I	0.37	1/4322 (0.0%)	0.62	2/5853 (0.0%)
6	K	0.40	2/4683 (0.0%)	0.66	7/6338 (0.1%)
7	L	0.35	0/4697	0.65	1/6348 (0.0%)
All	All	0.36	5/70472 (0.0%)	0.71	138/95303 (0.1%)

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
2	b	0	1
2	m	0	1
2	o	0	1

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Mol	Chain	#Chirality outliers	#Planarity outliers
3	H	0	2
3	N	0	2
4	J	0	3
5	G	0	3
5	M	0	3
6	I	0	1
7	L	0	1
All	All	0	18

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	I	124	TYR	CD1-CE1	-8.86	1.26	1.39
5	G	536	GLU	CB-CG	5.74	1.63	1.52
5	M	536	GLU	CB-CG	5.72	1.63	1.52
6	K	267	TYR	CD1-CE1	-5.68	1.30	1.39
6	K	651	TYR	CD2-CE2	-5.01	1.31	1.39

The worst 5 of 138 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	M	641	LEU	CA-CB-CG	10.10	138.53	115.30
5	G	641	LEU	CA-CB-CG	10.10	138.52	115.30
3	H	677	LEU	CB-CG-CD2	-10.07	93.88	111.00
3	N	677	LEU	CB-CG-CD2	-10.05	93.91	111.00
3	H	667	LEU	CA-CB-CG	9.77	137.77	115.30

There are no chirality outliers.

5 of 18 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
5	G	239	ALA	Peptide
5	G	240	GLY	Peptide
2	b	69	LYS	Peptide
2	m	69	LYS	Peptide
2	o	69	LYS	Peptide

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen

atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	1	3373	0	3325	63	0
1	2	3373	0	3325	63	0
1	U	3373	0	3325	45	0
1	V	3373	0	3325	51	0
1	W	3373	0	3325	50	0
1	X	3373	0	3325	48	0
1	Y	3373	0	3325	50	0
1	Z	3373	0	3325	53	0
2	b	484	0	512	0	0
2	m	484	0	512	0	0
2	o	484	0	512	0	0
3	H	4907	0	4896	65	0
3	N	4907	0	4896	84	0
3	a	933	0	953	0	0
3	n	803	0	831	0	0
4	J	4429	0	4482	32	0
4	l	875	0	842	0	0
5	G	5186	0	5219	64	0
5	M	5186	0	5219	80	0
6	I	4225	0	4259	35	0
6	K	4579	0	4586	40	0
7	L	4587	0	4636	29	0
All	All	69053	0	68955	788	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 788 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)
1:2:357:GLN:HG2	3:N:716:HIS:HB3	1.65	0.77
5:G:521:LEU:HD22	5:G:702:MET:HG2	1.69	0.75
5:M:521:LEU:HD22	5:M:702:MET:HG2	1.69	0.73
3:N:774:GLN:NE2	3:N:857:ILE:O	2.22	0.73
3:H:774:GLN:NE2	3:H:857:ILE:O	2.22	0.73

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	1	408/451 (90%)	394 (97%)	12 (3%)	2 (0%)	29	69
1	2	408/451 (90%)	394 (97%)	12 (3%)	2 (0%)	29	69
1	U	408/451 (90%)	394 (97%)	12 (3%)	2 (0%)	29	69
1	V	408/451 (90%)	394 (97%)	12 (3%)	2 (0%)	29	69
1	W	408/451 (90%)	394 (97%)	12 (3%)	2 (0%)	29	69
1	X	408/451 (90%)	394 (97%)	12 (3%)	2 (0%)	29	69
1	Y	408/451 (90%)	394 (97%)	12 (3%)	2 (0%)	29	69
1	Z	408/451 (90%)	394 (97%)	12 (3%)	2 (0%)	29	69
2	b	63/82 (77%)	61 (97%)	2 (3%)	0	100	100
2	m	63/82 (77%)	61 (97%)	2 (3%)	0	100	100
2	o	63/82 (77%)	61 (97%)	2 (3%)	0	100	100
3	H	584/907 (64%)	561 (96%)	22 (4%)	1 (0%)	47	81
3	N	584/907 (64%)	561 (96%)	22 (4%)	1 (0%)	47	81
3	a	112/907 (12%)	110 (98%)	2 (2%)	0	100	100
3	n	97/907 (11%)	94 (97%)	3 (3%)	0	100	100
4	J	506/1024 (49%)	473 (94%)	30 (6%)	3 (1%)	25	66
4	l	104/1024 (10%)	96 (92%)	8 (8%)	0	100	100
5	G	624/902 (69%)	590 (95%)	33 (5%)	1 (0%)	47	81
5	M	624/902 (69%)	590 (95%)	33 (5%)	1 (0%)	47	81
6	I	511/667 (77%)	484 (95%)	24 (5%)	3 (1%)	25	66
6	K	548/667 (82%)	534 (97%)	12 (2%)	2 (0%)	34	72
7	L	540/1819 (30%)	503 (93%)	33 (6%)	4 (1%)	22	63
All	All	8287/14487 (57%)	7931 (96%)	324 (4%)	32 (0%)	38	72

5 of 32 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
5	G	241	ARG
6	I	408	ASP
4	J	236	LEU
4	J	238	LEU
6	K	410	LEU

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	1	376/400 (94%)	334 (89%)	42 (11%)	6	21
1	2	376/400 (94%)	334 (89%)	42 (11%)	6	21
1	U	376/400 (94%)	334 (89%)	42 (11%)	6	21
1	V	376/400 (94%)	334 (89%)	42 (11%)	6	21
1	W	376/400 (94%)	335 (89%)	41 (11%)	6	23
1	X	376/400 (94%)	334 (89%)	42 (11%)	6	21
1	Y	376/400 (94%)	334 (89%)	42 (11%)	6	21
1	Z	376/400 (94%)	334 (89%)	42 (11%)	6	21
2	b	53/62 (86%)	41 (77%)	12 (23%)	1	5
2	m	53/62 (86%)	41 (77%)	12 (23%)	1	5
2	o	53/62 (86%)	41 (77%)	12 (23%)	1	5
3	H	539/798 (68%)	441 (82%)	98 (18%)	1	10
3	N	539/798 (68%)	441 (82%)	98 (18%)	1	10
3	a	101/798 (13%)	100 (99%)	1 (1%)	76	86
3	n	88/798 (11%)	88 (100%)	0	100	100
4	J	498/933 (53%)	495 (99%)	3 (1%)	86	92
4	l	96/933 (10%)	94 (98%)	2 (2%)	53	72
5	G	572/791 (72%)	472 (82%)	100 (18%)	2	11
5	M	572/791 (72%)	472 (82%)	100 (18%)	2	11
6	I	472/594 (80%)	471 (100%)	1 (0%)	93	96

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
6	K	509/594 (86%)	507 (100%)	2 (0%)	91	94
7	L	501/1546 (32%)	498 (99%)	3 (1%)	86	92
All	All	7654/12760 (60%)	6875 (90%)	779 (10%)	11	25

5 of 779 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	N	481	ARG
1	V	31	ILE
3	N	555	LEU
3	N	477	MET
3	N	809	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 176 such sidechains are listed below:

Mol	Chain	Res	Type
1	U	229	ASN
1	X	54	GLN
1	V	16	GLN
1	W	16	GLN
1	X	251	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 monosaccharides in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

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.

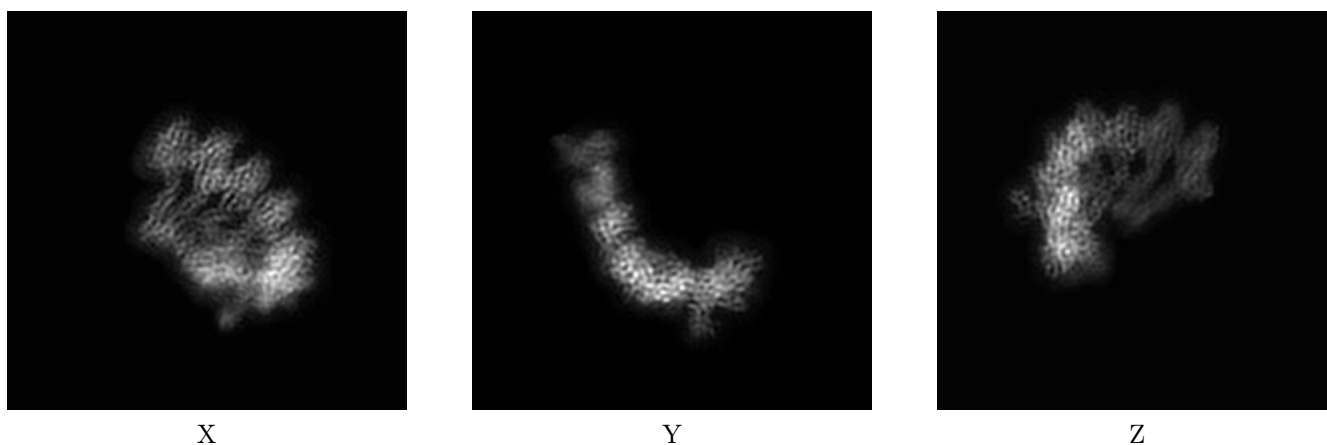
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-14008. These allow visual inspection of the internal detail of the map and identification of artifacts.

No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections [i](#)

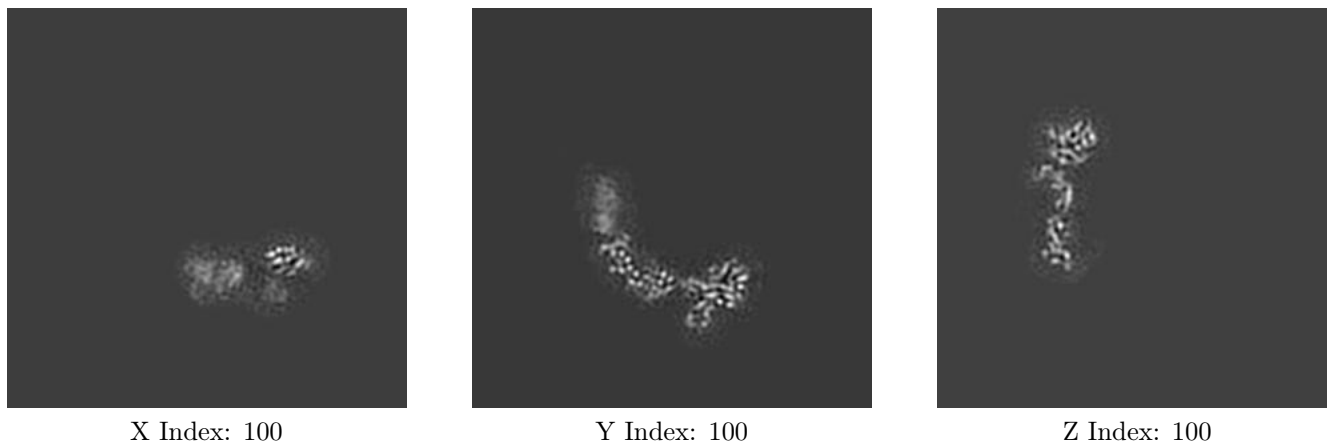
6.1.1 Primary map



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

6.2 Central slices [i](#)

6.2.1 Primary map



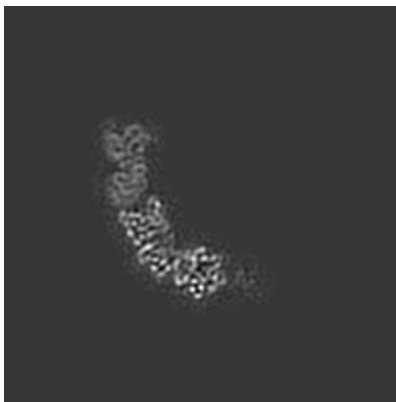
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

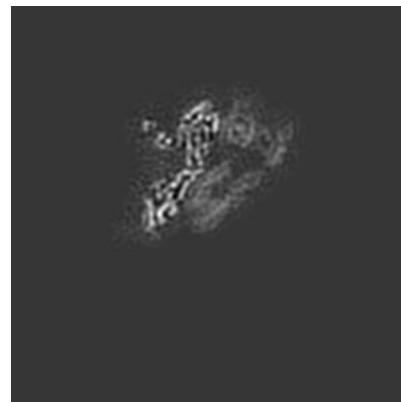
6.3.1 Primary map



X Index: 62



Y Index: 132



Z Index: 70

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

6.4 Orthogonal surface views [i](#)

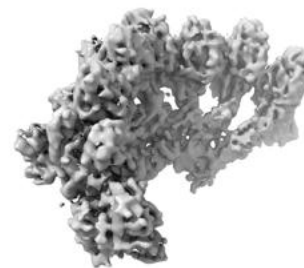
6.4.1 Primary map



X



Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.0379. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

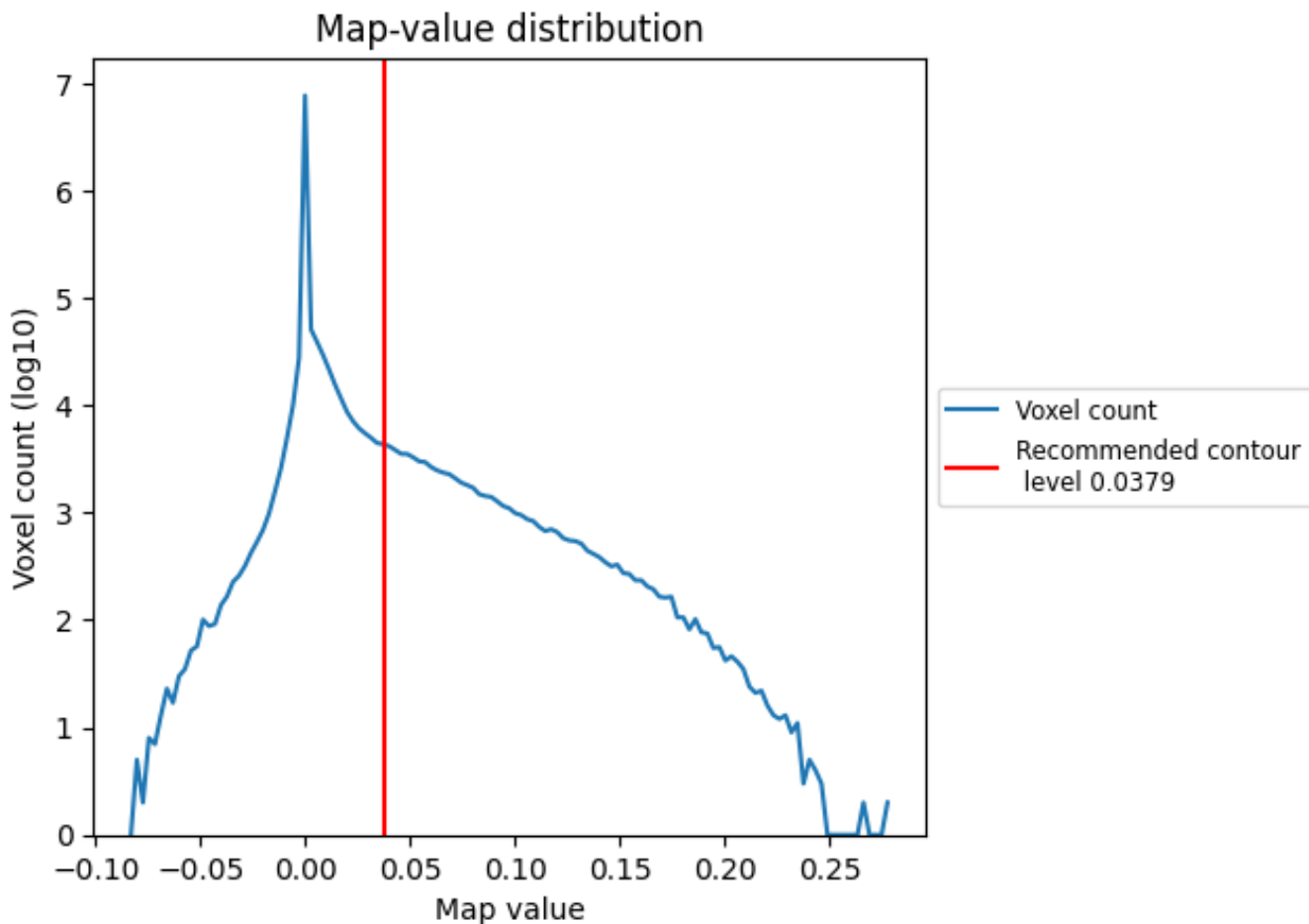
6.5 Mask visualisation

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

7 Map analysis [i](#)

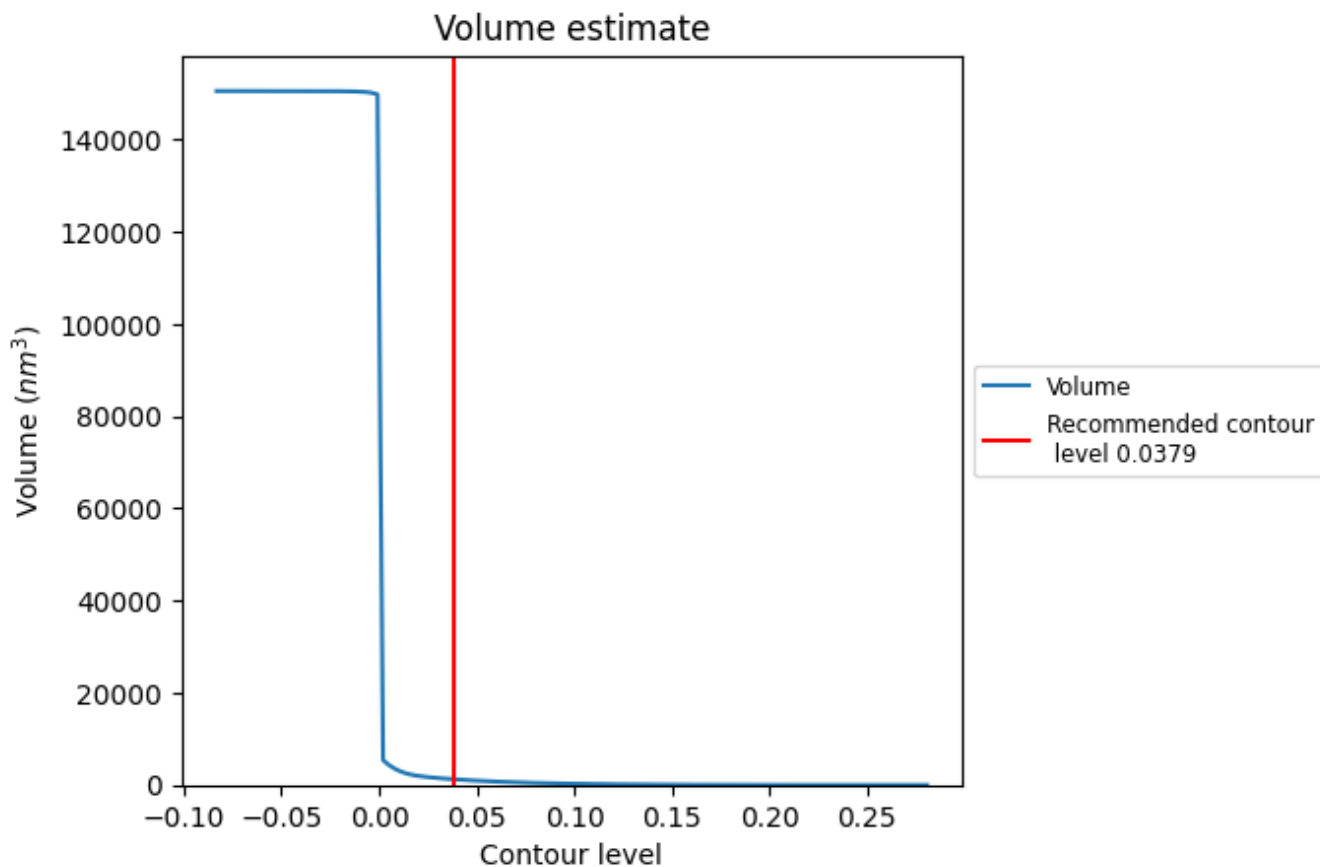
This section contains the results of statistical analysis of the map.

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.

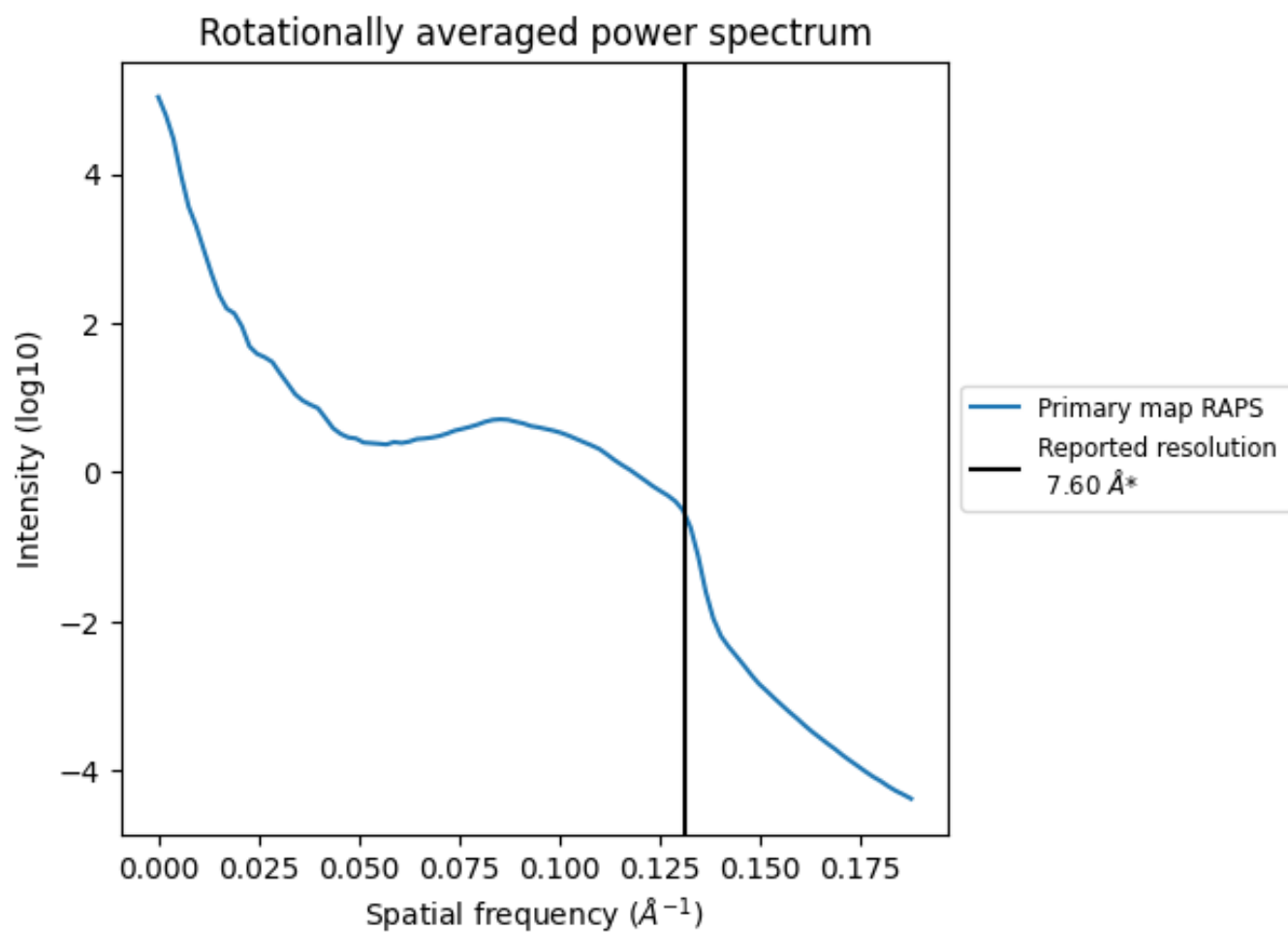
7.2 Volume estimate [\(i\)](#)



The volume at the recommended contour level is 1250 nm^3 ; this corresponds to an approximate mass of 1130 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 [i](#)



*Reported resolution corresponds to spatial frequency of 0.132 Å⁻¹

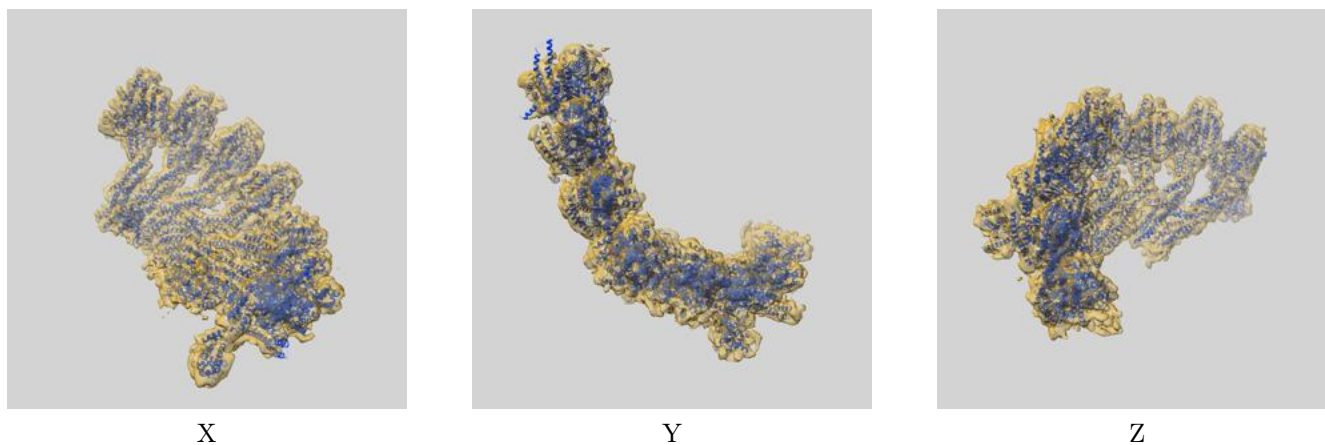
8 Fourier-Shell correlation

This section was not generated. No FSC curve or half-maps provided.

9 Map-model fit [i](#)

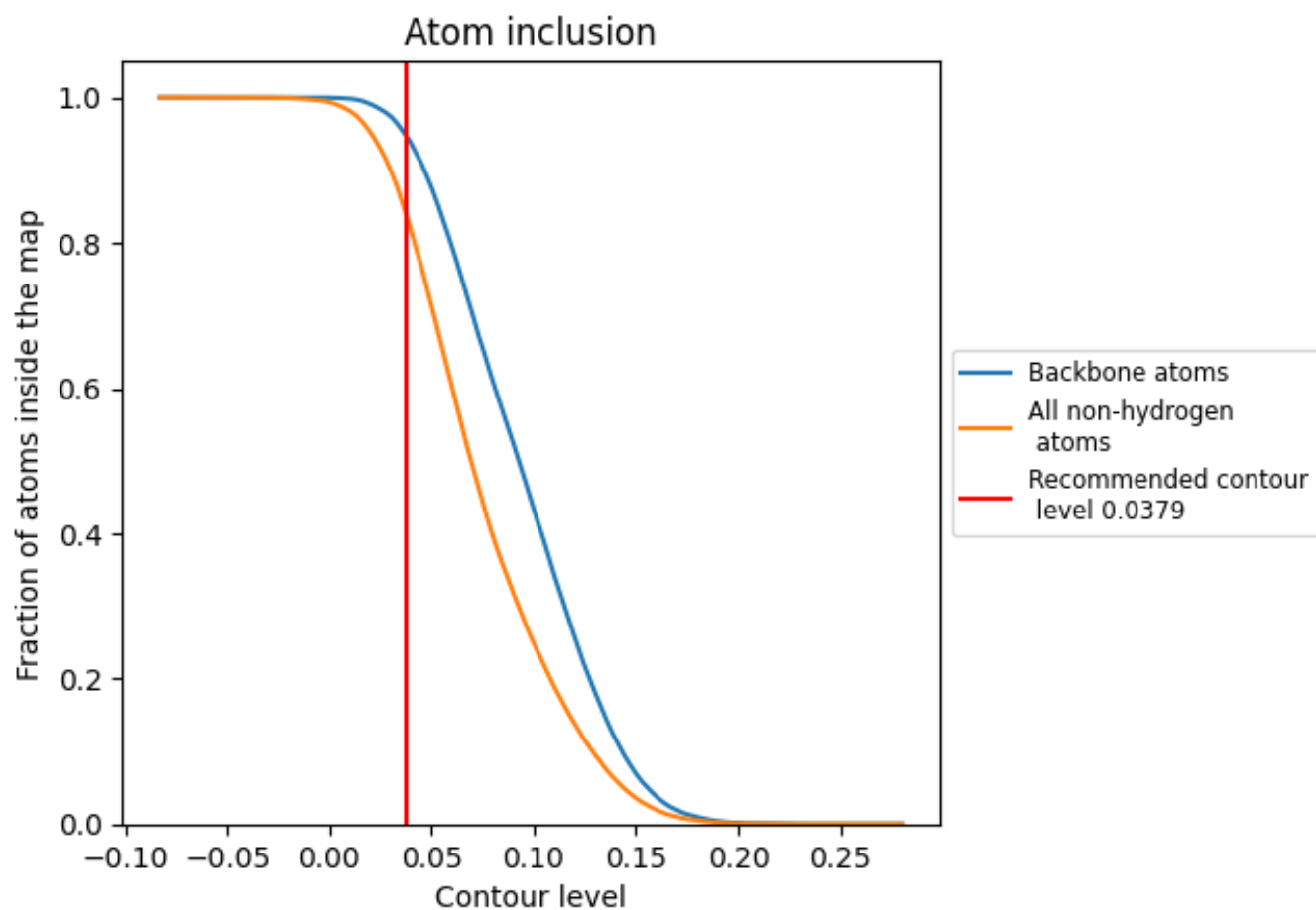
This section contains information regarding the fit between EMDB map EMD-14008 and PDB model 7QJ3. Per-residue inclusion information can be found in section 3 on page 6.

9.1 Map-model overlay [i](#)



The images above show the 3D surface view of the map at the recommended contour level 0.0379 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 Atom inclusion [i](#)



At the recommended contour level, 95% of all backbone atoms, 84% of all non-hydrogen atoms, are inside the map.