



wwPDB EM Validation Summary Report ⓘ

Mar 8, 2026 – 05:32 PM UTC

PDB ID : 5FM1 / pdb_00005fm1
EMDB ID : EMD-1731
Title : Structure of gamma-tubulin small complex based on a cryo-EM map, chemical cross-links, and a remotely related structure
Authors : Greenberg, C.H.; Kollman, J.; Zelter, A.; Johnson, R.; MacCoss, M.J.; Davis, T.N.; Agard, D.A.; Sali, A.
Deposited on : 2015-10-30
Resolution : 8.00 Å(reported)

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

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

A user guide is available at

<https://www.wwpdb.org/validation/2017/EMValidationReportHelp>
with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

EMDB validation analysis : 0.0.1.dev132
MolProbity : 4-5-2 with Phenix2.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : **NOT EXECUTED**
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

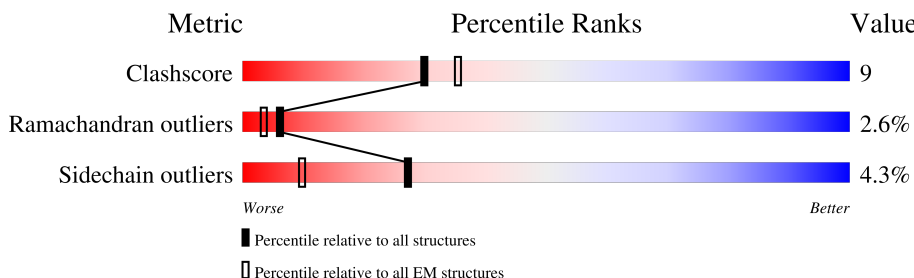
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 8.00 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.



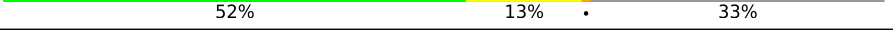
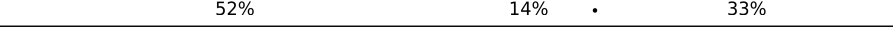
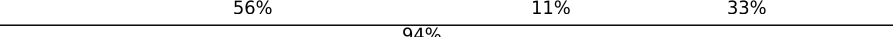
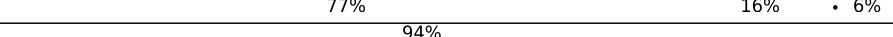
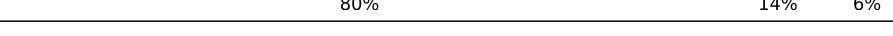
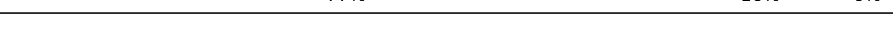
Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	229148	23984
Ramachandran outliers	224038	23583
Sidechain outliers	223484	23102

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-A	823	70% 55% 13% • 30%
1	10-A	823	54% 15% • 30%
1	2-A	823	56% 12% • 30%
1	3-A	823	57% 11% • 30%
1	4-A	823	57% 11% • 30%
1	5-A	823	53% 14% • 30%
1	6-A	823	57% 12% • 30%
1	7-A	823	56% 14% • 30%

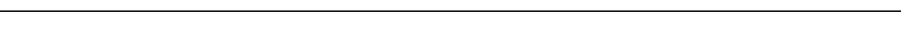
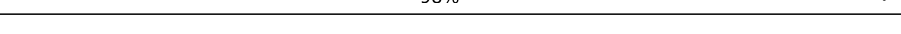
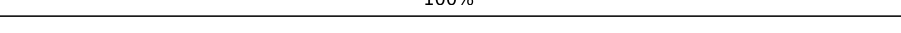
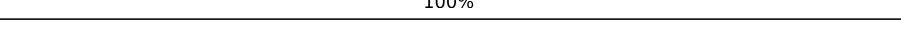
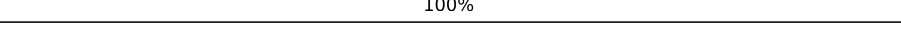
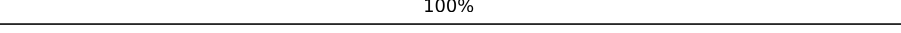
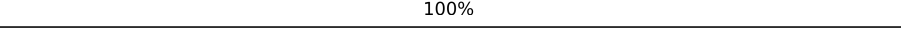
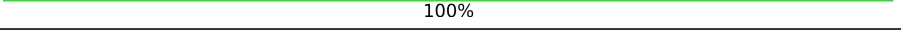
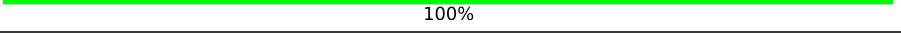
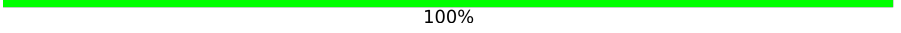
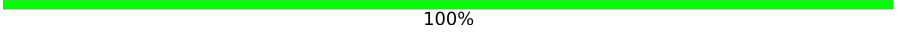
Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
1	8-A	823	
1	9-A	823	
2	1-B	846	
2	10-B	846	
2	2-B	846	
2	3-B	846	
2	4-B	846	
2	5-B	846	
2	6-B	846	
2	7-B	846	
2	8-B	846	
2	9-B	846	
3	1-C	473	
3	1-D	473	
3	10-C	473	
3	10-D	473	
3	2-C	473	
3	2-D	473	
3	3-C	473	
3	3-D	473	
3	4-C	473	
3	4-D	473	
3	5-C	473	
3	5-D	473	
3	6-C	473	

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
3	6-D	473	 79%15% • 6%
3	7-C	473	 79%15% • 6%
3	7-D	473	 79%14% • 6%
3	8-C	473	 78%15% • 6%
3	8-D	473	 79%15% • 6%
3	9-C	473	 81%12% • 6%
3	9-D	473	 80%13% • 6%
4	1-E	44	 100%
4	1-F	44	 100%98% •
4	10-E	44	 95%5%
4	10-F	44	 100%
4	2-E	44	 100%
4	2-F	44	 100%
4	3-E	44	 100%
4	3-F	44	 98% •
4	4-E	44	 100%
4	4-F	44	 100%
4	5-E	44	 100%
4	5-F	44	 100%
4	6-E	44	 100%
4	6-F	44	 100%
4	7-E	44	 100%
4	7-F	44	 100%
4	8-E	44	 100%
4	8-F	44	 100%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
4	9-E	44	 100%
4	9-F	44	 100%

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 169380 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 SPINDLE POLE BODY COMPONENT SPC97.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	1-A	575	Total	C	N	O	S	0	0
			4831	3110	806	889	26		
1	2-A	575	Total	C	N	O	S	0	0
			4831	3110	806	889	26		
1	3-A	575	Total	C	N	O	S	0	0
			4831	3110	806	889	26		
1	4-A	575	Total	C	N	O	S	0	0
			4831	3110	806	889	26		
1	5-A	575	Total	C	N	O	S	0	0
			4831	3110	806	889	26		
1	6-A	575	Total	C	N	O	S	0	0
			4831	3110	806	889	26		
1	7-A	575	Total	C	N	O	S	0	0
			4831	3110	806	889	26		
1	8-A	575	Total	C	N	O	S	0	0
			4831	3110	806	889	26		
1	9-A	575	Total	C	N	O	S	0	0
			4831	3110	806	889	26		
1	10-A	575	Total	C	N	O	S	0	0
			4831	3110	806	889	26		

- Molecule 2 is a protein called SPINDLE POLE BODY COMPONENT SPC98.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	1-B	565	Total	C	N	O	S	0	0
			4701	3058	775	853	15		
2	2-B	565	Total	C	N	O	S	0	0
			4701	3058	775	853	15		
2	3-B	565	Total	C	N	O	S	0	0
			4701	3058	775	853	15		
2	4-B	565	Total	C	N	O	S	0	0
			4701	3058	775	853	15		
2	5-B	565	Total	C	N	O	S	0	0
			4701	3058	775	853	15		

Continued on next page...

Continued from previous page...

Mol	Chain	Residues	Atoms					AltConf	Trace
2	6-B	565	Total	C	N	O	S	0	0
			4701	3058	775	853	15		
2	7-B	565	Total	C	N	O	S	0	0
			4701	3058	775	853	15		
2	8-B	565	Total	C	N	O	S	0	0
			4701	3058	775	853	15		
2	9-B	565	Total	C	N	O	S	0	0
			4701	3058	775	853	15		
2	10-B	565	Total	C	N	O	S	0	0
			4701	3058	775	853	15		

- Molecule 3 is a protein called TUBULIN GAMMA CHAIN.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	1-C	445	Total	C	N	O	S	0	0
			3483	2179	591	696	17		
3	2-C	445	Total	C	N	O	S	0	0
			3483	2179	591	696	17		
3	3-C	445	Total	C	N	O	S	0	0
			3483	2179	591	696	17		
3	4-C	445	Total	C	N	O	S	0	0
			3483	2179	591	696	17		
3	5-C	445	Total	C	N	O	S	0	0
			3483	2179	591	696	17		
3	6-C	445	Total	C	N	O	S	0	0
			3483	2179	591	696	17		
3	7-C	445	Total	C	N	O	S	0	0
			3483	2179	591	696	17		
3	8-C	445	Total	C	N	O	S	0	0
			3483	2179	591	696	17		
3	9-C	445	Total	C	N	O	S	0	0
			3483	2179	591	696	17		
3	10-C	445	Total	C	N	O	S	0	0
			3483	2179	591	696	17		
3	1-D	445	Total	C	N	O	S	0	0
			3483	2179	591	696	17		
3	2-D	445	Total	C	N	O	S	0	0
			3483	2179	591	696	17		
3	3-D	445	Total	C	N	O	S	0	0
			3483	2179	591	696	17		
3	4-D	445	Total	C	N	O	S	0	0
			3483	2179	591	696	17		

Continued on next page...

Continued from previous page...

Mol	Chain	Residues	Atoms					AltConf	Trace
3	5-D	445	Total	C	N	O	S	0	0
			3483	2179	591	696	17		
3	6-D	445	Total	C	N	O	S	0	0
			3483	2179	591	696	17		
3	7-D	445	Total	C	N	O	S	0	0
			3483	2179	591	696	17		
3	8-D	445	Total	C	N	O	S	0	0
			3483	2179	591	696	17		
3	9-D	445	Total	C	N	O	S	0	0
			3483	2179	591	696	17		
3	10-D	445	Total	C	N	O	S	0	0
			3483	2179	591	696	17		

- Molecule 4 is a protein called SPINDLE POLE BODY COMPONENT 110.

Mol	Chain	Residues	Atoms				AltConf	Trace
4	1-E	44	Total	C	N	O	0	0
			220	132	44	44		
4	2-E	44	Total	C	N	O	0	0
			220	132	44	44		
4	3-E	44	Total	C	N	O	0	0
			220	132	44	44		
4	4-E	44	Total	C	N	O	0	0
			220	132	44	44		
4	5-E	44	Total	C	N	O	0	0
			220	132	44	44		
4	6-E	44	Total	C	N	O	0	0
			220	132	44	44		
4	7-E	44	Total	C	N	O	0	0
			220	132	44	44		
4	8-E	44	Total	C	N	O	0	0
			220	132	44	44		
4	9-E	44	Total	C	N	O	0	0
			220	132	44	44		
4	10-E	44	Total	C	N	O	0	0
			220	132	44	44		
4	1-F	44	Total	C	N	O	0	0
			220	132	44	44		
4	2-F	44	Total	C	N	O	0	0
			220	132	44	44		
4	3-F	44	Total	C	N	O	0	0
			220	132	44	44		

Continued on next page...

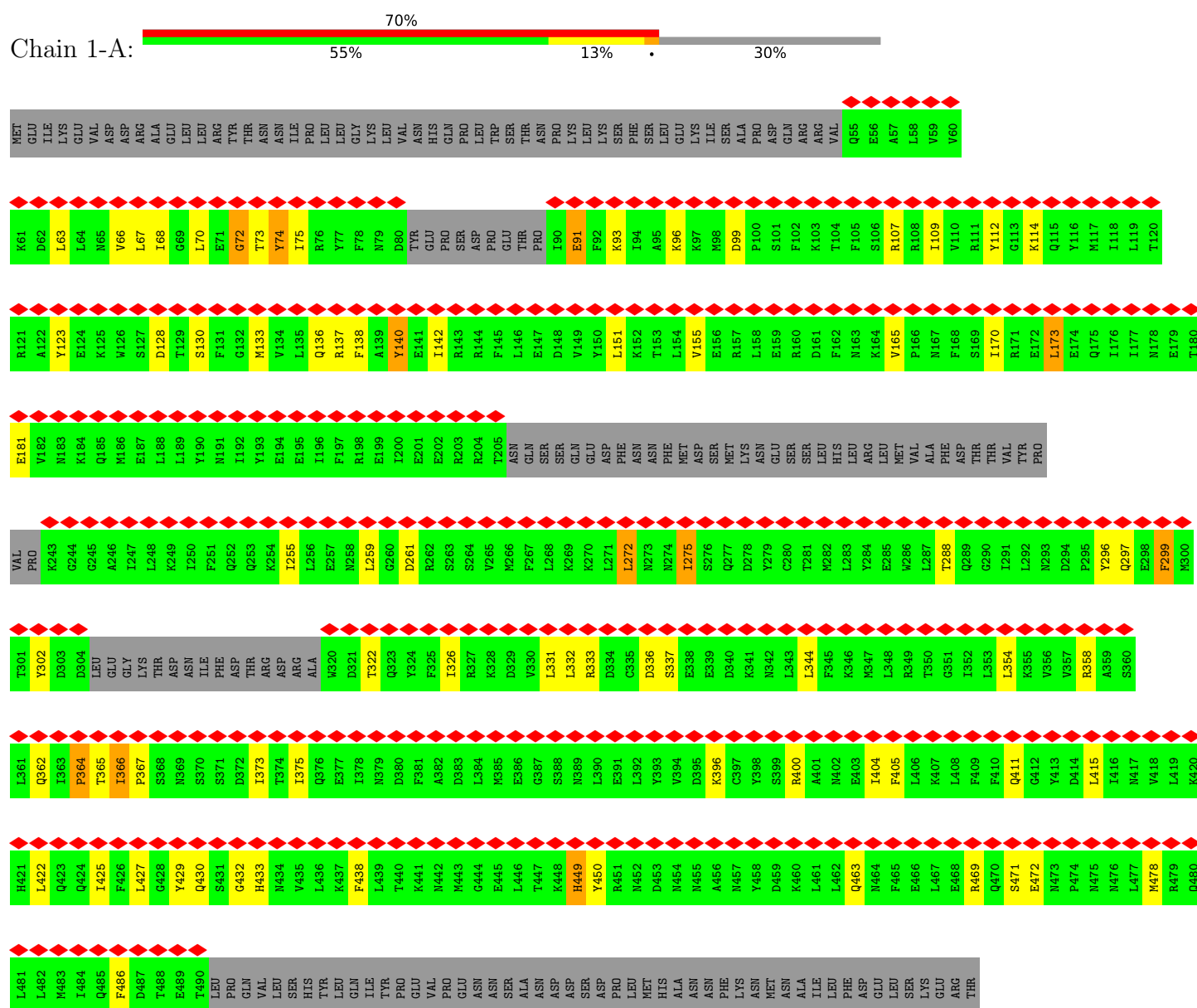
Continued from previous page...

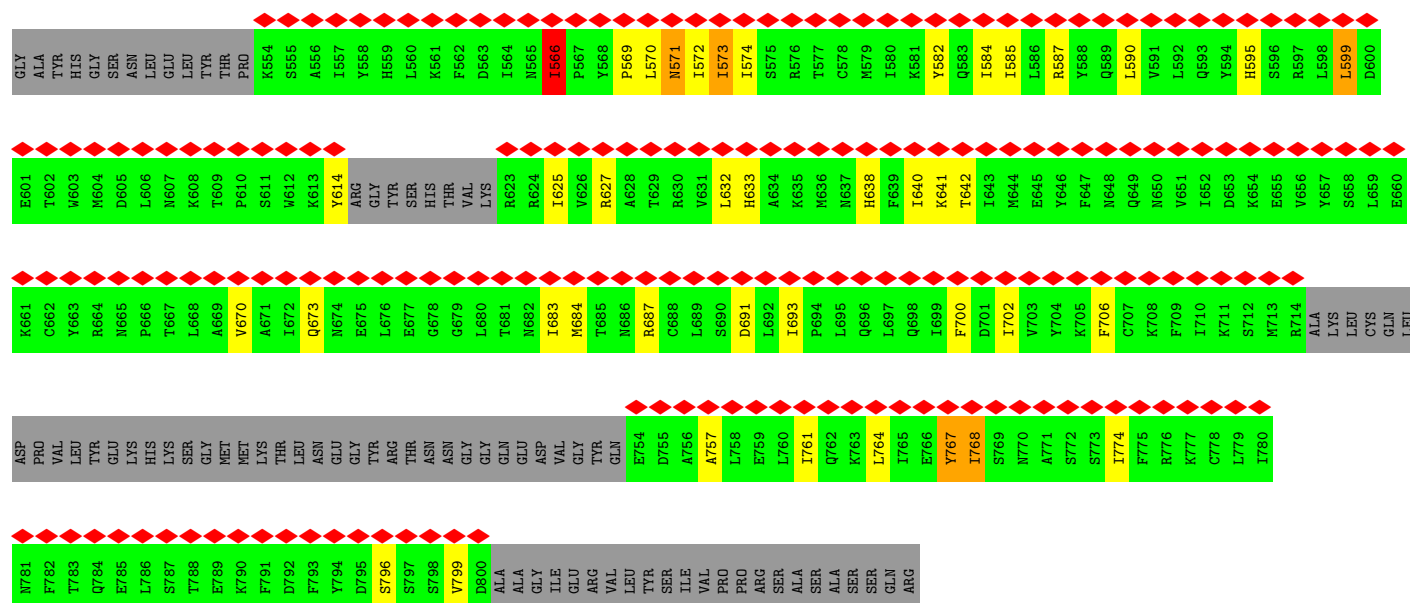
Mol	Chain	Residues	Atoms				AltConf	Trace
4	4-F	44	Total 220	C 132	N 44	O 44	0	0
4	5-F	44	Total 220	C 132	N 44	O 44	0	0
4	6-F	44	Total 220	C 132	N 44	O 44	0	0
4	7-F	44	Total 220	C 132	N 44	O 44	0	0
4	8-F	44	Total 220	C 132	N 44	O 44	0	0
4	9-F	44	Total 220	C 132	N 44	O 44	0	0
4	10-F	44	Total 220	C 132	N 44	O 44	0	0

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.

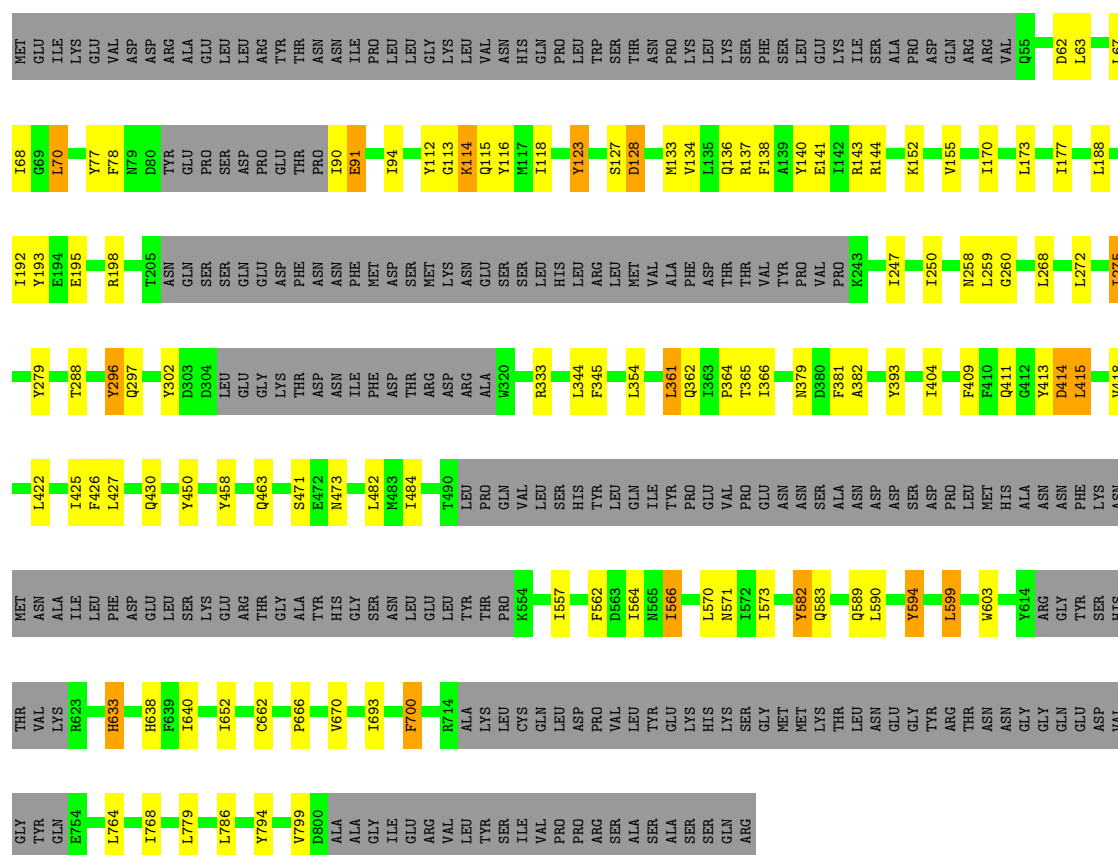
• Molecule 1: SPINDLE POLE BODY COMPONENT SPC97





• Molecule 1: SPINDLE POLE BODY COMPONENT SPC97

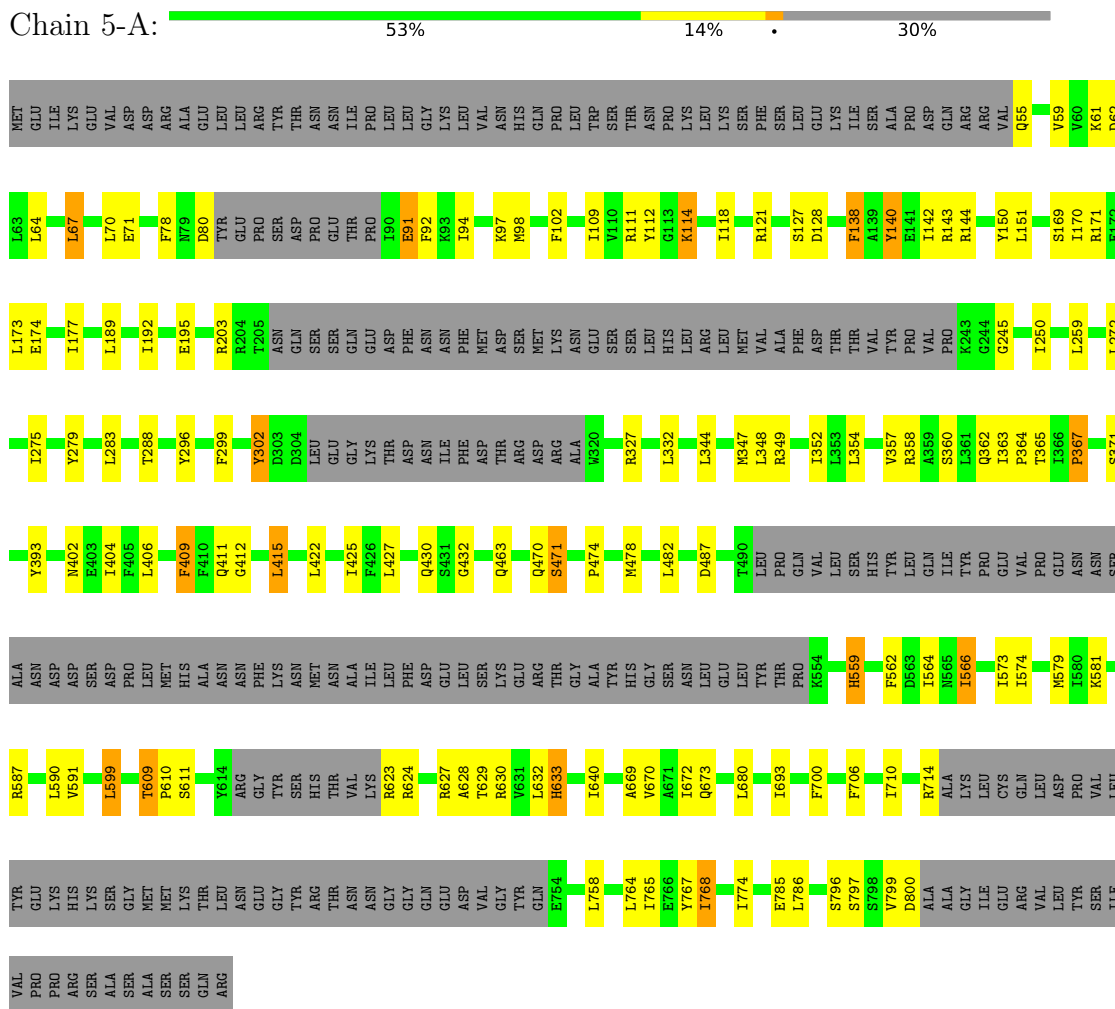
Chain 2-A: 56% 12% 30%



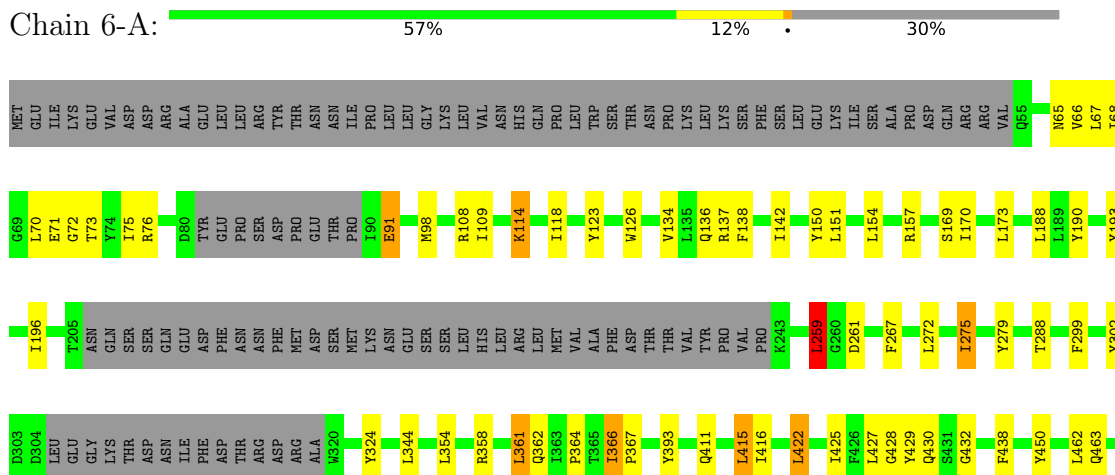
• Molecule 1: SPINDLE POLE BODY COMPONENT SPC97

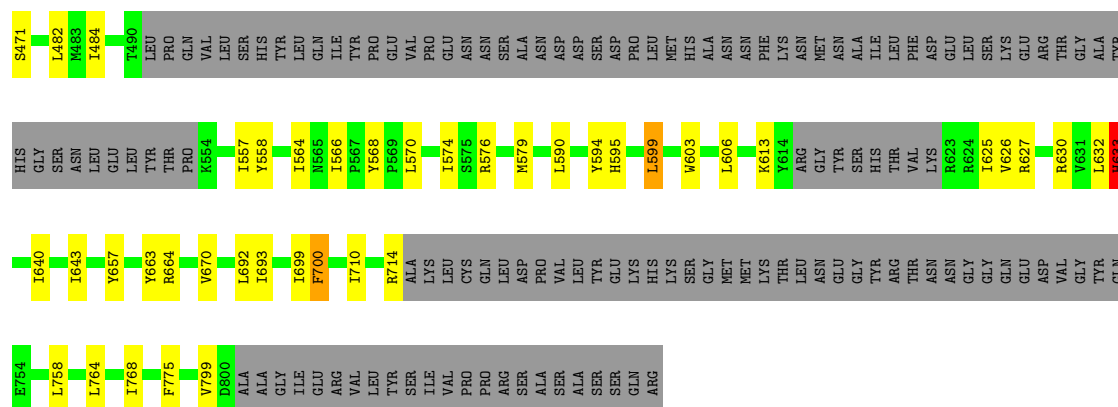
Chain 3-A: 57% 11% 30%

- Molecule 1: SPINDLE POLE BODY COMPONENT SPC97



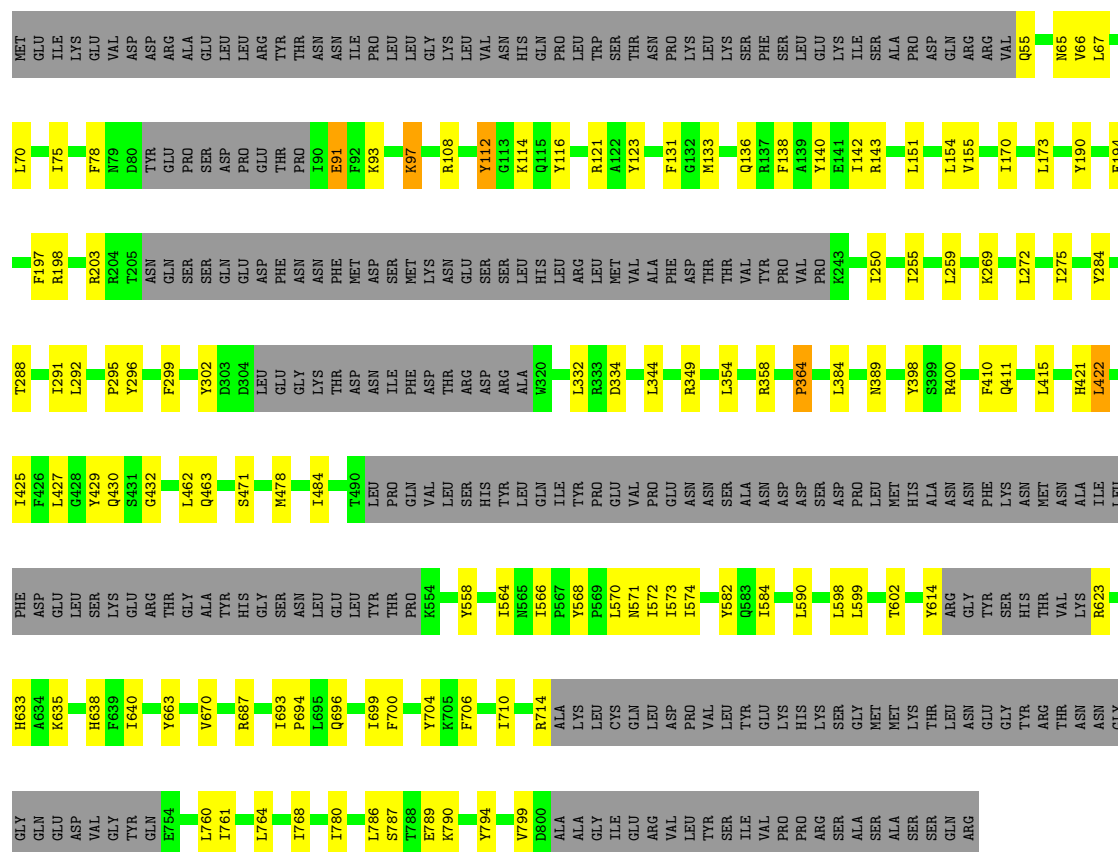
- Molecule 1: SPINDLE POLE BODY COMPONENT SPC97





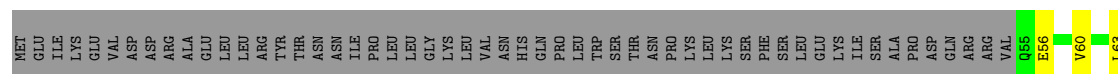
• Molecule 1: SPINDLE POLE BODY COMPONENT SPC97

Chain 7-A: 56% 14% 30%

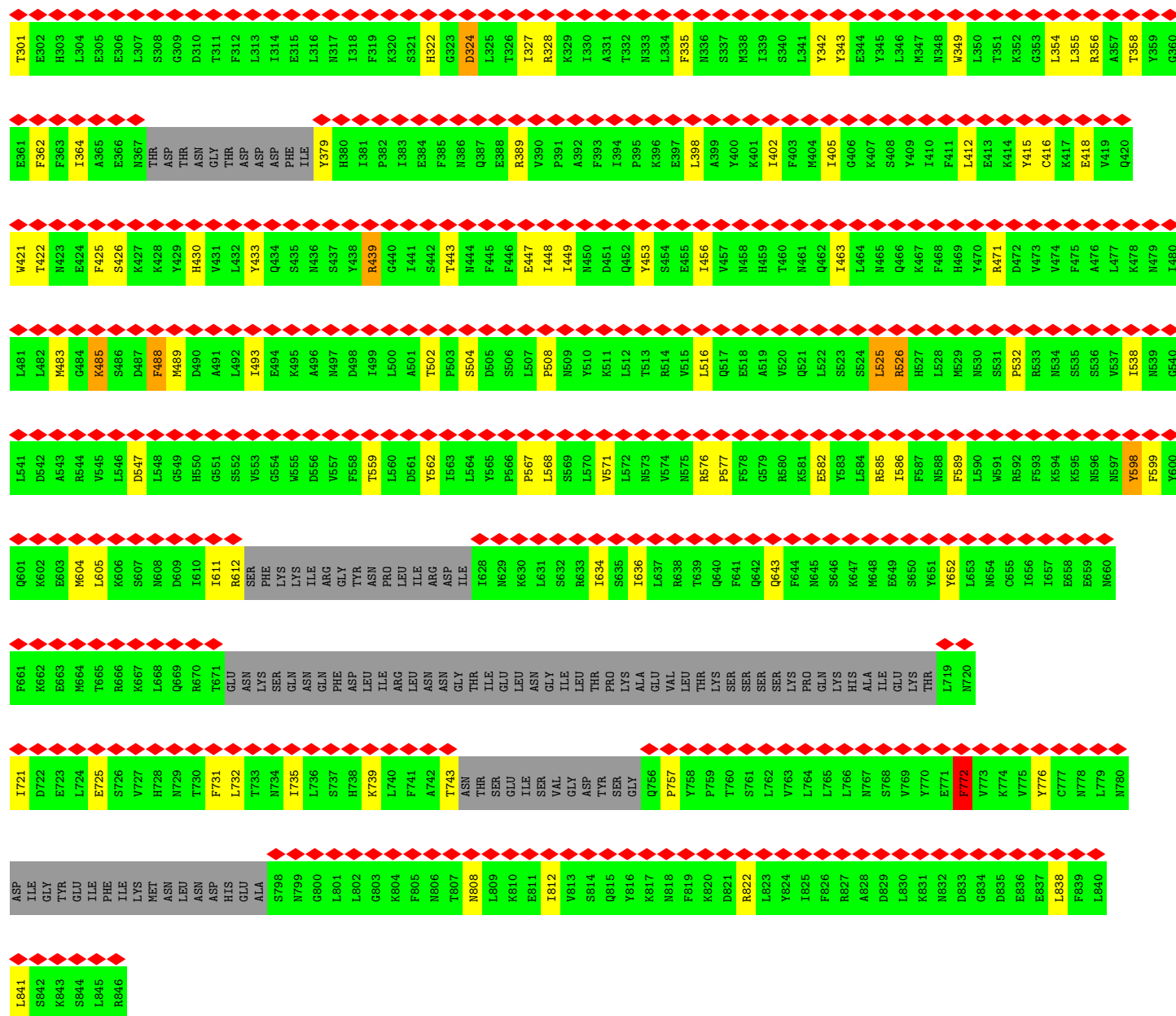


• Molecule 1: SPINDLE POLE BODY COMPONENT SPC97

Chain 8-A: 56% 13% 30%

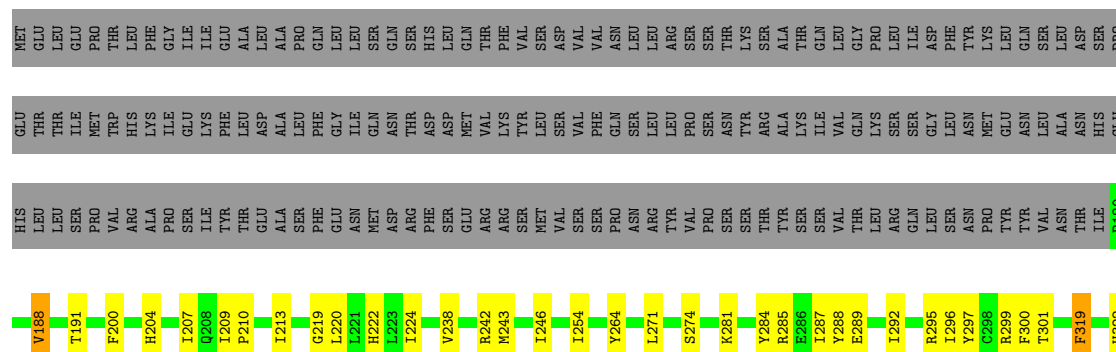


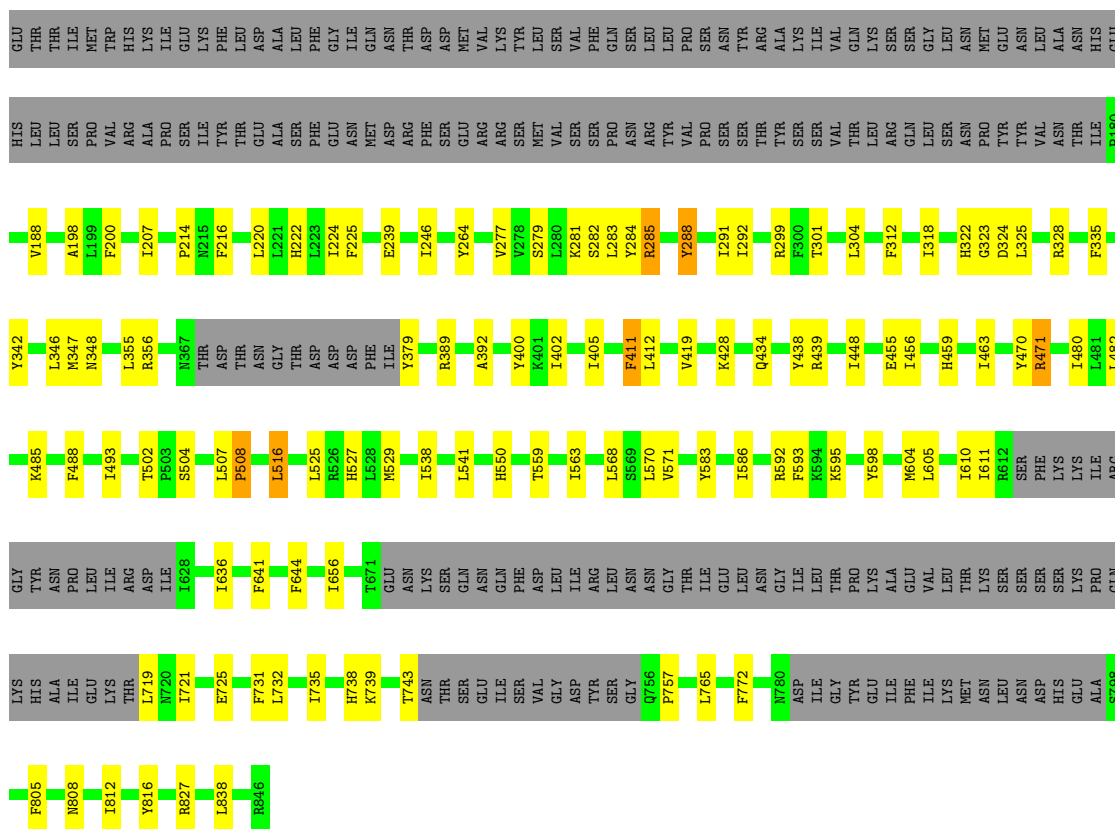




● Molecule 2: SPINDLE POLE BODY COMPONENT SPC98

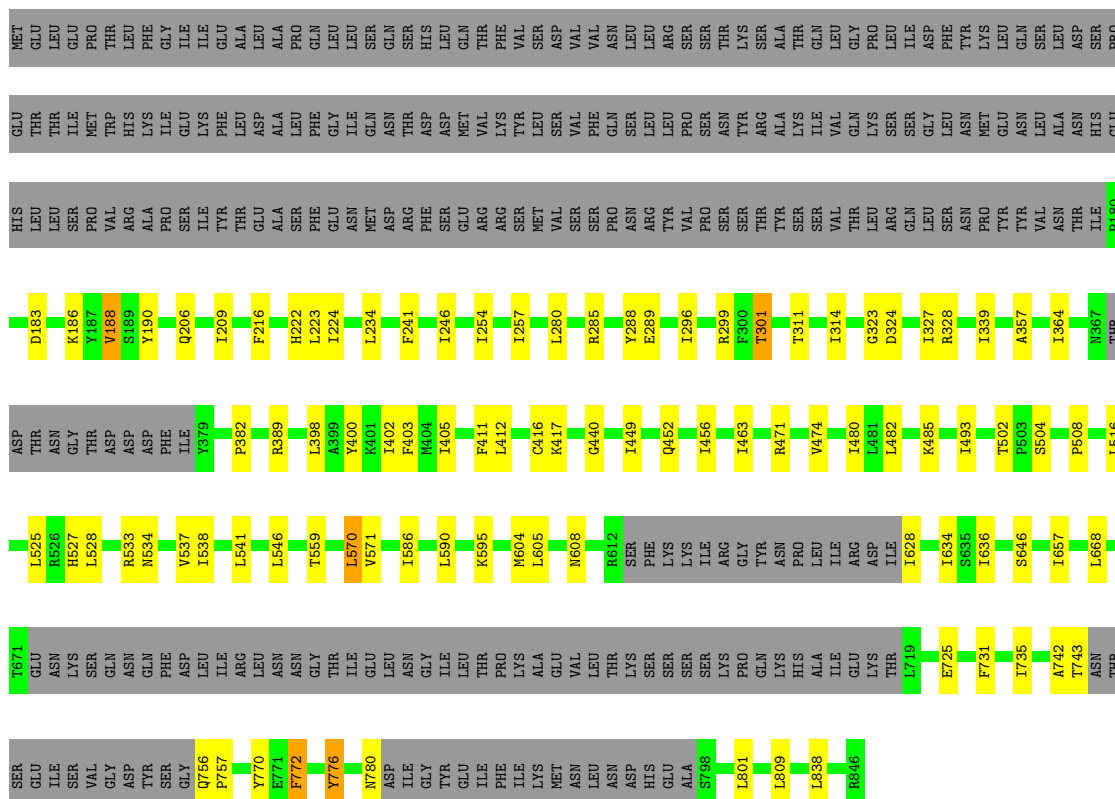
Chain 2-B: 54% 12% 33%





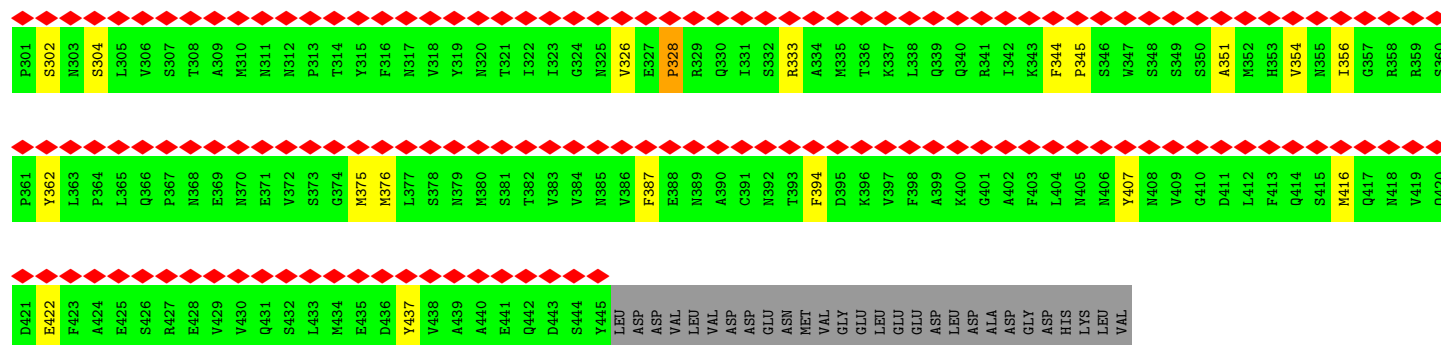
- Molecule 2: SPINDLE POLE BODY COMPONENT SPC98

Chain 5-B: 56% 11% • 33%



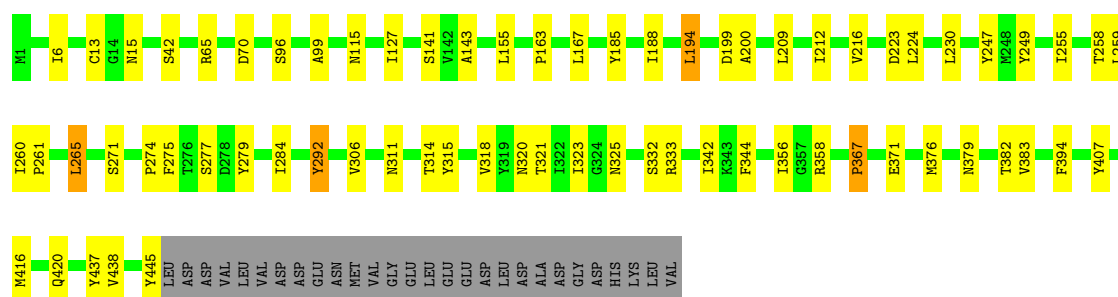
[illegible][illegible]

- Molecule 3: TUBULIN GAMMA CHAIN



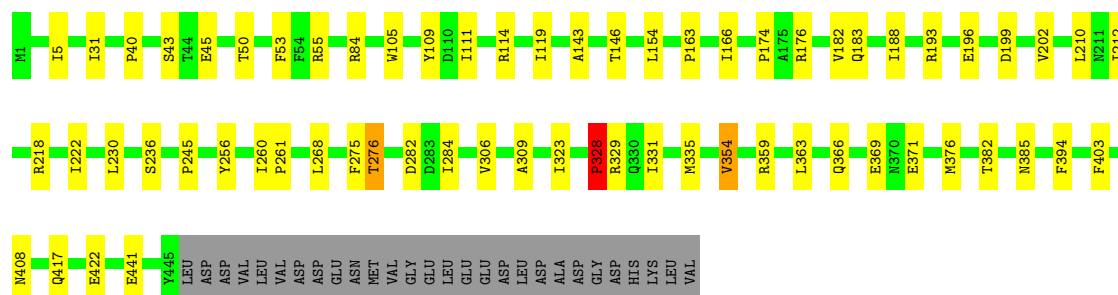
• Molecule 3: TUBULIN GAMMA CHAIN

Chain 2-C: 79% 14% • 6%



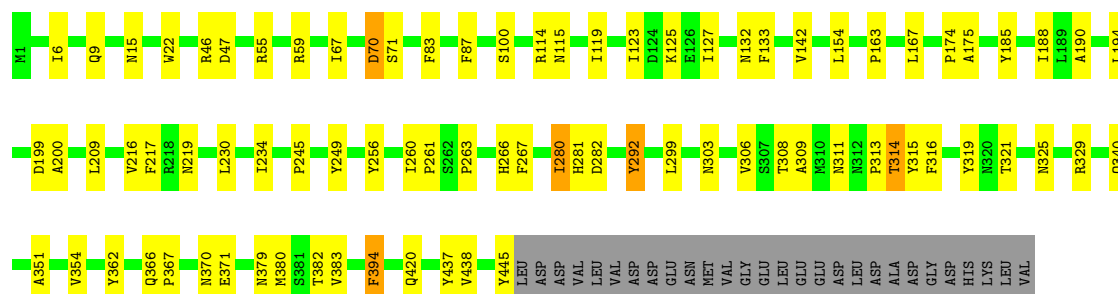
• Molecule 3: TUBULIN GAMMA CHAIN

Chain 2-D: 80% 13% 6%



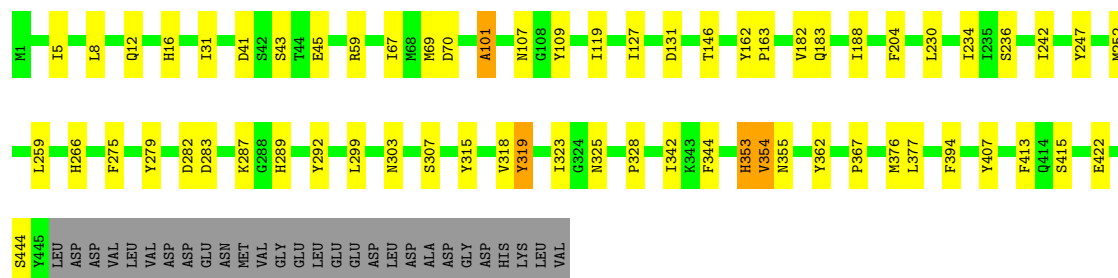
• Molecule 3: TUBULIN GAMMA CHAIN

Chain 3-C: 77% 16% • 6%



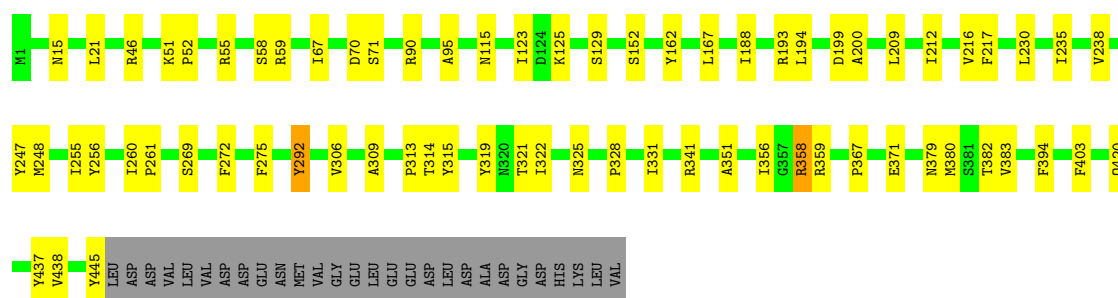
- Molecule 3: TUBULIN GAMMA CHAIN

Chain 3-D:  81% 13% 6%



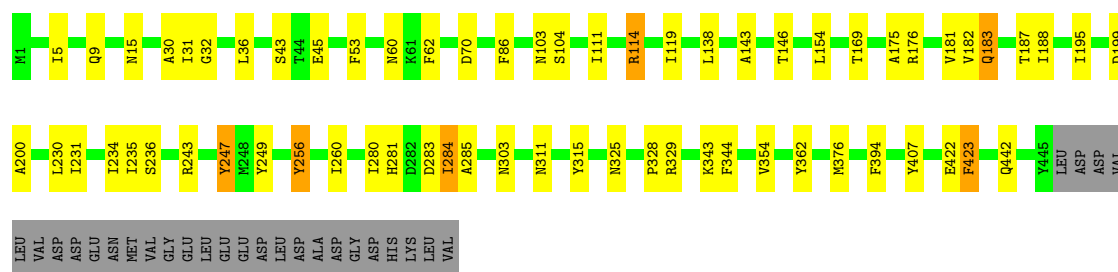
- Molecule 3: TUBULIN GAMMA CHAIN

Chain 4-C:  79% 14% 6%



- Molecule 3: TUBULIN GAMMA CHAIN

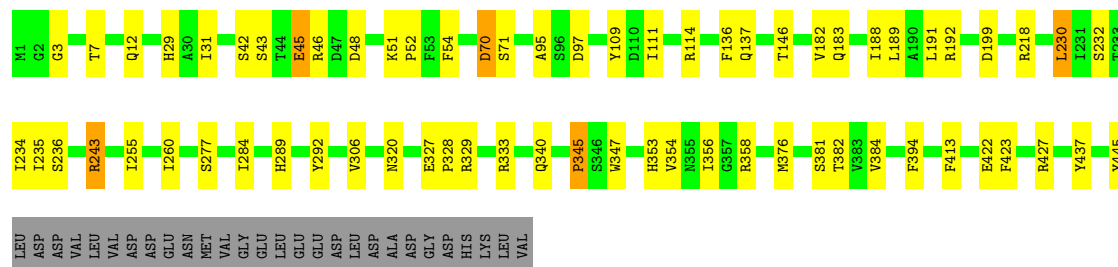
Chain 4-D:  80% 12% 6%





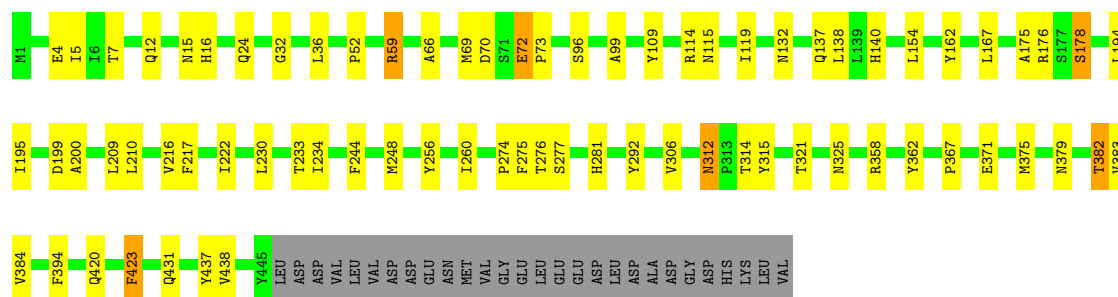
• Molecule 3: TUBULIN GAMMA CHAIN

Chain 5-D: 80% 13% • 6%



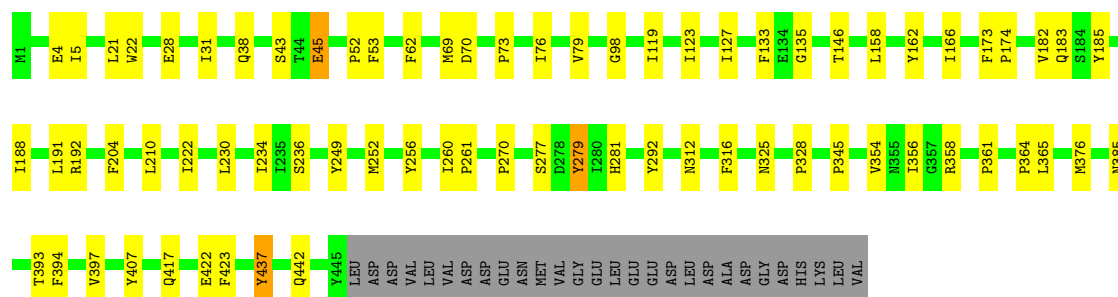
• Molecule 3: TUBULIN GAMMA CHAIN

Chain 6-C: 78% 15% • 6%



• Molecule 3: TUBULIN GAMMA CHAIN

Chain 6-D: 79% 15% • 6%



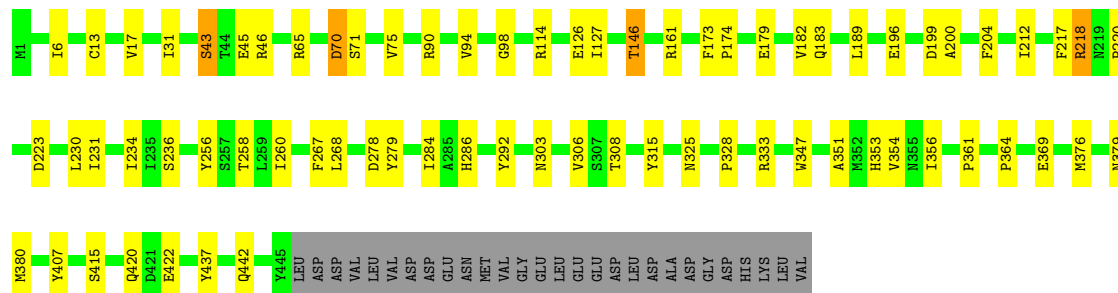
• Molecule 3: TUBULIN GAMMA CHAIN

Chain 7-C: 79% 15% • 6%

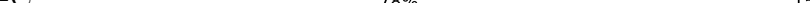


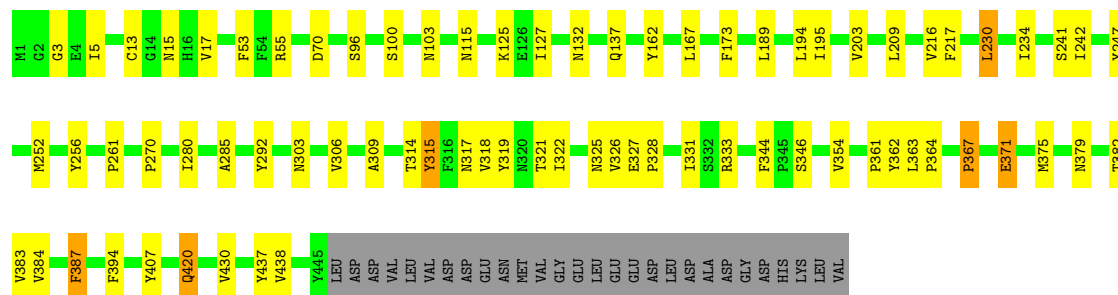
- Molecule 3: TUBULIN GAMMA CHAIN

Chain 7-D:  79% 14% 6%



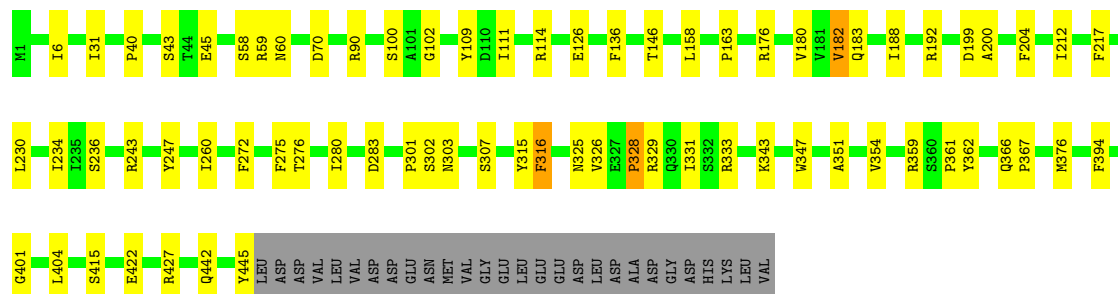
- Molecule 3: TUBULIN GAMMA CHAIN

Chain 8-C:  78% 15% • 6%

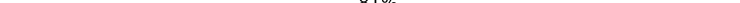


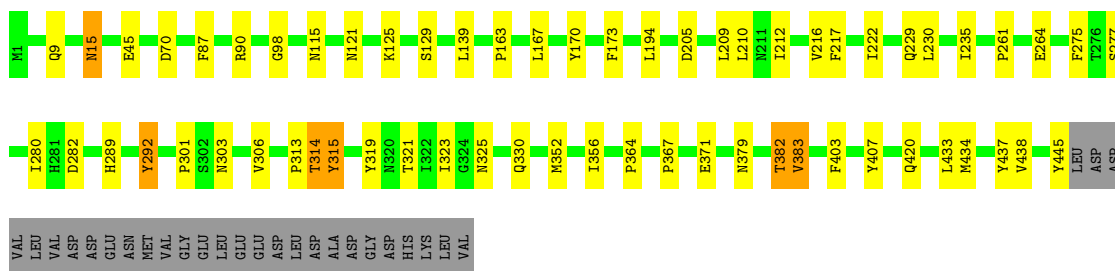
- Molecule 3: TUBULIN GAMMA CHAIN

Chain 8-D:  79% 15% 6%

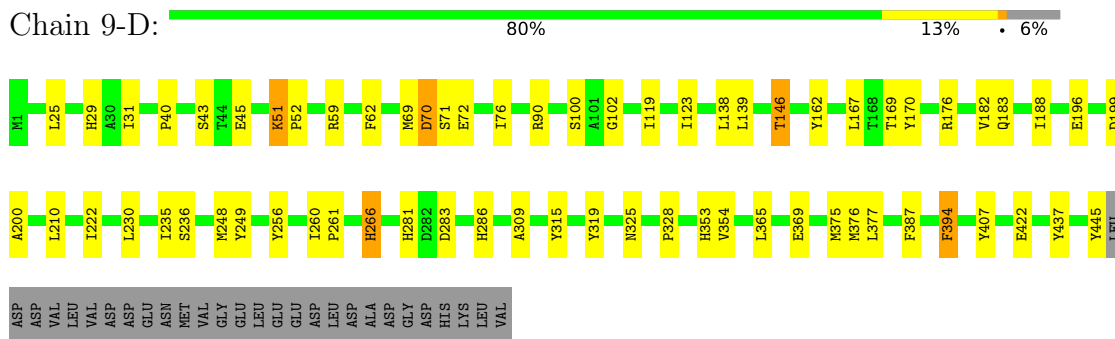


- Molecule 3: TUBULIN GAMMA CHAIN

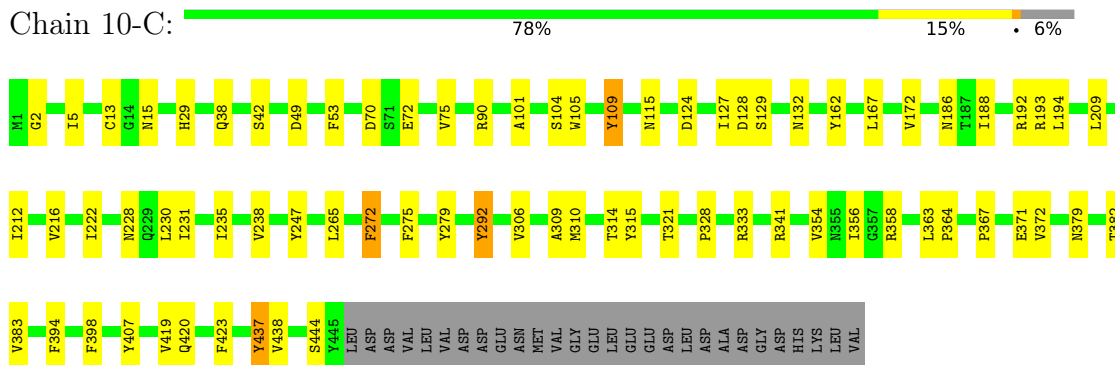
Chain 9-C:  81% 12% 6%



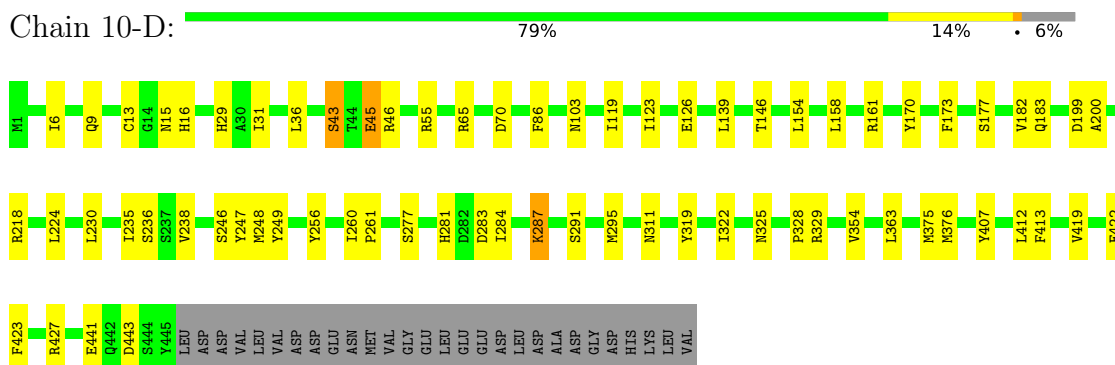
• Molecule 3: TUBULIN GAMMA CHAIN



• Molecule 3: TUBULIN GAMMA CHAIN

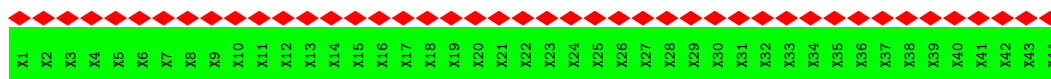


• Molecule 3: TUBULIN GAMMA CHAIN

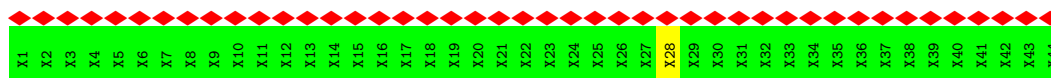


• Molecule 4: SPINDLE POLE BODY COMPONENT 110





- Molecule 4: SPINDLE POLE BODY COMPONENT 110



- Molecule 4: SPINDLE POLE BODY COMPONENT 110



There are no outlier residues recorded for this chain.

- Molecule 4: SPINDLE POLE BODY COMPONENT 110



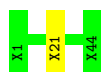
There are no outlier residues recorded for this chain.

- Molecule 4: SPINDLE POLE BODY COMPONENT 110



There are no outlier residues recorded for this chain.

- Molecule 4: SPINDLE POLE BODY COMPONENT 110



- Molecule 4: SPINDLE POLE BODY COMPONENT 110



There are no outlier residues recorded for this chain.

- Molecule 4: SPINDLE POLE BODY COMPONENT 110



There are no outlier residues recorded for this chain.

- Molecule 4: SPINDLE POLE BODY COMPONENT 110



There are no outlier residues recorded for this chain.

- Molecule 4: SPINDLE POLE BODY COMPONENT 110

Chain 5-F:  100%

There are no outlier residues recorded for this chain.

- Molecule 4: SPINDLE POLE BODY COMPONENT 110

Chain 6-E:  100%

There are no outlier residues recorded for this chain.

- Molecule 4: SPINDLE POLE BODY COMPONENT 110

Chain 6-F:  100%

There are no outlier residues recorded for this chain.

- Molecule 4: SPINDLE POLE BODY COMPONENT 110

Chain 7-E:  100%

There are no outlier residues recorded for this chain.

- Molecule 4: SPINDLE POLE BODY COMPONENT 110

Chain 7-F:  100%

There are no outlier residues recorded for this chain.

- Molecule 4: SPINDLE POLE BODY COMPONENT 110

Chain 8-E:  100%

There are no outlier residues recorded for this chain.

- Molecule 4: SPINDLE POLE BODY COMPONENT 110

Chain 8-F:  100%

There are no outlier residues recorded for this chain.

- Molecule 4: SPINDLE POLE BODY COMPONENT 110

Chain 9-E:  100%

There are no outlier residues recorded for this chain.

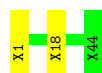
- Molecule 4: SPINDLE POLE BODY COMPONENT 110

Chain 9-F:  100%

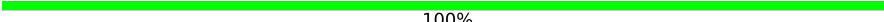
There are no outlier residues recorded for this chain.

- Molecule 4: SPINDLE POLE BODY COMPONENT 110

Chain 10-E:  95% 5%



- Molecule 4: SPINDLE POLE BODY COMPONENT 110

Chain 10-F:  100%

There are no outlier residues recorded for this chain.

4 Experimental information

Property	Value	Source
EM reconstruction method	HELICAL	Depositor
Imposed symmetry	HELICAL, twist=Not provided°, rise=Not provided Å, axial sym=Not provided	Depositor
Number of segments used	Not provided	
Resolution determination method	Not provided	
CTF correction method	WHOLE MICROGRAPH	Depositor
Microscope	FEI TECNAI F20	Depositor
Voltage (kV)	200	Depositor
Electron dose ($e^-/\text{\AA}^2$)	20	Depositor
Minimum defocus (nm)	800	Depositor
Maximum defocus (nm)	3000	Depositor
Magnification	60000	Depositor
Image detector	TVIPS TEMCAM-F816 (8k x 8k)	Depositor
Maximum map value	6.278	Depositor
Minimum map value	-3.005	Depositor
Average map value	1.000	Depositor
Map value standard deviation	1.000	Depositor
Recommended contour level	2.5	Depositor
Map size (Å)	380.8, 380.8, 380.8	wwPDB
Map dimensions	320, 320, 320	wwPDB
Map angles (°)	90, 90, 90	wwPDB
Pixel spacing (Å)	1.19, 1.19, 1.19	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-A	0.40	0/4917	0.48	0/6616
1	2-A	0.40	0/4917	0.48	0/6616
1	3-A	0.40	0/4917	0.48	0/6616
1	4-A	0.40	0/4917	0.48	0/6616
1	5-A	0.40	0/4917	0.48	0/6616
1	6-A	0.40	0/4917	0.48	0/6616
1	7-A	0.40	0/4917	0.48	0/6616
1	8-A	0.40	0/4917	0.48	0/6616
1	9-A	0.40	0/4917	0.48	0/6616
1	10-A	0.40	0/4917	0.48	0/6616
2	1-B	0.41	0/4803	0.47	0/6481
2	2-B	0.41	0/4803	0.47	0/6481
2	3-B	0.41	0/4803	0.47	0/6481
2	4-B	0.41	0/4803	0.47	0/6481
2	5-B	0.41	0/4803	0.47	0/6481
2	6-B	0.41	0/4803	0.47	0/6481
2	7-B	0.41	0/4803	0.47	0/6481
2	8-B	0.41	0/4803	0.47	0/6481
2	9-B	0.41	0/4803	0.47	0/6481
2	10-B	0.41	0/4803	0.47	0/6481
3	1-C	0.42	0/3558	0.47	0/4831
3	1-D	0.41	0/3558	0.45	0/4831
3	2-C	0.42	0/3558	0.47	0/4831
3	2-D	0.41	0/3558	0.45	0/4831
3	3-C	0.42	0/3558	0.47	0/4831
3	3-D	0.41	0/3558	0.45	0/4831
3	4-C	0.42	0/3558	0.47	0/4831
3	4-D	0.41	0/3558	0.45	0/4831
3	5-C	0.42	0/3558	0.47	0/4831
3	5-D	0.41	0/3558	0.45	0/4831
3	6-C	0.42	0/3558	0.47	0/4831
3	6-D	0.41	0/3558	0.45	0/4831
3	7-C	0.42	0/3558	0.47	0/4831
3	7-D	0.41	0/3558	0.45	0/4831

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
3	8-C	0.42	0/3558	0.47	0/4831
3	8-D	0.41	0/3558	0.45	0/4831
3	9-C	0.42	0/3558	0.47	0/4831
3	9-D	0.41	0/3558	0.45	0/4831
3	10-C	0.42	0/3558	0.47	0/4831
3	10-D	0.41	0/3558	0.45	0/4831
All	All	0.41	0/168360	0.47	0/227590

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	1-A	0	19
1	2-A	0	16
1	3-A	0	15
1	4-A	0	16
1	5-A	0	18
1	6-A	0	24
1	7-A	0	19
1	8-A	0	21
1	9-A	0	19
1	10-A	0	20
2	1-B	0	25
2	2-B	0	18
2	3-B	0	17
2	4-B	0	21
2	5-B	0	7
2	6-B	0	19
2	7-B	0	23
2	8-B	0	28
2	9-B	0	15
2	10-B	0	25
3	1-C	0	15
3	1-D	0	9
3	2-C	0	9
3	2-D	0	6
3	3-C	0	16
3	3-D	0	12
3	4-C	0	13
3	4-D	0	13

Continued on next page...

Continued from previous page...

Mol	Chain	#Chirality outliers	#Planarity outliers
3	5-C	0	8
3	5-D	0	10
3	6-C	0	12
3	6-D	1	8
3	7-C	0	9
3	7-D	0	11
3	8-C	0	9
3	8-D	0	14
3	9-C	0	8
3	9-D	0	14
3	10-C	0	11
3	10-D	0	17
All	All	1	609

There are no bond length outliers.

There are no bond angle outliers.

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
3	6-D	73	PRO	CA

5 of 609 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	1-A	112	TYR	Sidechain
1	1-A	123	TYR	Sidechain
1	1-A	140	TYR	Sidechain
1	1-A	181	GLU	Peptide
1	1-A	74	TYR	Sidechain

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-A	4831	0	4863	192	0
1	2-A	4831	0	4863	140	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	3-A	4831	0	4863	117	0
1	4-A	4831	0	4862	121	0
1	5-A	4831	0	4863	128	0
1	6-A	4831	0	4862	115	0
1	7-A	4831	0	4863	113	0
1	8-A	4831	0	4862	146	0
1	9-A	4831	0	4863	148	0
1	10-A	4831	0	4863	153	0
2	1-B	4701	0	4728	183	0
2	2-B	4701	0	4731	143	0
2	3-B	4701	0	4731	122	0
2	4-B	4701	0	4729	136	0
2	5-B	4701	0	4729	144	0
2	6-B	4701	0	4729	180	0
2	7-B	4701	0	4729	127	0
2	8-B	4701	0	4731	183	0
2	9-B	4701	0	4727	124	0
2	10-B	4701	0	4729	135	0
3	1-C	3483	0	3340	47	0
3	1-D	3483	0	3340	38	0
3	2-C	3483	0	3340	43	0
3	2-D	3483	0	3340	49	0
3	3-C	3483	0	3340	51	0
3	3-D	3483	0	3340	38	0
3	4-C	3483	0	3340	54	0
3	4-D	3483	0	3340	43	0
3	5-C	3483	0	3340	34	0
3	5-D	3483	0	3340	51	0
3	6-C	3483	0	3340	28	0
3	6-D	3483	0	3340	62	0
3	7-C	3483	0	3340	34	0
3	7-D	3483	0	3340	48	0
3	8-C	3483	0	3340	24	0
3	8-D	3483	0	3340	45	0
3	9-C	3483	0	3340	29	0
3	9-D	3483	0	3340	42	0
3	10-C	3483	0	3340	44	0
3	10-D	3483	0	3340	28	0
4	1-E	220	0	46	0	0
4	1-F	220	0	46	1	0
4	2-E	220	0	46	0	0
4	2-F	220	0	46	0	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	3-E	220	0	46	0	0
4	3-F	220	0	46	1	0
4	4-E	220	0	46	0	0
4	4-F	220	0	46	0	0
4	5-E	220	0	46	0	0
4	5-F	220	0	46	0	0
4	6-E	220	0	46	0	0
4	6-F	220	0	46	0	0
4	7-E	220	0	46	0	0
4	7-F	220	0	46	0	0
4	8-E	220	0	46	0	0
4	8-F	220	0	46	0	0
4	9-E	220	0	46	0	0
4	9-F	220	0	46	0	0
4	10-E	220	0	46	2	0
4	10-F	220	0	46	0	0
All	All	169380	0	163640	3046	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 9.

The worst 5 of 3046 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:68:ILE:HD13	2:B:216:PHE:CG	1.27	1.67
2:B:405:ILE:CG2	2:B:456:ILE:HD12	1.28	1.57
1:A:68:ILE:CD1	2:B:216:PHE:HB3	1.21	1.55
1:A:131:PHE:CE2	2:B:322:HIS:NE2	1.71	1.54
1:A:68:ILE:HD13	2:B:216:PHE:CB	1.30	1.53

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-A	561/823 (68%)	518 (92%)	20 (4%)	23 (4%)	2	18
1	2-A	561/823 (68%)	534 (95%)	17 (3%)	10 (2%)	6	34
1	3-A	561/823 (68%)	522 (93%)	23 (4%)	16 (3%)	3	23
1	4-A	561/823 (68%)	529 (94%)	20 (4%)	12 (2%)	5	30
1	5-A	561/823 (68%)	525 (94%)	20 (4%)	16 (3%)	3	23
1	6-A	561/823 (68%)	538 (96%)	13 (2%)	10 (2%)	6	34
1	7-A	561/823 (68%)	529 (94%)	23 (4%)	9 (2%)	7	38
1	8-A	561/823 (68%)	523 (93%)	23 (4%)	15 (3%)	4	25
1	9-A	561/823 (68%)	530 (94%)	23 (4%)	8 (1%)	9	40
1	10-A	561/823 (68%)	521 (93%)	29 (5%)	11 (2%)	6	31
2	1-B	553/846 (65%)	519 (94%)	23 (4%)	11 (2%)	6	31
2	2-B	553/846 (65%)	520 (94%)	21 (4%)	12 (2%)	5	29
2	3-B	553/846 (65%)	521 (94%)	20 (4%)	12 (2%)	5	29
2	4-B	553/846 (65%)	515 (93%)	28 (5%)	10 (2%)	6	34
2	5-B	553/846 (65%)	516 (93%)	30 (5%)	7 (1%)	9	42
2	6-B	553/846 (65%)	513 (93%)	27 (5%)	13 (2%)	4	27
2	7-B	553/846 (65%)	514 (93%)	23 (4%)	16 (3%)	3	23
2	8-B	553/846 (65%)	525 (95%)	19 (3%)	9 (2%)	7	38
2	9-B	553/846 (65%)	521 (94%)	24 (4%)	8 (1%)	9	40
2	10-B	553/846 (65%)	517 (94%)	22 (4%)	14 (2%)	4	26
3	1-C	443/473 (94%)	392 (88%)	32 (7%)	19 (4%)	2	17
3	1-D	443/473 (94%)	404 (91%)	28 (6%)	11 (2%)	4	26
3	2-C	443/473 (94%)	400 (90%)	30 (7%)	13 (3%)	3	23
3	2-D	443/473 (94%)	411 (93%)	22 (5%)	10 (2%)	5	28
3	3-C	443/473 (94%)	384 (87%)	37 (8%)	22 (5%)	1	16
3	3-D	443/473 (94%)	402 (91%)	27 (6%)	14 (3%)	3	21
3	4-C	443/473 (94%)	399 (90%)	35 (8%)	9 (2%)	6	31
3	4-D	443/473 (94%)	392 (88%)	38 (9%)	13 (3%)	3	23
3	5-C	443/473 (94%)	408 (92%)	19 (4%)	16 (4%)	2	20
3	5-D	443/473 (94%)	399 (90%)	36 (8%)	8 (2%)	6	34

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
3	6-C	443/473 (94%)	396 (89%)	36 (8%)	11 (2%)	4	26
3	6-D	443/473 (94%)	400 (90%)	29 (6%)	14 (3%)	3	21
3	7-C	443/473 (94%)	406 (92%)	26 (6%)	11 (2%)	4	26
3	7-D	443/473 (94%)	393 (89%)	34 (8%)	16 (4%)	2	20
3	8-C	443/473 (94%)	399 (90%)	27 (6%)	17 (4%)	2	19
3	8-D	443/473 (94%)	395 (89%)	32 (7%)	16 (4%)	2	20
3	9-C	443/473 (94%)	396 (89%)	35 (8%)	12 (3%)	4	25
3	9-D	443/473 (94%)	399 (90%)	32 (7%)	12 (3%)	4	25
3	10-C	443/473 (94%)	404 (91%)	27 (6%)	12 (3%)	4	25
3	10-D	443/473 (94%)	390 (88%)	38 (9%)	15 (3%)	3	21
All	All	20000/26150 (76%)	18419 (92%)	1068 (5%)	513 (3%)	6	25

5 of 513 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	1-A	91	GLU
1	1-A	99	ASP
1	1-A	261	ASP
1	1-A	322	THR
1	1-A	364	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	1-A	542/766 (71%)	513 (95%)	29 (5%)	20	41
1	2-A	542/766 (71%)	513 (95%)	29 (5%)	20	41
1	3-A	542/766 (71%)	513 (95%)	29 (5%)	20	41
1	4-A	542/766 (71%)	513 (95%)	29 (5%)	20	41
1	5-A	542/766 (71%)	513 (95%)	29 (5%)	20	41
1	6-A	542/766 (71%)	513 (95%)	29 (5%)	20	41

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	7-A	542/766 (71%)	513 (95%)	29 (5%)	20	41
1	8-A	542/766 (71%)	513 (95%)	29 (5%)	20	41
1	9-A	542/766 (71%)	513 (95%)	29 (5%)	20	41
1	10-A	542/766 (71%)	513 (95%)	29 (5%)	20	41
2	1-B	528/787 (67%)	509 (96%)	19 (4%)	31	52
2	2-B	528/787 (67%)	509 (96%)	19 (4%)	31	52
2	3-B	528/787 (67%)	509 (96%)	19 (4%)	31	52
2	4-B	528/787 (67%)	509 (96%)	19 (4%)	31	52
2	5-B	528/787 (67%)	509 (96%)	19 (4%)	31	52
2	6-B	528/787 (67%)	509 (96%)	19 (4%)	31	52
2	7-B	528/787 (67%)	509 (96%)	19 (4%)	31	52
2	8-B	528/787 (67%)	509 (96%)	19 (4%)	31	52
2	9-B	528/787 (67%)	509 (96%)	19 (4%)	31	52
2	10-B	528/787 (67%)	509 (96%)	19 (4%)	31	52
3	1-C	395/420 (94%)	375 (95%)	20 (5%)	21	42
3	1-D	395/420 (94%)	383 (97%)	12 (3%)	36	57
3	2-C	395/420 (94%)	375 (95%)	20 (5%)	21	42
3	2-D	395/420 (94%)	383 (97%)	12 (3%)	36	57
3	3-C	395/420 (94%)	375 (95%)	20 (5%)	21	42
3	3-D	395/420 (94%)	383 (97%)	12 (3%)	36	57
3	4-C	395/420 (94%)	375 (95%)	20 (5%)	21	42
3	4-D	395/420 (94%)	383 (97%)	12 (3%)	36	57
3	5-C	395/420 (94%)	375 (95%)	20 (5%)	21	42
3	5-D	395/420 (94%)	383 (97%)	12 (3%)	36	57
3	6-C	395/420 (94%)	375 (95%)	20 (5%)	21	42
3	6-D	395/420 (94%)	383 (97%)	12 (3%)	36	57
3	7-C	395/420 (94%)	375 (95%)	20 (5%)	21	42
3	7-D	395/420 (94%)	383 (97%)	12 (3%)	36	57
3	8-C	395/420 (94%)	375 (95%)	20 (5%)	21	42
3	8-D	395/420 (94%)	383 (97%)	12 (3%)	36	57
3	9-C	395/420 (94%)	375 (95%)	20 (5%)	21	42

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
3	9-D	395/420 (94%)	383 (97%)	12 (3%)	36	57
3	10-C	395/420 (94%)	375 (95%)	20 (5%)	21	42
3	10-D	395/420 (94%)	383 (97%)	12 (3%)	36	57
All	All	18600/23930 (78%)	17800 (96%)	800 (4%)	27	47

5 of 800 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	6-C	382	THR
1	8-A	415	LEU
3	10-D	422	GLU
3	6-D	328	PRO
3	6-C	379	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 614 such sidechains are listed below:

Mol	Chain	Res	Type
2	8-B	808	ASN
2	10-B	645	ASN
3	8-D	225	GLN
2	8-B	780	ASN
3	9-C	183	GLN

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 [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.

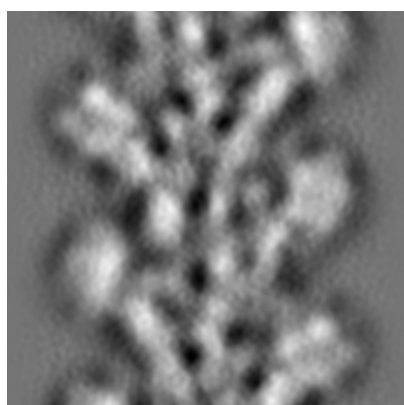
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-1731. These allow visual inspection of the internal detail of the map and identification of artifacts.

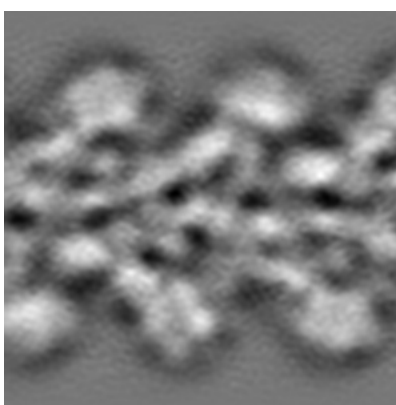
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections [i](#)

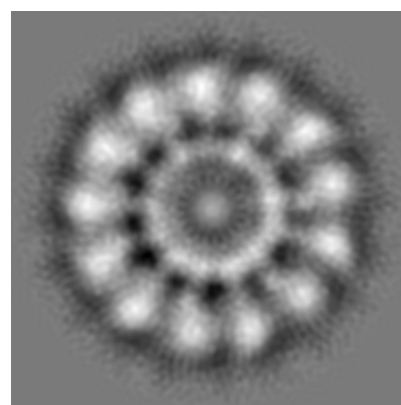
6.1.1 Primary map



X



Y

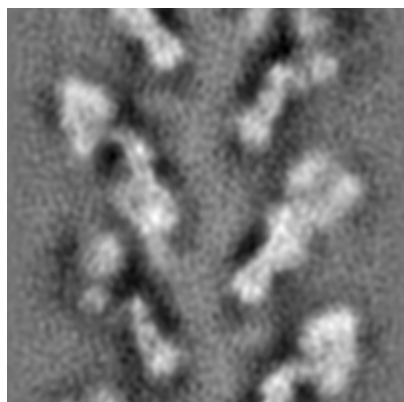


Z

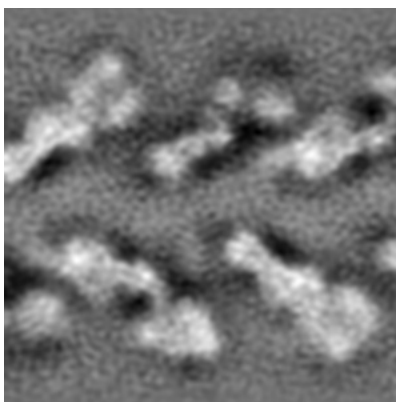
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

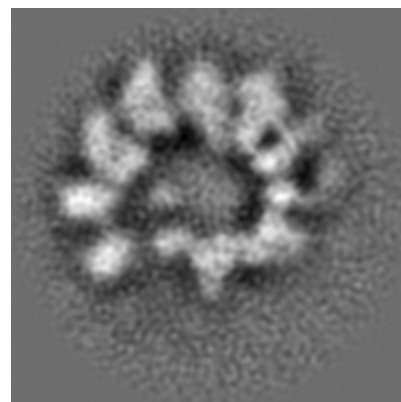
6.2.1 Primary map



X Index: 160



Y Index: 160

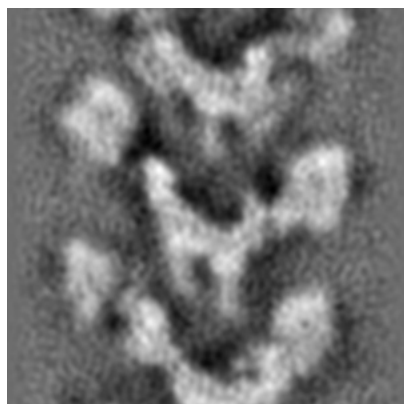


Z Index: 160

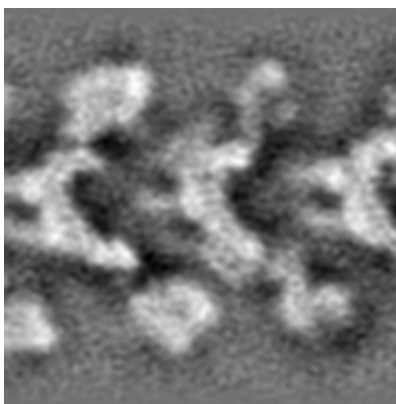
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

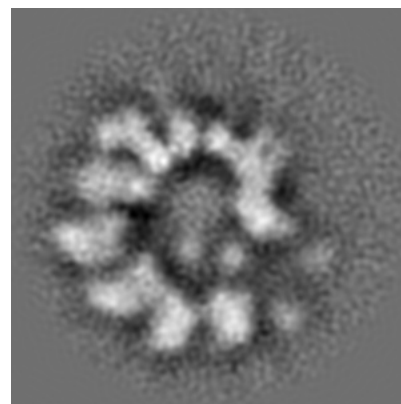
6.3.1 Primary map



X Index: 196



Y Index: 124

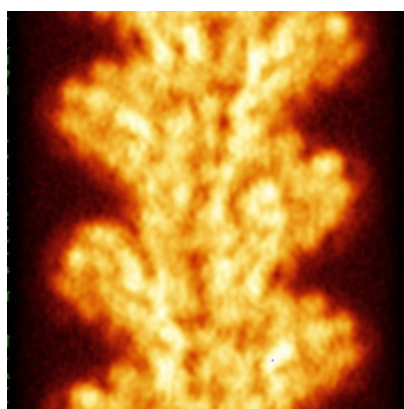


Z Index: 5

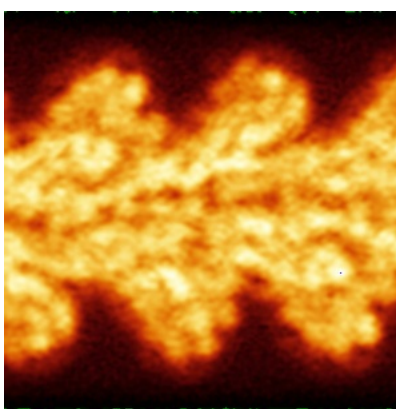
The images above show the largest variance slices of the map in three orthogonal directions.

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

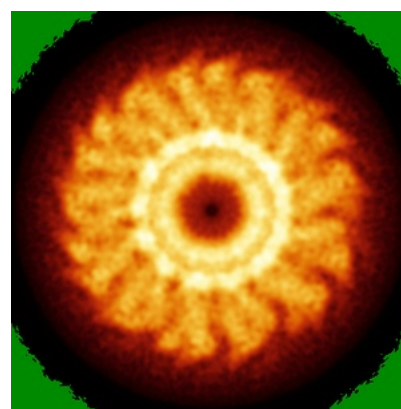
6.4.1 Primary map



X



Y

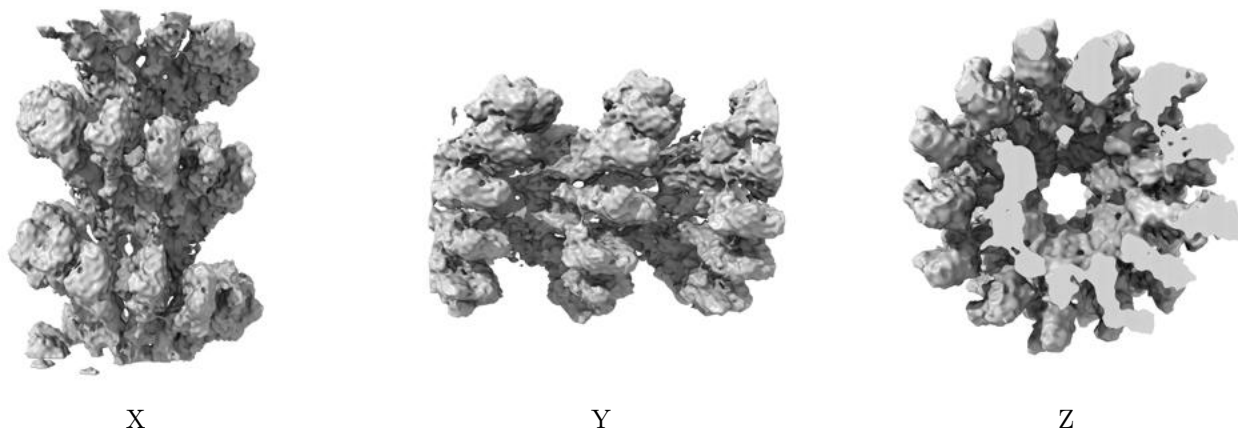


Z

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 2.5. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

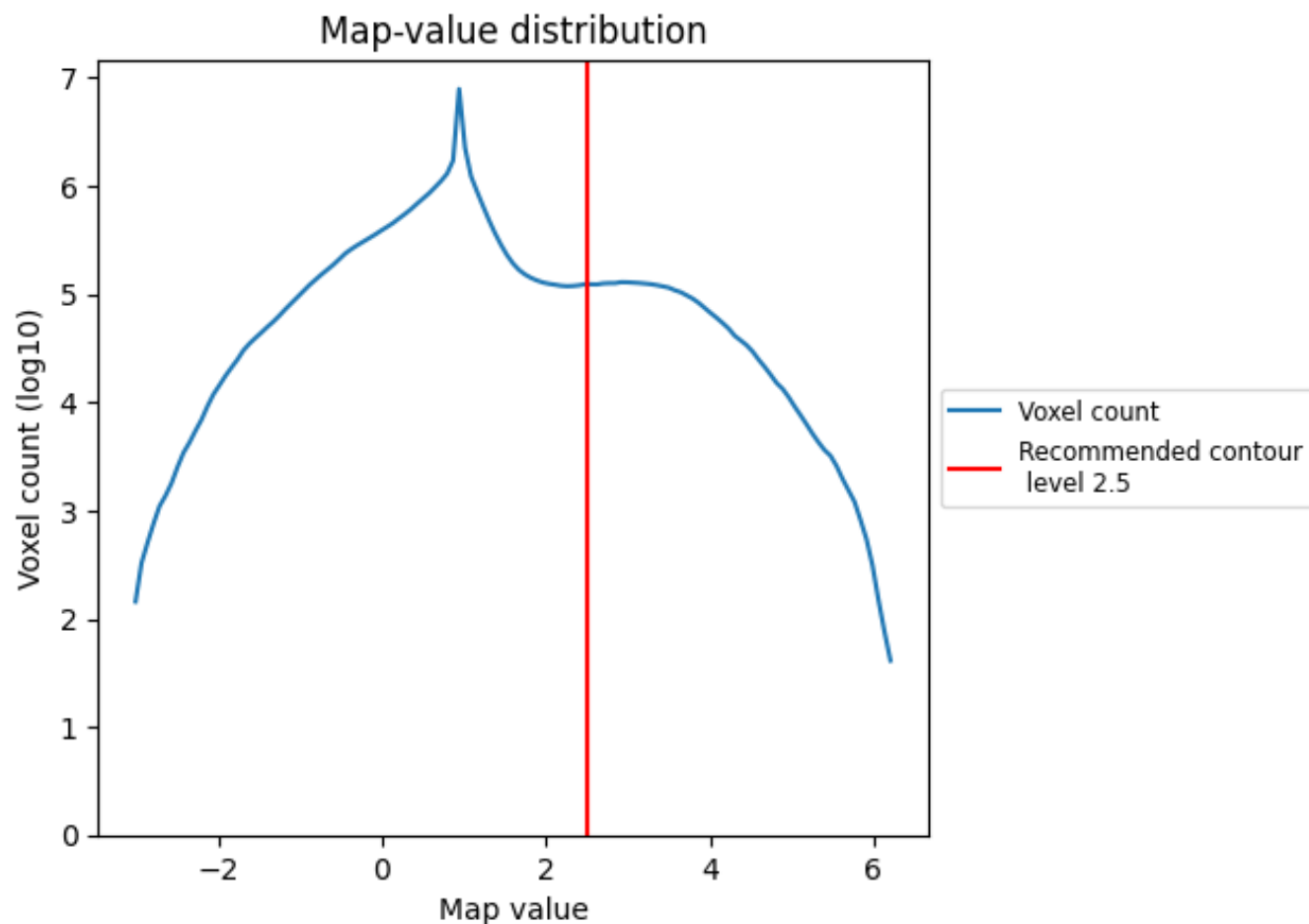
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

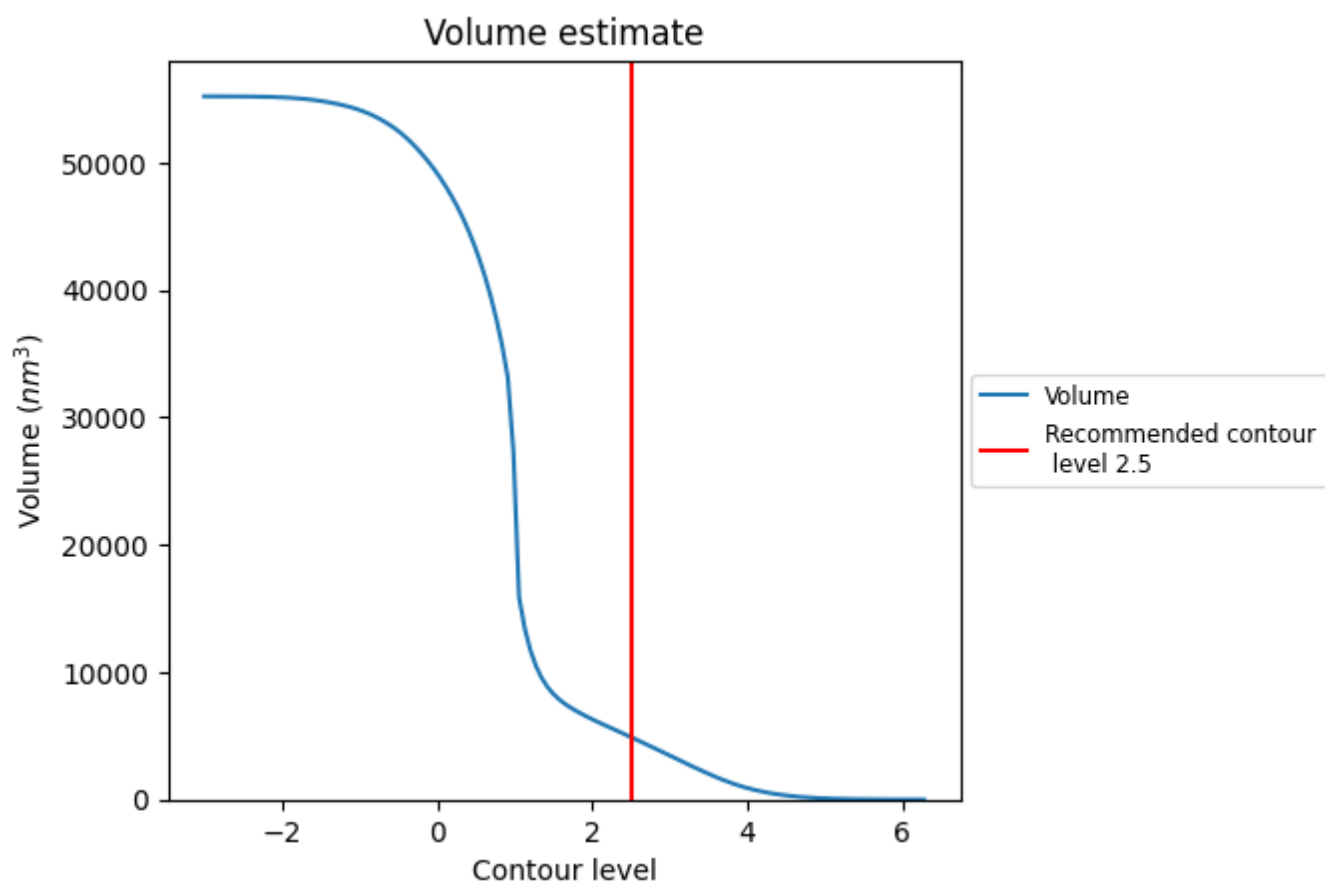
This section contains the results of statistical analysis of the map.

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.

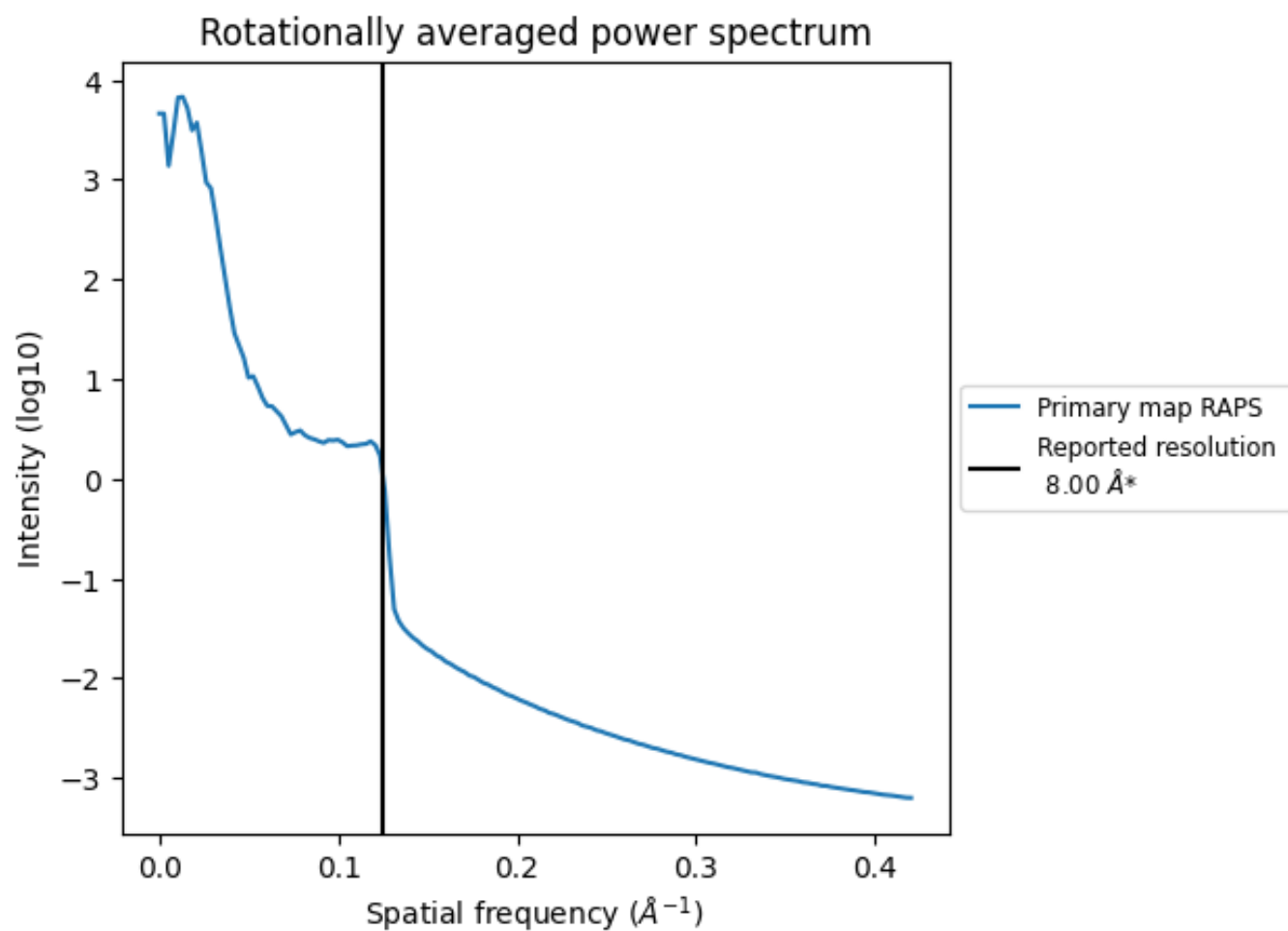
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 4902 nm³; this corresponds to an approximate mass of 4428 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 0.125 Å⁻¹

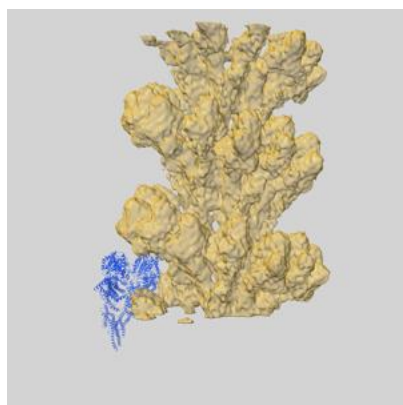
8 Fourier-Shell correlation

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

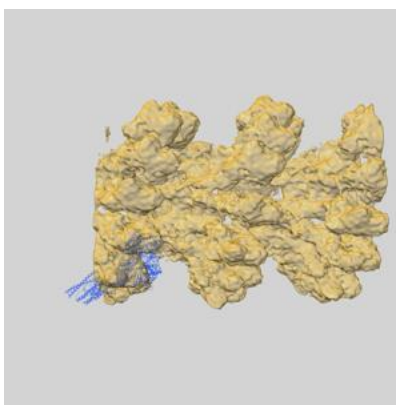
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-1731 and PDB model 5FM1. Per-residue inclusion information can be found in section [3](#) on page [10](#).

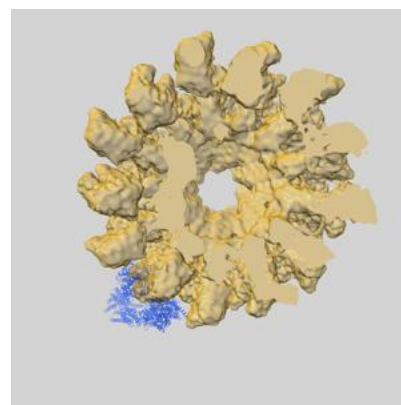
9.1 Map-model overlay [i](#)



X



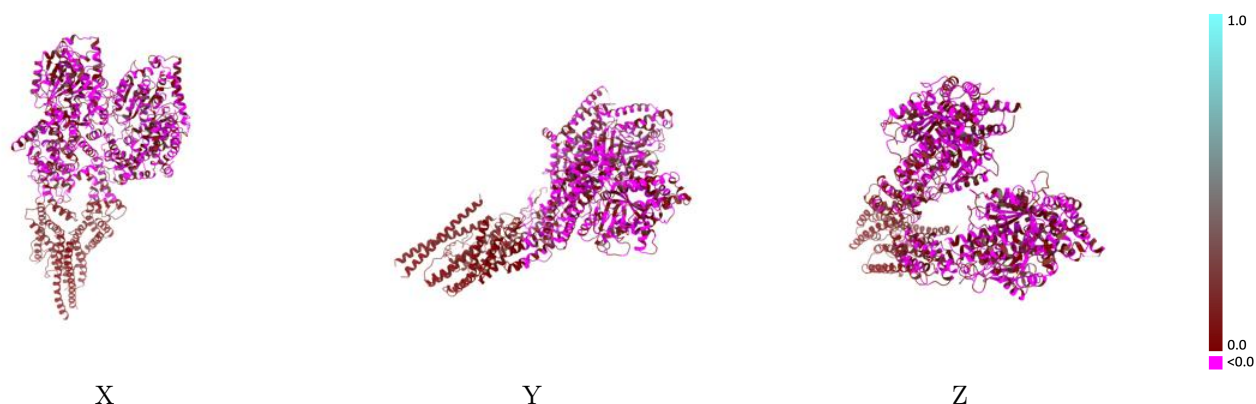
Y



Z

The images above show the 3D surface view of the map at the recommended contour level 2.5 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](#)

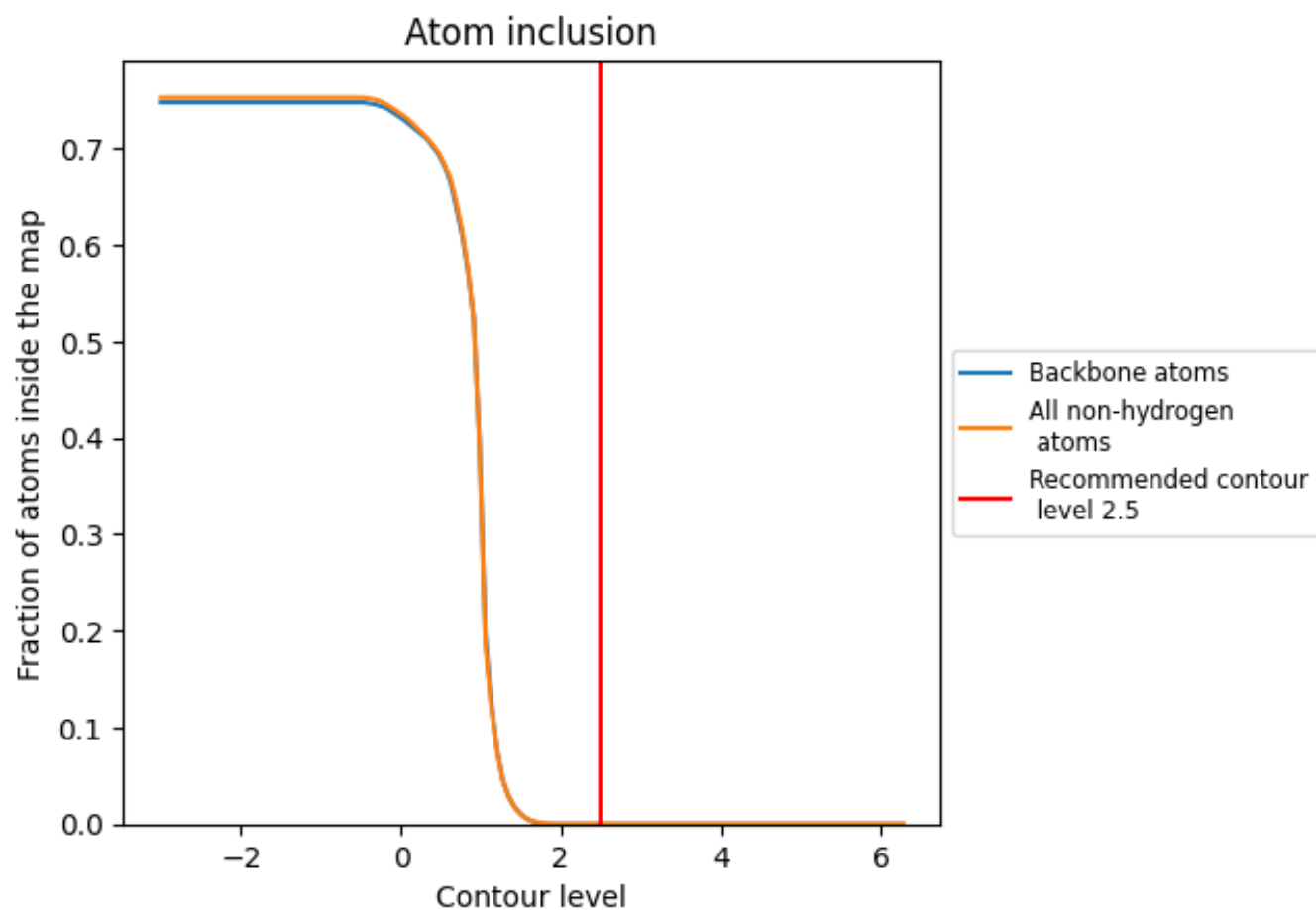


The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions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

This section was not generated.

9.4 Atom inclusion [i](#)



At the recommended contour level, 0% of all backbone atoms, 0% 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 (2.5) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.0000	0.0000
A	0.0000	-0.0000
B	0.0000	0.0040
C	0.0000	-0.0090
D	0.0000	0.0060
E	0.0000	0.0000
F	0.0000	0.0000

