



## wwPDB EM Validation Summary Report ⓘ

Jan 6, 2025 – 04:51 pm GMT

PDB ID : 9H9R  
EMDB ID : EMD-51972  
Title : Full gamma-tubulin ring complex composed of the *Candida albicans* gamma-tubulin small complex in complex with Spc72 CM1  
Authors : Vermeulen, B.J.A.; Pfeffer, S.  
Deposited on : 2024-10-31  
Resolution : 8.20 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](mailto: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>.

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

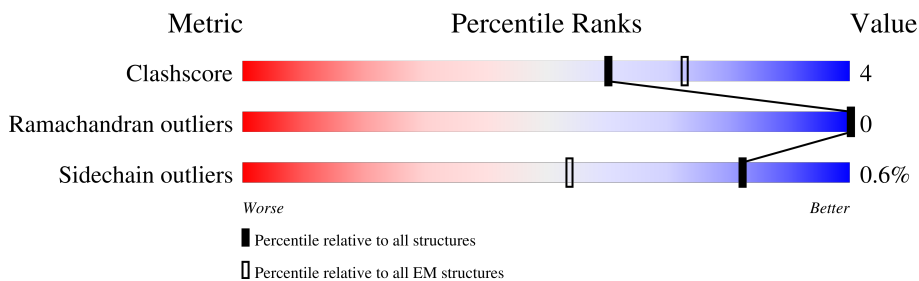
EMDB validation analysis : 0.0.1.dev113  
MolProbity : 4.02b-467  
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)  
MapQ : 1.9.13  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.40

# 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 8.20 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	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415

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  $\geq 3$ , 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	498	
1	B	498	
1	G	498	
1	H	498	
1	M	498	
1	N	498	
1	S	498	
1	T	498	

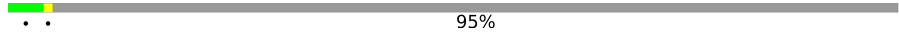


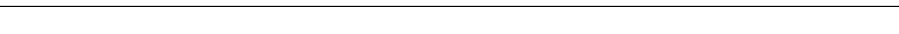
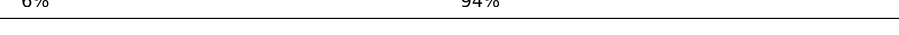
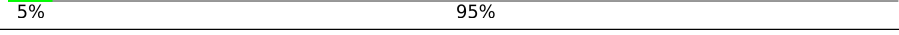
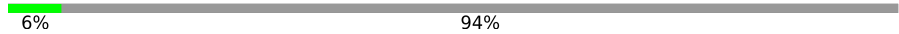
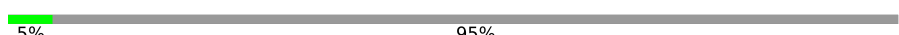

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Mol	Chain	Length	Quality of chain
1	Y	498	73% 7% 19%
1	Z	498	6% 74% 7% 19%
1	e	498	80% 19%
1	f	498	81% 19%
1	k	498	80% 19%
1	l	498	81% 19%
2	C	896	75% 7% 18%
2	I	896	75% 7% 18%
2	O	896	75% 7% 18%
2	U	896	16% 75% 7% 18%
2	a	896	81% 18%
2	g	896	81% 18%
2	m	896	81% 18%
3	D	810	71% 8% 22%
3	J	810	70% 8% 22%
3	P	810	70% 8% 22%
3	V	810	7% 70% 8% 22%
3	b	810	78% 22%
3	h	810	78% 22%
3	n	810	78% 22%
4	E	615	5% 94%
4	F	615	95%
4	K	615	5% 94%
4	L	615	95%
4	Q	615	5% 94%

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Mol	Chain	Length	Quality of chain
4	R	615	 95%
4	W	615	 6% 94%
4	X	615	 95%
4	c	615	 6% 94%
4	d	615	 5% 95%
4	i	615	 6% 94%
4	j	615	 5% 95%
4	o	615	 6% 94%
4	p	615	 5% 95%

## 2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 128163 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 chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	401	3188	2016	535	624	13	0	0
1	B	404	3220	2039	541	627	13	0	0
1	G	401	3188	2016	535	624	13	0	0
1	H	404	3220	2039	541	627	13	0	0
1	M	401	3188	2016	535	624	13	0	0
1	N	404	3220	2039	541	627	13	0	0
1	S	401	3188	2016	535	624	13	0	0
1	T	404	3220	2039	541	627	13	0	0
1	Y	401	3188	2016	535	624	13	0	0
1	Z	404	3220	2039	541	627	13	0	0
1	e	401	3188	2016	535	624	13	0	0
1	f	404	3220	2039	541	627	13	0	0
1	k	401	3188	2016	535	624	13	0	0
1	l	404	3220	2039	541	627	13	0	0

- Molecule 2 is a protein called Spindle pole body component.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	C	735	6001	3869	993	1119	20	0	0

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Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	I	735	6001	3869	993	1119	20	0	0
2	O	735	6001	3869	993	1119	20	0	0
2	U	735	6001	3869	993	1119	20	0	0
2	a	735	6001	3869	993	1119	20	0	0
2	g	735	6001	3869	993	1119	20	0	0
2	m	735	6001	3869	993	1119	20	0	0

There are 175 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	-24	MET	-	initiating methionine	UNP Q59PZ2
C	-23	HIS	-	expression tag	UNP Q59PZ2
C	-22	HIS	-	expression tag	UNP Q59PZ2
C	-21	HIS	-	expression tag	UNP Q59PZ2
C	-20	HIS	-	expression tag	UNP Q59PZ2
C	-19	HIS	-	expression tag	UNP Q59PZ2
C	-18	HIS	-	expression tag	UNP Q59PZ2
C	-17	ASP	-	expression tag	UNP Q59PZ2
C	-16	TYR	-	expression tag	UNP Q59PZ2
C	-15	ASP	-	expression tag	UNP Q59PZ2
C	-14	ILE	-	expression tag	UNP Q59PZ2
C	-13	PRO	-	expression tag	UNP Q59PZ2
C	-12	THR	-	expression tag	UNP Q59PZ2
C	-11	THR	-	expression tag	UNP Q59PZ2
C	-10	GLU	-	expression tag	UNP Q59PZ2
C	-9	ASN	-	expression tag	UNP Q59PZ2
C	-8	LEU	-	expression tag	UNP Q59PZ2
C	-7	TYR	-	expression tag	UNP Q59PZ2
C	-6	PHE	-	expression tag	UNP Q59PZ2
C	-5	GLN	-	expression tag	UNP Q59PZ2
C	-4	GLY	-	expression tag	UNP Q59PZ2
C	-3	ALA	-	expression tag	UNP Q59PZ2
C	-2	MET	-	expression tag	UNP Q59PZ2
C	-1	ASP	-	expression tag	UNP Q59PZ2
C	0	PRO	-	expression tag	UNP Q59PZ2
I	-24	MET	-	initiating methionine	UNP Q59PZ2
I	-23	HIS	-	expression tag	UNP Q59PZ2

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Chain	Residue	Modelled	Actual	Comment	Reference
I	-22	HIS	-	expression tag	UNP Q59PZ2
I	-21	HIS	-	expression tag	UNP Q59PZ2
I	-20	HIS	-	expression tag	UNP Q59PZ2
I	-19	HIS	-	expression tag	UNP Q59PZ2
I	-18	HIS	-	expression tag	UNP Q59PZ2
I	-17	ASP	-	expression tag	UNP Q59PZ2
I	-16	TYR	-	expression tag	UNP Q59PZ2
I	-15	ASP	-	expression tag	UNP Q59PZ2
I	-14	ILE	-	expression tag	UNP Q59PZ2
I	-13	PRO	-	expression tag	UNP Q59PZ2
I	-12	THR	-	expression tag	UNP Q59PZ2
I	-11	THR	-	expression tag	UNP Q59PZ2
I	-10	GLU	-	expression tag	UNP Q59PZ2
I	-9	ASN	-	expression tag	UNP Q59PZ2
I	-8	LEU	-	expression tag	UNP Q59PZ2
I	-7	TYR	-	expression tag	UNP Q59PZ2
I	-6	PHE	-	expression tag	UNP Q59PZ2
I	-5	GLN	-	expression tag	UNP Q59PZ2
I	-4	GLY	-	expression tag	UNP Q59PZ2
I	-3	ALA	-	expression tag	UNP Q59PZ2
I	-2	MET	-	expression tag	UNP Q59PZ2
I	-1	ASP	-	expression tag	UNP Q59PZ2
I	0	PRO	-	expression tag	UNP Q59PZ2
O	-24	MET	-	initiating methionine	UNP Q59PZ2
O	-23	HIS	-	expression tag	UNP Q59PZ2
O	-22	HIS	-	expression tag	UNP Q59PZ2
O	-21	HIS	-	expression tag	UNP Q59PZ2
O	-20	HIS	-	expression tag	UNP Q59PZ2
O	-19	HIS	-	expression tag	UNP Q59PZ2
O	-18	HIS	-	expression tag	UNP Q59PZ2
O	-17	ASP	-	expression tag	UNP Q59PZ2
O	-16	TYR	-	expression tag	UNP Q59PZ2
O	-15	ASP	-	expression tag	UNP Q59PZ2
O	-14	ILE	-	expression tag	UNP Q59PZ2
O	-13	PRO	-	expression tag	UNP Q59PZ2
O	-12	THR	-	expression tag	UNP Q59PZ2
O	-11	THR	-	expression tag	UNP Q59PZ2
O	-10	GLU	-	expression tag	UNP Q59PZ2
O	-9	ASN	-	expression tag	UNP Q59PZ2
O	-8	LEU	-	expression tag	UNP Q59PZ2
O	-7	TYR	-	expression tag	UNP Q59PZ2
O	-6	PHE	-	expression tag	UNP Q59PZ2

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Chain	Residue	Modelled	Actual	Comment	Reference
O	-5	GLN	-	expression tag	UNP Q59PZ2
O	-4	GLY	-	expression tag	UNP Q59PZ2
O	-3	ALA	-	expression tag	UNP Q59PZ2
O	-2	MET	-	expression tag	UNP Q59PZ2
O	-1	ASP	-	expression tag	UNP Q59PZ2
O	0	PRO	-	expression tag	UNP Q59PZ2
U	-24	MET	-	initiating methionine	UNP Q59PZ2
U	-23	HIS	-	expression tag	UNP Q59PZ2
U	-22	HIS	-	expression tag	UNP Q59PZ2
U	-21	HIS	-	expression tag	UNP Q59PZ2
U	-20	HIS	-	expression tag	UNP Q59PZ2
U	-19	HIS	-	expression tag	UNP Q59PZ2
U	-18	HIS	-	expression tag	UNP Q59PZ2
U	-17	ASP	-	expression tag	UNP Q59PZ2
U	-16	TYR	-	expression tag	UNP Q59PZ2
U	-15	ASP	-	expression tag	UNP Q59PZ2
U	-14	ILE	-	expression tag	UNP Q59PZ2
U	-13	PRO	-	expression tag	UNP Q59PZ2
U	-12	THR	-	expression tag	UNP Q59PZ2
U	-11	THR	-	expression tag	UNP Q59PZ2
U	-10	GLU	-	expression tag	UNP Q59PZ2
U	-9	ASN	-	expression tag	UNP Q59PZ2
U	-8	LEU	-	expression tag	UNP Q59PZ2
U	-7	TYR	-	expression tag	UNP Q59PZ2
U	-6	PHE	-	expression tag	UNP Q59PZ2
U	-5	GLN	-	expression tag	UNP Q59PZ2
U	-4	GLY	-	expression tag	UNP Q59PZ2
U	-3	ALA	-	expression tag	UNP Q59PZ2
U	-2	MET	-	expression tag	UNP Q59PZ2
U	-1	ASP	-	expression tag	UNP Q59PZ2
U	0	PRO	-	expression tag	UNP Q59PZ2
a	-24	MET	-	initiating methionine	UNP Q59PZ2
a	-23	HIS	-	expression tag	UNP Q59PZ2
a	-22	HIS	-	expression tag	UNP Q59PZ2
a	-21	HIS	-	expression tag	UNP Q59PZ2
a	-20	HIS	-	expression tag	UNP Q59PZ2
a	-19	HIS	-	expression tag	UNP Q59PZ2
a	-18	HIS	-	expression tag	UNP Q59PZ2
a	-17	ASP	-	expression tag	UNP Q59PZ2
a	-16	TYR	-	expression tag	UNP Q59PZ2
a	-15	ASP	-	expression tag	UNP Q59PZ2
a	-14	ILE	-	expression tag	UNP Q59PZ2

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Chain	Residue	Modelled	Actual	Comment	Reference
a	-13	PRO	-	expression tag	UNP Q59PZ2
a	-12	THR	-	expression tag	UNP Q59PZ2
a	-11	THR	-	expression tag	UNP Q59PZ2
a	-10	GLU	-	expression tag	UNP Q59PZ2
a	-9	ASN	-	expression tag	UNP Q59PZ2
a	-8	LEU	-	expression tag	UNP Q59PZ2
a	-7	TYR	-	expression tag	UNP Q59PZ2
a	-6	PHE	-	expression tag	UNP Q59PZ2
a	-5	GLN	-	expression tag	UNP Q59PZ2
a	-4	GLY	-	expression tag	UNP Q59PZ2
a	-3	ALA	-	expression tag	UNP Q59PZ2
a	-2	MET	-	expression tag	UNP Q59PZ2
a	-1	ASP	-	expression tag	UNP Q59PZ2
a	0	PRO	-	expression tag	UNP Q59PZ2
g	-24	MET	-	initiating methionine	UNP Q59PZ2
g	-23	HIS	-	expression tag	UNP Q59PZ2
g	-22	HIS	-	expression tag	UNP Q59PZ2
g	-21	HIS	-	expression tag	UNP Q59PZ2
g	-20	HIS	-	expression tag	UNP Q59PZ2
g	-19	HIS	-	expression tag	UNP Q59PZ2
g	-18	HIS	-	expression tag	UNP Q59PZ2
g	-17	ASP	-	expression tag	UNP Q59PZ2
g	-16	TYR	-	expression tag	UNP Q59PZ2
g	-15	ASP	-	expression tag	UNP Q59PZ2
g	-14	ILE	-	expression tag	UNP Q59PZ2
g	-13	PRO	-	expression tag	UNP Q59PZ2
g	-12	THR	-	expression tag	UNP Q59PZ2
g	-11	THR	-	expression tag	UNP Q59PZ2
g	-10	GLU	-	expression tag	UNP Q59PZ2
g	-9	ASN	-	expression tag	UNP Q59PZ2
g	-8	LEU	-	expression tag	UNP Q59PZ2
g	-7	TYR	-	expression tag	UNP Q59PZ2
g	-6	PHE	-	expression tag	UNP Q59PZ2
g	-5	GLN	-	expression tag	UNP Q59PZ2
g	-4	GLY	-	expression tag	UNP Q59PZ2
g	-3	ALA	-	expression tag	UNP Q59PZ2
g	-2	MET	-	expression tag	UNP Q59PZ2
g	-1	ASP	-	expression tag	UNP Q59PZ2
g	0	PRO	-	expression tag	UNP Q59PZ2
m	-24	MET	-	initiating methionine	UNP Q59PZ2
m	-23	HIS	-	expression tag	UNP Q59PZ2
m	-22	HIS	-	expression tag	UNP Q59PZ2

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Chain	Residue	Modelled	Actual	Comment	Reference
m	-21	HIS	-	expression tag	UNP Q59PZ2
m	-20	HIS	-	expression tag	UNP Q59PZ2
m	-19	HIS	-	expression tag	UNP Q59PZ2
m	-18	HIS	-	expression tag	UNP Q59PZ2
m	-17	ASP	-	expression tag	UNP Q59PZ2
m	-16	TYR	-	expression tag	UNP Q59PZ2
m	-15	ASP	-	expression tag	UNP Q59PZ2
m	-14	ILE	-	expression tag	UNP Q59PZ2
m	-13	PRO	-	expression tag	UNP Q59PZ2
m	-12	THR	-	expression tag	UNP Q59PZ2
m	-11	THR	-	expression tag	UNP Q59PZ2
m	-10	GLU	-	expression tag	UNP Q59PZ2
m	-9	ASN	-	expression tag	UNP Q59PZ2
m	-8	LEU	-	expression tag	UNP Q59PZ2
m	-7	TYR	-	expression tag	UNP Q59PZ2
m	-6	PHE	-	expression tag	UNP Q59PZ2
m	-5	GLN	-	expression tag	UNP Q59PZ2
m	-4	GLY	-	expression tag	UNP Q59PZ2
m	-3	ALA	-	expression tag	UNP Q59PZ2
m	-2	MET	-	expression tag	UNP Q59PZ2
m	-1	ASP	-	expression tag	UNP Q59PZ2
m	0	PRO	-	expression tag	UNP Q59PZ2

- Molecule 3 is a protein called Spc98p.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	D	635	5313	3463	873	966	11	0	0
3	J	635	5313	3463	873	966	11	0	0
3	P	635	5313	3463	873	966	11	0	0
3	V	635	5313	3463	873	966	11	0	0
3	b	635	5313	3463	873	966	11	0	0
3	h	635	5313	3463	873	966	11	0	0
3	n	635	5313	3463	873	966	11	0	0

There are 189 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	-24	MET	-	initiating methionine	UNP A0A1D8PS42
D	-23	HIS	-	expression tag	UNP A0A1D8PS42
D	-22	HIS	-	expression tag	UNP A0A1D8PS42
D	-21	HIS	-	expression tag	UNP A0A1D8PS42
D	-20	HIS	-	expression tag	UNP A0A1D8PS42
D	-19	HIS	-	expression tag	UNP A0A1D8PS42
D	-18	HIS	-	expression tag	UNP A0A1D8PS42
D	-17	ASP	-	expression tag	UNP A0A1D8PS42
D	-16	TYR	-	expression tag	UNP A0A1D8PS42
D	-15	ASP	-	expression tag	UNP A0A1D8PS42
D	-14	ILE	-	expression tag	UNP A0A1D8PS42
D	-13	PRO	-	expression tag	UNP A0A1D8PS42
D	-12	THR	-	expression tag	UNP A0A1D8PS42
D	-11	THR	-	expression tag	UNP A0A1D8PS42
D	-10	GLU	-	expression tag	UNP A0A1D8PS42
D	-9	ASN	-	expression tag	UNP A0A1D8PS42
D	-8	LEU	-	expression tag	UNP A0A1D8PS42
D	-7	TYR	-	expression tag	UNP A0A1D8PS42
D	-6	PHE	-	expression tag	UNP A0A1D8PS42
D	-5	GLN	-	expression tag	UNP A0A1D8PS42
D	-4	GLY	-	expression tag	UNP A0A1D8PS42
D	-3	ALA	-	expression tag	UNP A0A1D8PS42
D	-2	MET	-	expression tag	UNP A0A1D8PS42
D	-1	ASP	-	expression tag	UNP A0A1D8PS42
D	0	PRO	-	expression tag	UNP A0A1D8PS42
D	123	VAL	LEU	conflict	UNP A0A1D8PS42
D	717	CYS	VAL	conflict	UNP A0A1D8PS42
J	-24	MET	-	initiating methionine	UNP A0A1D8PS42
J	-23	HIS	-	expression tag	UNP A0A1D8PS42
J	-22	HIS	-	expression tag	UNP A0A1D8PS42
J	-21	HIS	-	expression tag	UNP A0A1D8PS42
J	-20	HIS	-	expression tag	UNP A0A1D8PS42
J	-19	HIS	-	expression tag	UNP A0A1D8PS42
J	-18	HIS	-	expression tag	UNP A0A1D8PS42
J	-17	ASP	-	expression tag	UNP A0A1D8PS42
J	-16	TYR	-	expression tag	UNP A0A1D8PS42
J	-15	ASP	-	expression tag	UNP A0A1D8PS42
J	-14	ILE	-	expression tag	UNP A0A1D8PS42
J	-13	PRO	-	expression tag	UNP A0A1D8PS42
J	-12	THR	-	expression tag	UNP A0A1D8PS42
J	-11	THR	-	expression tag	UNP A0A1D8PS42
J	-10	GLU	-	expression tag	UNP A0A1D8PS42
J	-9	ASN	-	expression tag	UNP A0A1D8PS42

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Chain	Residue	Modelled	Actual	Comment	Reference
J	-8	LEU	-	expression tag	UNP A0A1D8PS42
J	-7	TYR	-	expression tag	UNP A0A1D8PS42
J	-6	PHE	-	expression tag	UNP A0A1D8PS42
J	-5	GLN	-	expression tag	UNP A0A1D8PS42
J	-4	GLY	-	expression tag	UNP A0A1D8PS42
J	-3	ALA	-	expression tag	UNP A0A1D8PS42
J	-2	MET	-	expression tag	UNP A0A1D8PS42
J	-1	ASP	-	expression tag	UNP A0A1D8PS42
J	0	PRO	-	expression tag	UNP A0A1D8PS42
J	123	VAL	LEU	conflict	UNP A0A1D8PS42
J	717	CYS	VAL	conflict	UNP A0A1D8PS42
P	-24	MET	-	initiating methionine	UNP A0A1D8PS42
P	-23	HIS	-	expression tag	UNP A0A1D8PS42
P	-22	HIS	-	expression tag	UNP A0A1D8PS42
P	-21	HIS	-	expression tag	UNP A0A1D8PS42
P	-20	HIS	-	expression tag	UNP A0A1D8PS42
P	-19	HIS	-	expression tag	UNP A0A1D8PS42
P	-18	HIS	-	expression tag	UNP A0A1D8PS42
P	-17	ASP	-	expression tag	UNP A0A1D8PS42
P	-16	TYR	-	expression tag	UNP A0A1D8PS42
P	-15	ASP	-	expression tag	UNP A0A1D8PS42
P	-14	ILE	-	expression tag	UNP A0A1D8PS42
P	-13	PRO	-	expression tag	UNP A0A1D8PS42
P	-12	THR	-	expression tag	UNP A0A1D8PS42
P	-11	THR	-	expression tag	UNP A0A1D8PS42
P	-10	GLU	-	expression tag	UNP A0A1D8PS42
P	-9	ASN	-	expression tag	UNP A0A1D8PS42
P	-8	LEU	-	expression tag	UNP A0A1D8PS42
P	-7	TYR	-	expression tag	UNP A0A1D8PS42
P	-6	PHE	-	expression tag	UNP A0A1D8PS42
P	-5	GLN	-	expression tag	UNP A0A1D8PS42
P	-4	GLY	-	expression tag	UNP A0A1D8PS42
P	-3	ALA	-	expression tag	UNP A0A1D8PS42
P	-2	MET	-	expression tag	UNP A0A1D8PS42
P	-1	ASP	-	expression tag	UNP A0A1D8PS42
P	0	PRO	-	expression tag	UNP A0A1D8PS42
P	123	VAL	LEU	conflict	UNP A0A1D8PS42
P	717	CYS	VAL	conflict	UNP A0A1D8PS42
V	-24	MET	-	initiating methionine	UNP A0A1D8PS42
V	-23	HIS	-	expression tag	UNP A0A1D8PS42
V	-22	HIS	-	expression tag	UNP A0A1D8PS42
V	-21	HIS	-	expression tag	UNP A0A1D8PS42

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Chain	Residue	Modelled	Actual	Comment	Reference
V	-20	HIS	-	expression tag	UNP A0A1D8PS42
V	-19	HIS	-	expression tag	UNP A0A1D8PS42
V	-18	HIS	-	expression tag	UNP A0A1D8PS42
V	-17	ASP	-	expression tag	UNP A0A1D8PS42
V	-16	TYR	-	expression tag	UNP A0A1D8PS42
V	-15	ASP	-	expression tag	UNP A0A1D8PS42
V	-14	ILE	-	expression tag	UNP A0A1D8PS42
V	-13	PRO	-	expression tag	UNP A0A1D8PS42
V	-12	THR	-	expression tag	UNP A0A1D8PS42
V	-11	THR	-	expression tag	UNP A0A1D8PS42
V	-10	GLU	-	expression tag	UNP A0A1D8PS42
V	-9	ASN	-	expression tag	UNP A0A1D8PS42
V	-8	LEU	-	expression tag	UNP A0A1D8PS42
V	-7	TYR	-	expression tag	UNP A0A1D8PS42
V	-6	PHE	-	expression tag	UNP A0A1D8PS42
V	-5	GLN	-	expression tag	UNP A0A1D8PS42
V	-4	GLY	-	expression tag	UNP A0A1D8PS42
V	-3	ALA	-	expression tag	UNP A0A1D8PS42
V	-2	MET	-	expression tag	UNP A0A1D8PS42
V	-1	ASP	-	expression tag	UNP A0A1D8PS42
V	0	PRO	-	expression tag	UNP A0A1D8PS42
V	123	VAL	LEU	conflict	UNP A0A1D8PS42
V	717	CYS	VAL	conflict	UNP A0A1D8PS42
b	-24	MET	-	initiating methionine	UNP A0A1D8PS42
b	-23	HIS	-	expression tag	UNP A0A1D8PS42
b	-22	HIS	-	expression tag	UNP A0A1D8PS42
b	-21	HIS	-	expression tag	UNP A0A1D8PS42
b	-20	HIS	-	expression tag	UNP A0A1D8PS42
b	-19	HIS	-	expression tag	UNP A0A1D8PS42
b	-18	HIS	-	expression tag	UNP A0A1D8PS42
b	-17	ASP	-	expression tag	UNP A0A1D8PS42
b	-16	TYR	-	expression tag	UNP A0A1D8PS42
b	-15	ASP	-	expression tag	UNP A0A1D8PS42
b	-14	ILE	-	expression tag	UNP A0A1D8PS42
b	-13	PRO	-	expression tag	UNP A0A1D8PS42
b	-12	THR	-	expression tag	UNP A0A1D8PS42
b	-11	THR	-	expression tag	UNP A0A1D8PS42
b	-10	GLU	-	expression tag	UNP A0A1D8PS42
b	-9	ASN	-	expression tag	UNP A0A1D8PS42
b	-8	LEU	-	expression tag	UNP A0A1D8PS42
b	-7	TYR	-	expression tag	UNP A0A1D8PS42
b	-6	PHE	-	expression tag	UNP A0A1D8PS42

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Chain	Residue	Modelled	Actual	Comment	Reference
b	-5	GLN	-	expression tag	UNP A0A1D8PS42
b	-4	GLY	-	expression tag	UNP A0A1D8PS42
b	-3	ALA	-	expression tag	UNP A0A1D8PS42
b	-2	MET	-	expression tag	UNP A0A1D8PS42
b	-1	ASP	-	expression tag	UNP A0A1D8PS42
b	0	PRO	-	expression tag	UNP A0A1D8PS42
b	123	VAL	LEU	conflict	UNP A0A1D8PS42
b	717	CYS	VAL	conflict	UNP A0A1D8PS42
h	-24	MET	-	initiating methionine	UNP A0A1D8PS42
h	-23	HIS	-	expression tag	UNP A0A1D8PS42
h	-22	HIS	-	expression tag	UNP A0A1D8PS42
h	-21	HIS	-	expression tag	UNP A0A1D8PS42
h	-20	HIS	-	expression tag	UNP A0A1D8PS42
h	-19	HIS	-	expression tag	UNP A0A1D8PS42
h	-18	HIS	-	expression tag	UNP A0A1D8PS42
h	-17	ASP	-	expression tag	UNP A0A1D8PS42
h	-16	TYR	-	expression tag	UNP A0A1D8PS42
h	-15	ASP	-	expression tag	UNP A0A1D8PS42
h	-14	ILE	-	expression tag	UNP A0A1D8PS42
h	-13	PRO	-	expression tag	UNP A0A1D8PS42
h	-12	THR	-	expression tag	UNP A0A1D8PS42
h	-11	THR	-	expression tag	UNP A0A1D8PS42
h	-10	GLU	-	expression tag	UNP A0A1D8PS42
h	-9	ASN	-	expression tag	UNP A0A1D8PS42
h	-8	LEU	-	expression tag	UNP A0A1D8PS42
h	-7	TYR	-	expression tag	UNP A0A1D8PS42
h	-6	PHE	-	expression tag	UNP A0A1D8PS42
h	-5	GLN	-	expression tag	UNP A0A1D8PS42
h	-4	GLY	-	expression tag	UNP A0A1D8PS42
h	-3	ALA	-	expression tag	UNP A0A1D8PS42
h	-2	MET	-	expression tag	UNP A0A1D8PS42
h	-1	ASP	-	expression tag	UNP A0A1D8PS42
h	0	PRO	-	expression tag	UNP A0A1D8PS42
h	123	VAL	LEU	conflict	UNP A0A1D8PS42
h	717	CYS	VAL	conflict	UNP A0A1D8PS42
n	-24	MET	-	initiating methionine	UNP A0A1D8PS42
n	-23	HIS	-	expression tag	UNP A0A1D8PS42
n	-22	HIS	-	expression tag	UNP A0A1D8PS42
n	-21	HIS	-	expression tag	UNP A0A1D8PS42
n	-20	HIS	-	expression tag	UNP A0A1D8PS42
n	-19	HIS	-	expression tag	UNP A0A1D8PS42
n	-18	HIS	-	expression tag	UNP A0A1D8PS42

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Chain	Residue	Modelled	Actual	Comment	Reference
n	-17	ASP	-	expression tag	UNP A0A1D8PS42
n	-16	TYR	-	expression tag	UNP A0A1D8PS42
n	-15	ASP	-	expression tag	UNP A0A1D8PS42
n	-14	ILE	-	expression tag	UNP A0A1D8PS42
n	-13	PRO	-	expression tag	UNP A0A1D8PS42
n	-12	THR	-	expression tag	UNP A0A1D8PS42
n	-11	THR	-	expression tag	UNP A0A1D8PS42
n	-10	GLU	-	expression tag	UNP A0A1D8PS42
n	-9	ASN	-	expression tag	UNP A0A1D8PS42
n	-8	LEU	-	expression tag	UNP A0A1D8PS42
n	-7	TYR	-	expression tag	UNP A0A1D8PS42
n	-6	PHE	-	expression tag	UNP A0A1D8PS42
n	-5	GLN	-	expression tag	UNP A0A1D8PS42
n	-4	GLY	-	expression tag	UNP A0A1D8PS42
n	-3	ALA	-	expression tag	UNP A0A1D8PS42
n	-2	MET	-	expression tag	UNP A0A1D8PS42
n	-1	ASP	-	expression tag	UNP A0A1D8PS42
n	0	PRO	-	expression tag	UNP A0A1D8PS42
n	123	VAL	LEU	conflict	UNP A0A1D8PS42
n	717	CYS	VAL	conflict	UNP A0A1D8PS42

- Molecule 4 is a protein called Mto2p-binding domain-containing protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	E	37	Total	C	N	O	S	0	0
			314	198	57	58	1		
4	F	31	Total	C	N	O	S	0	0
			273	172	51	49	1		
4	K	37	Total	C	N	O	S	0	0
			314	198	57	58	1		
4	L	31	Total	C	N	O	S	0	0
			273	172	51	49	1		
4	Q	37	Total	C	N	O	S	0	0
			314	198	57	58	1		
4	R	31	Total	C	N	O	S	0	0
			273	172	51	49	1		
4	W	37	Total	C	N	O	S	0	0
			314	198	57	58	1		
4	X	31	Total	C	N	O	S	0	0
			273	172	51	49	1		
4	c	37	Total	C	N	O	S	0	0
			314	198	57	58	1		

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Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	d	31	273	172	51	49	1	0	0
4	i	37	314	198	57	58	1	0	0
4	j	31	273	172	51	49	1	0	0
4	o	37	314	198	57	58	1	0	0
4	p	31	273	172	51	49	1	0	0

There are 224 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
E	600	GLY	-	expression tag	UNP Q5AGV5
E	601	SER	-	expression tag	UNP Q5AGV5
E	602	GLY	-	expression tag	UNP Q5AGV5
E	603	SER	-	expression tag	UNP Q5AGV5
E	604	GLY	-	expression tag	UNP Q5AGV5
E	605	SER	-	expression tag	UNP Q5AGV5
E	606	GLU	-	expression tag	UNP Q5AGV5
E	607	GLN	-	expression tag	UNP Q5AGV5
E	608	LYS	-	expression tag	UNP Q5AGV5
E	609	LEU	-	expression tag	UNP Q5AGV5
E	610	ILE	-	expression tag	UNP Q5AGV5
E	611	SER	-	expression tag	UNP Q5AGV5
E	612	GLU	-	expression tag	UNP Q5AGV5
E	613	GLU	-	expression tag	UNP Q5AGV5
E	614	ASP	-	expression tag	UNP Q5AGV5
E	615	LEU	-	expression tag	UNP Q5AGV5
F	600	GLY	-	expression tag	UNP Q5AGV5
F	601	SER	-	expression tag	UNP Q5AGV5
F	602	GLY	-	expression tag	UNP Q5AGV5
F	603	SER	-	expression tag	UNP Q5AGV5
F	604	GLY	-	expression tag	UNP Q5AGV5
F	605	SER	-	expression tag	UNP Q5AGV5
F	606	GLU	-	expression tag	UNP Q5AGV5
F	607	GLN	-	expression tag	UNP Q5AGV5
F	608	LYS	-	expression tag	UNP Q5AGV5
F	609	LEU	-	expression tag	UNP Q5AGV5
F	610	ILE	-	expression tag	UNP Q5AGV5
F	611	SER	-	expression tag	UNP Q5AGV5
F	612	GLU	-	expression tag	UNP Q5AGV5

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Chain	Residue	Modelled	Actual	Comment	Reference
F	613	GLU	-	expression tag	UNP Q5AGV5
F	614	ASP	-	expression tag	UNP Q5AGV5
F	615	LEU	-	expression tag	UNP Q5AGV5
K	600	GLY	-	expression tag	UNP Q5AGV5
K	601	SER	-	expression tag	UNP Q5AGV5
K	602	GLY	-	expression tag	UNP Q5AGV5
K	603	SER	-	expression tag	UNP Q5AGV5
K	604	GLY	-	expression tag	UNP Q5AGV5
K	605	SER	-	expression tag	UNP Q5AGV5
K	606	GLU	-	expression tag	UNP Q5AGV5
K	607	GLN	-	expression tag	UNP Q5AGV5
K	608	LYS	-	expression tag	UNP Q5AGV5
K	609	LEU	-	expression tag	UNP Q5AGV5
K	610	ILE	-	expression tag	UNP Q5AGV5
K	611	SER	-	expression tag	UNP Q5AGV5
K	612	GLU	-	expression tag	UNP Q5AGV5
K	613	GLU	-	expression tag	UNP Q5AGV5
K	614	ASP	-	expression tag	UNP Q5AGV5
K	615	LEU	-	expression tag	UNP Q5AGV5
L	600	GLY	-	expression tag	UNP Q5AGV5
L	601	SER	-	expression tag	UNP Q5AGV5
L	602	GLY	-	expression tag	UNP Q5AGV5
L	603	SER	-	expression tag	UNP Q5AGV5
L	604	GLY	-	expression tag	UNP Q5AGV5
L	605	SER	-	expression tag	UNP Q5AGV5
L	606	GLU	-	expression tag	UNP Q5AGV5
L	607	GLN	-	expression tag	UNP Q5AGV5
L	608	LYS	-	expression tag	UNP Q5AGV5
L	609	LEU	-	expression tag	UNP Q5AGV5
L	610	ILE	-	expression tag	UNP Q5AGV5
L	611	SER	-	expression tag	UNP Q5AGV5
L	612	GLU	-	expression tag	UNP Q5AGV5
L	613	GLU	-	expression tag	UNP Q5AGV5
L	614	ASP	-	expression tag	UNP Q5AGV5
L	615	LEU	-	expression tag	UNP Q5AGV5
Q	600	GLY	-	expression tag	UNP Q5AGV5
Q	601	SER	-	expression tag	UNP Q5AGV5
Q	602	GLY	-	expression tag	UNP Q5AGV5
Q	603	SER	-	expression tag	UNP Q5AGV5
Q	604	GLY	-	expression tag	UNP Q5AGV5
Q	605	SER	-	expression tag	UNP Q5AGV5
Q	606	GLU	-	expression tag	UNP Q5AGV5

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Chain	Residue	Modelled	Actual	Comment	Reference
Q	607	GLN	-	expression tag	UNP Q5AGV5
Q	608	LYS	-	expression tag	UNP Q5AGV5
Q	609	LEU	-	expression tag	UNP Q5AGV5
Q	610	ILE	-	expression tag	UNP Q5AGV5
Q	611	SER	-	expression tag	UNP Q5AGV5
Q	612	GLU	-	expression tag	UNP Q5AGV5
Q	613	GLU	-	expression tag	UNP Q5AGV5
Q	614	ASP	-	expression tag	UNP Q5AGV5
Q	615	LEU	-	expression tag	UNP Q5AGV5
R	600	GLY	-	expression tag	UNP Q5AGV5
R	601	SER	-	expression tag	UNP Q5AGV5
R	602	GLY	-	expression tag	UNP Q5AGV5
R	603	SER	-	expression tag	UNP Q5AGV5
R	604	GLY	-	expression tag	UNP Q5AGV5
R	605	SER	-	expression tag	UNP Q5AGV5
R	606	GLU	-	expression tag	UNP Q5AGV5
R	607	GLN	-	expression tag	UNP Q5AGV5
R	608	LYS	-	expression tag	UNP Q5AGV5
R	609	LEU	-	expression tag	UNP Q5AGV5
R	610	ILE	-	expression tag	UNP Q5AGV5
R	611	SER	-	expression tag	UNP Q5AGV5
R	612	GLU	-	expression tag	UNP Q5AGV5
R	613	GLU	-	expression tag	UNP Q5AGV5
R	614	ASP	-	expression tag	UNP Q5AGV5
R	615	LEU	-	expression tag	UNP Q5AGV5
W	600	GLY	-	expression tag	UNP Q5AGV5
W	601	SER	-	expression tag	UNP Q5AGV5
W	602	GLY	-	expression tag	UNP Q5AGV5
W	603	SER	-	expression tag	UNP Q5AGV5
W	604	GLY	-	expression tag	UNP Q5AGV5
W	605	SER	-	expression tag	UNP Q5AGV5
W	606	GLU	-	expression tag	UNP Q5AGV5
W	607	GLN	-	expression tag	UNP Q5AGV5
W	608	LYS	-	expression tag	UNP Q5AGV5
W	609	LEU	-	expression tag	UNP Q5AGV5
W	610	ILE	-	expression tag	UNP Q5AGV5
W	611	SER	-	expression tag	UNP Q5AGV5
W	612	GLU	-	expression tag	UNP Q5AGV5
W	613	GLU	-	expression tag	UNP Q5AGV5
W	614	ASP	-	expression tag	UNP Q5AGV5
W	615	LEU	-	expression tag	UNP Q5AGV5
X	600	GLY	-	expression tag	UNP Q5AGV5

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Chain	Residue	Modelled	Actual	Comment	Reference
X	601	SER	-	expression tag	UNP Q5AGV5
X	602	GLY	-	expression tag	UNP Q5AGV5
X	603	SER	-	expression tag	UNP Q5AGV5
X	604	GLY	-	expression tag	UNP Q5AGV5
X	605	SER	-	expression tag	UNP Q5AGV5
X	606	GLU	-	expression tag	UNP Q5AGV5
X	607	GLN	-	expression tag	UNP Q5AGV5
X	608	LYS	-	expression tag	UNP Q5AGV5
X	609	LEU	-	expression tag	UNP Q5AGV5
X	610	ILE	-	expression tag	UNP Q5AGV5
X	611	SER	-	expression tag	UNP Q5AGV5
X	612	GLU	-	expression tag	UNP Q5AGV5
X	613	GLU	-	expression tag	UNP Q5AGV5
X	614	ASP	-	expression tag	UNP Q5AGV5
X	615	LEU	-	expression tag	UNP Q5AGV5
c	600	GLY	-	expression tag	UNP Q5AGV5
c	601	SER	-	expression tag	UNP Q5AGV5
c	602	GLY	-	expression tag	UNP Q5AGV5
c	603	SER	-	expression tag	UNP Q5AGV5
c	604	GLY	-	expression tag	UNP Q5AGV5
c	605	SER	-	expression tag	UNP Q5AGV5
c	606	GLU	-	expression tag	UNP Q5AGV5
c	607	GLN	-	expression tag	UNP Q5AGV5
c	608	LYS	-	expression tag	UNP Q5AGV5
c	609	LEU	-	expression tag	UNP Q5AGV5
c	610	ILE	-	expression tag	UNP Q5AGV5
c	611	SER	-	expression tag	UNP Q5AGV5
c	612	GLU	-	expression tag	UNP Q5AGV5
c	613	GLU	-	expression tag	UNP Q5AGV5
c	614	ASP	-	expression tag	UNP Q5AGV5
c	615	LEU	-	expression tag	UNP Q5AGV5
d	600	GLY	-	expression tag	UNP Q5AGV5
d	601	SER	-	expression tag	UNP Q5AGV5
d	602	GLY	-	expression tag	UNP Q5AGV5
d	603	SER	-	expression tag	UNP Q5AGV5
d	604	GLY	-	expression tag	UNP Q5AGV5
d	605	SER	-	expression tag	UNP Q5AGV5
d	606	GLU	-	expression tag	UNP Q5AGV5
d	607	GLN	-	expression tag	UNP Q5AGV5
d	608	LYS	-	expression tag	UNP Q5AGV5
d	609	LEU	-	expression tag	UNP Q5AGV5
d	610	ILE	-	expression tag	UNP Q5AGV5

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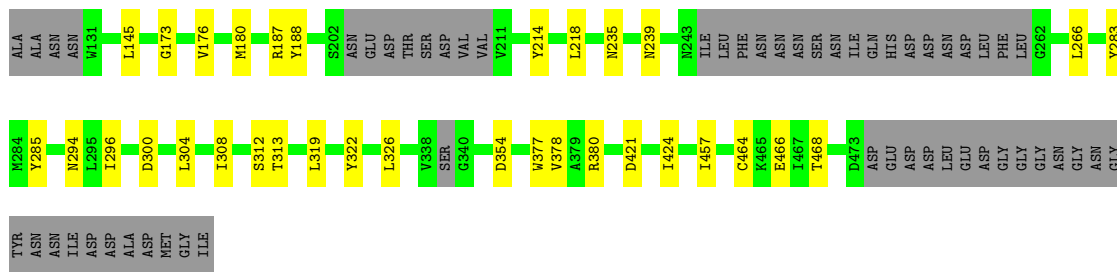
Chain	Residue	Modelled	Actual	Comment	Reference
d	611	SER	-	expression tag	UNP Q5AGV5
d	612	GLU	-	expression tag	UNP Q5AGV5
d	613	GLU	-	expression tag	UNP Q5AGV5
d	614	ASP	-	expression tag	UNP Q5AGV5
d	615	LEU	-	expression tag	UNP Q5AGV5
i	600	GLY	-	expression tag	UNP Q5AGV5
i	601	SER	-	expression tag	UNP Q5AGV5
i	602	GLY	-	expression tag	UNP Q5AGV5
i	603	SER	-	expression tag	UNP Q5AGV5
i	604	GLY	-	expression tag	UNP Q5AGV5
i	605	SER	-	expression tag	UNP Q5AGV5
i	606	GLU	-	expression tag	UNP Q5AGV5
i	607	GLN	-	expression tag	UNP Q5AGV5
i	608	LYS	-	expression tag	UNP Q5AGV5
i	609	LEU	-	expression tag	UNP Q5AGV5
i	610	ILE	-	expression tag	UNP Q5AGV5
i	611	SER	-	expression tag	UNP Q5AGV5
i	612	GLU	-	expression tag	UNP Q5AGV5
i	613	GLU	-	expression tag	UNP Q5AGV5
i	614	ASP	-	expression tag	UNP Q5AGV5
i	615	LEU	-	expression tag	UNP Q5AGV5
j	600	GLY	-	expression tag	UNP Q5AGV5
j	601	SER	-	expression tag	UNP Q5AGV5
j	602	GLY	-	expression tag	UNP Q5AGV5
j	603	SER	-	expression tag	UNP Q5AGV5
j	604	GLY	-	expression tag	UNP Q5AGV5
j	605	SER	-	expression tag	UNP Q5AGV5
j	606	GLU	-	expression tag	UNP Q5AGV5
j	607	GLN	-	expression tag	UNP Q5AGV5
j	608	LYS	-	expression tag	UNP Q5AGV5
j	609	LEU	-	expression tag	UNP Q5AGV5
j	610	ILE	-	expression tag	UNP Q5AGV5
j	611	SER	-	expression tag	UNP Q5AGV5
j	612	GLU	-	expression tag	UNP Q5AGV5
j	613	GLU	-	expression tag	UNP Q5AGV5
j	614	ASP	-	expression tag	UNP Q5AGV5
j	615	LEU	-	expression tag	UNP Q5AGV5
o	600	GLY	-	expression tag	UNP Q5AGV5
o	601	SER	-	expression tag	UNP Q5AGV5
o	602	GLY	-	expression tag	UNP Q5AGV5
o	603	SER	-	expression tag	UNP Q5AGV5
o	604	GLY	-	expression tag	UNP Q5AGV5

*Continued on next page...*

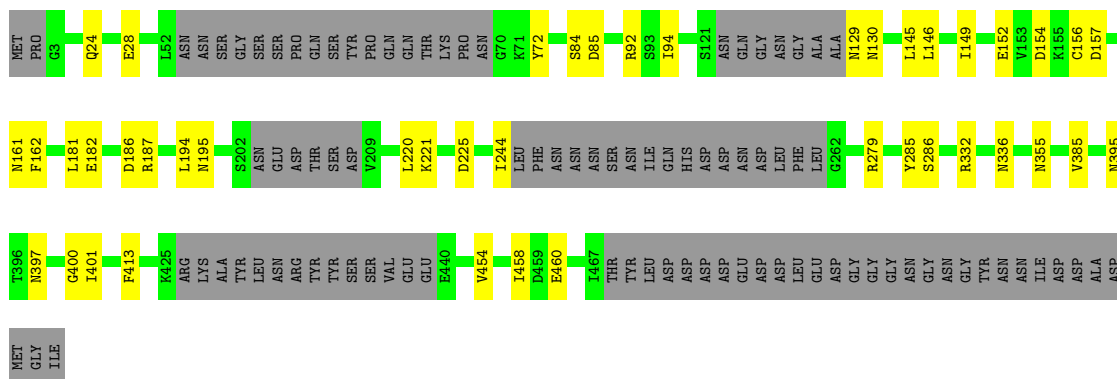
*Continued from previous page...*

Chain	Residue	Modelled	Actual	Comment	Reference
o	605	SER	-	expression tag	UNP Q5AGV5
o	606	GLU	-	expression tag	UNP Q5AGV5
o	607	GLN	-	expression tag	UNP Q5AGV5
o	608	LYS	-	expression tag	UNP Q5AGV5
o	609	LEU	-	expression tag	UNP Q5AGV5
o	610	ILE	-	expression tag	UNP Q5AGV5
o	611	SER	-	expression tag	UNP Q5AGV5
o	612	GLU	-	expression tag	UNP Q5AGV5
o	613	GLU	-	expression tag	UNP Q5AGV5
o	614	ASP	-	expression tag	UNP Q5AGV5
o	615	LEU	-	expression tag	UNP Q5AGV5
p	600	GLY	-	expression tag	UNP Q5AGV5
p	601	SER	-	expression tag	UNP Q5AGV5
p	602	GLY	-	expression tag	UNP Q5AGV5
p	603	SER	-	expression tag	UNP Q5AGV5
p	604	GLY	-	expression tag	UNP Q5AGV5
p	605	SER	-	expression tag	UNP Q5AGV5
p	606	GLU	-	expression tag	UNP Q5AGV5
p	607	GLN	-	expression tag	UNP Q5AGV5
p	608	LYS	-	expression tag	UNP Q5AGV5
p	609	LEU	-	expression tag	UNP Q5AGV5
p	610	ILE	-	expression tag	UNP Q5AGV5
p	611	SER	-	expression tag	UNP Q5AGV5
p	612	GLU	-	expression tag	UNP Q5AGV5
p	613	GLU	-	expression tag	UNP Q5AGV5
p	614	ASP	-	expression tag	UNP Q5AGV5
p	615	LEU	-	expression tag	UNP Q5AGV5

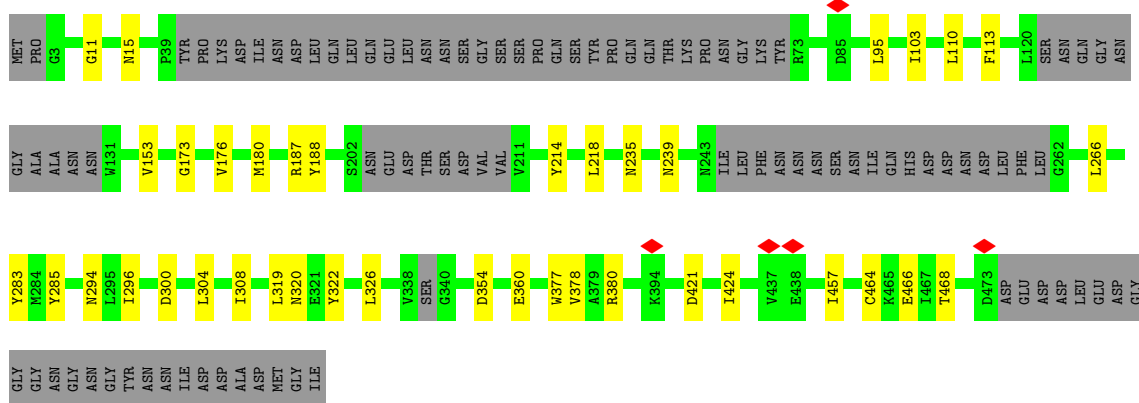




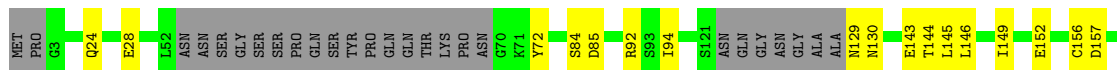
Molecule 1: Tubulin gamma chain



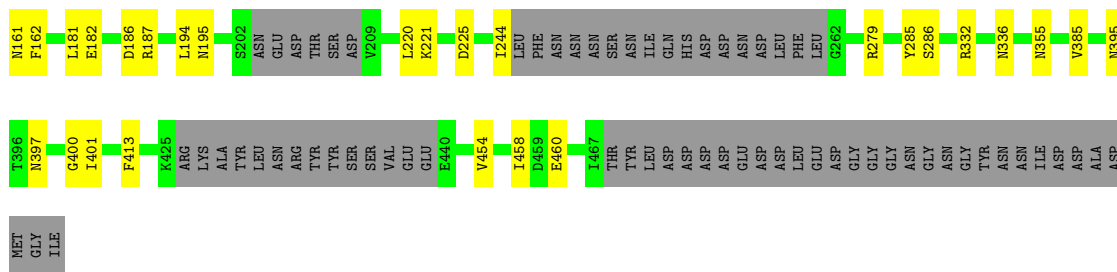
Molecule 1: Tubulin gamma chain



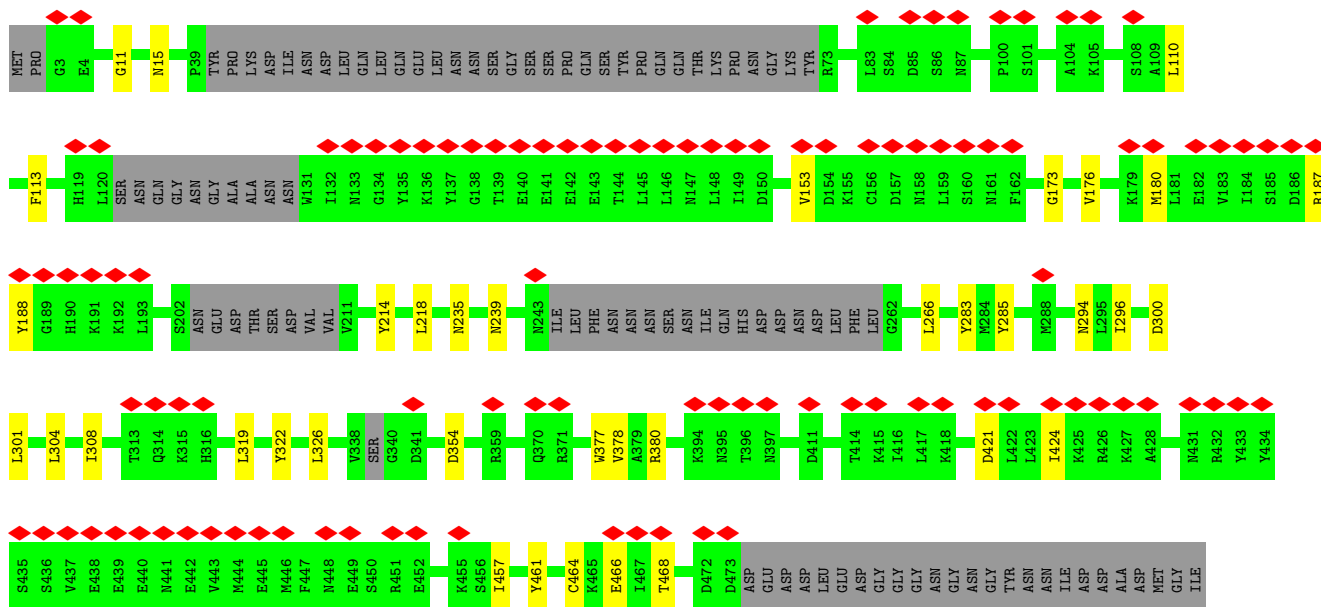
Molecule 1: Tubulin gamma chain



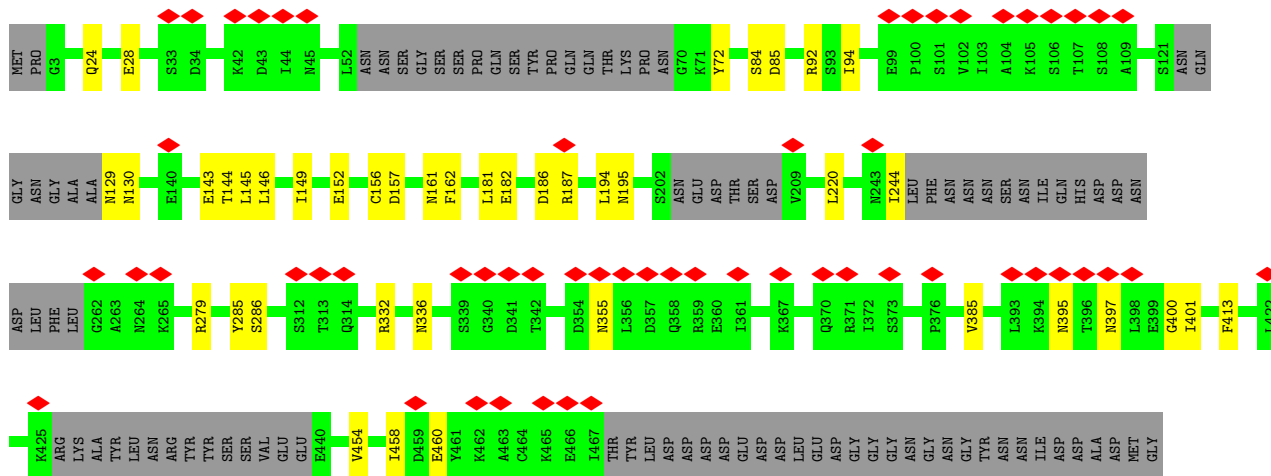
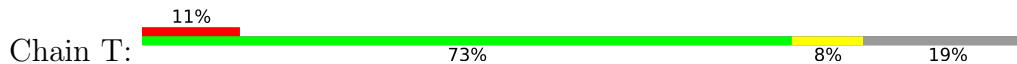




● Molecule 1: Tubulin gamma chain



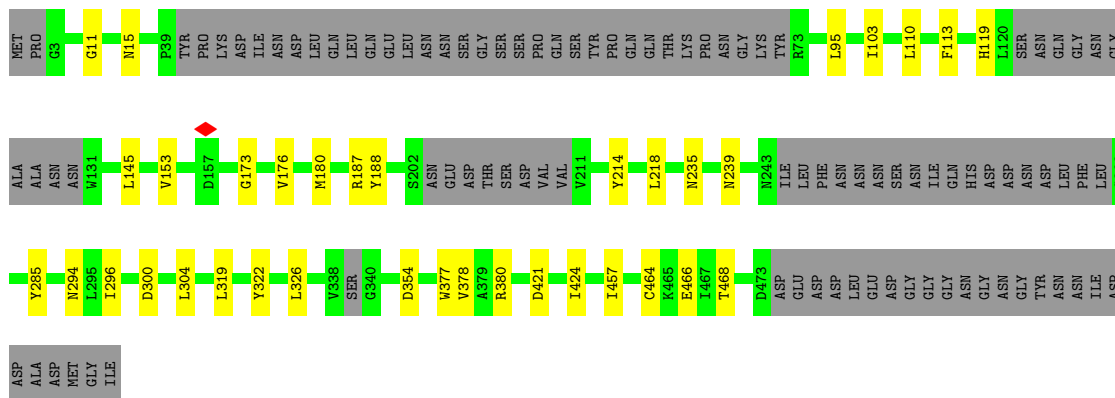
● Molecule 1: Tubulin gamma chain



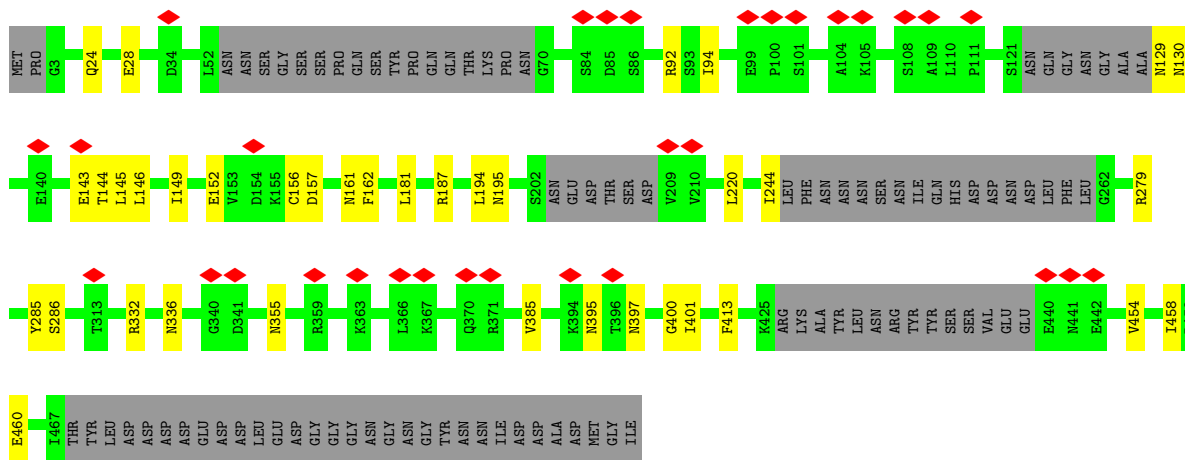


ILE


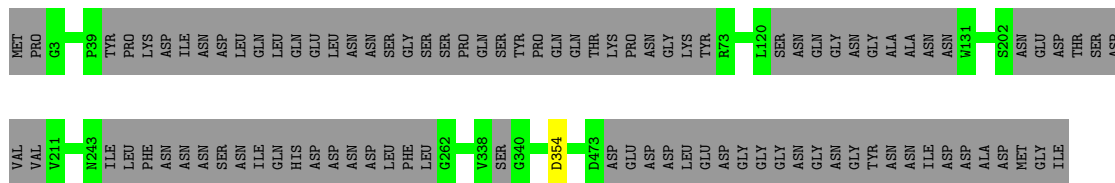
## • Molecule 1: Tubulin gamma chain

Chain Y:  73% 7% 19%


## • Molecule 1: Tubulin gamma chain

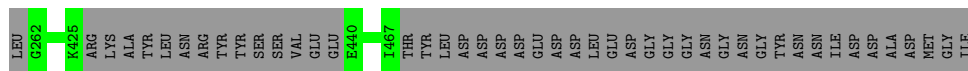
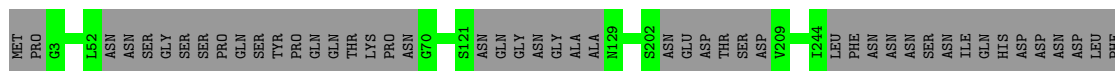
Chain Z:  6% 74% 7% 19%

## • Molecule 1: Tubulin gamma chain

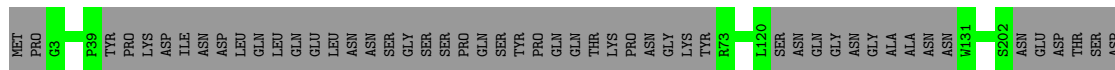
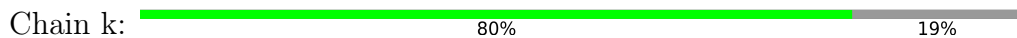
Chain e:  80% 19%

## • Molecule 1: Tubulin gamma chain

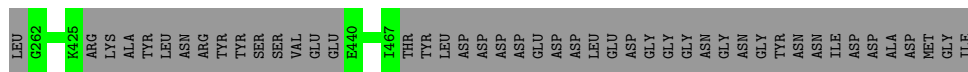
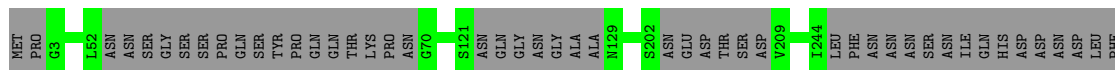
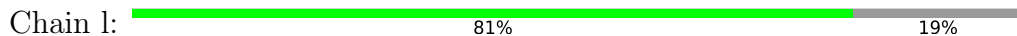
Chain f:  81% 19%



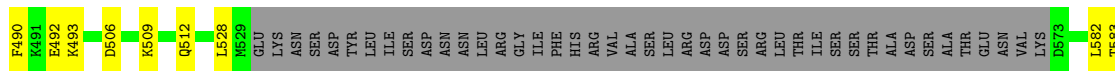
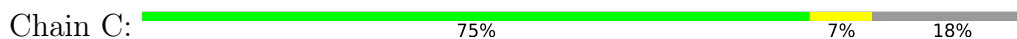
• Molecule 1: Tubulin gamma chain



• Molecule 1: Tubulin gamma chain

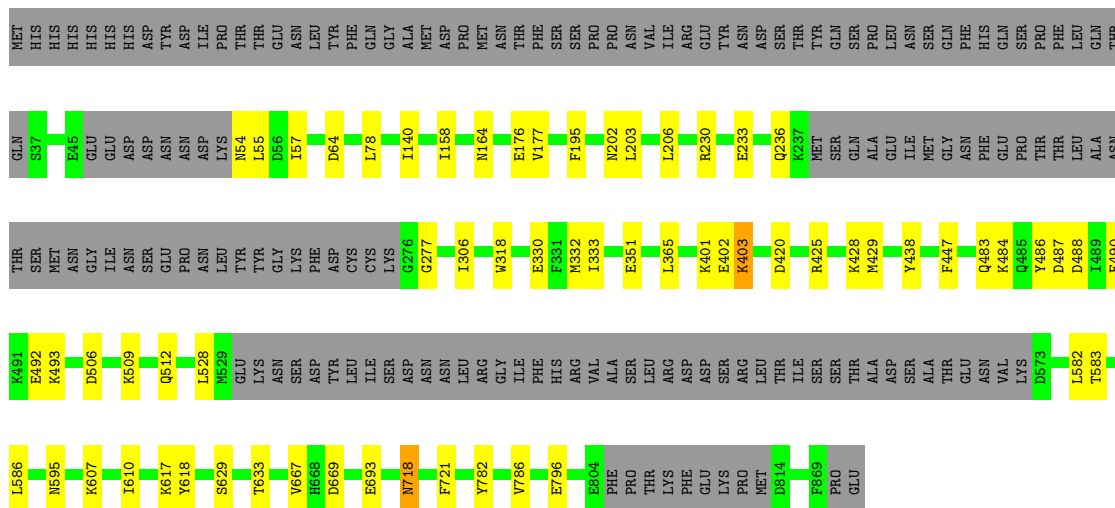


• Molecule 2: Spindle pole body component

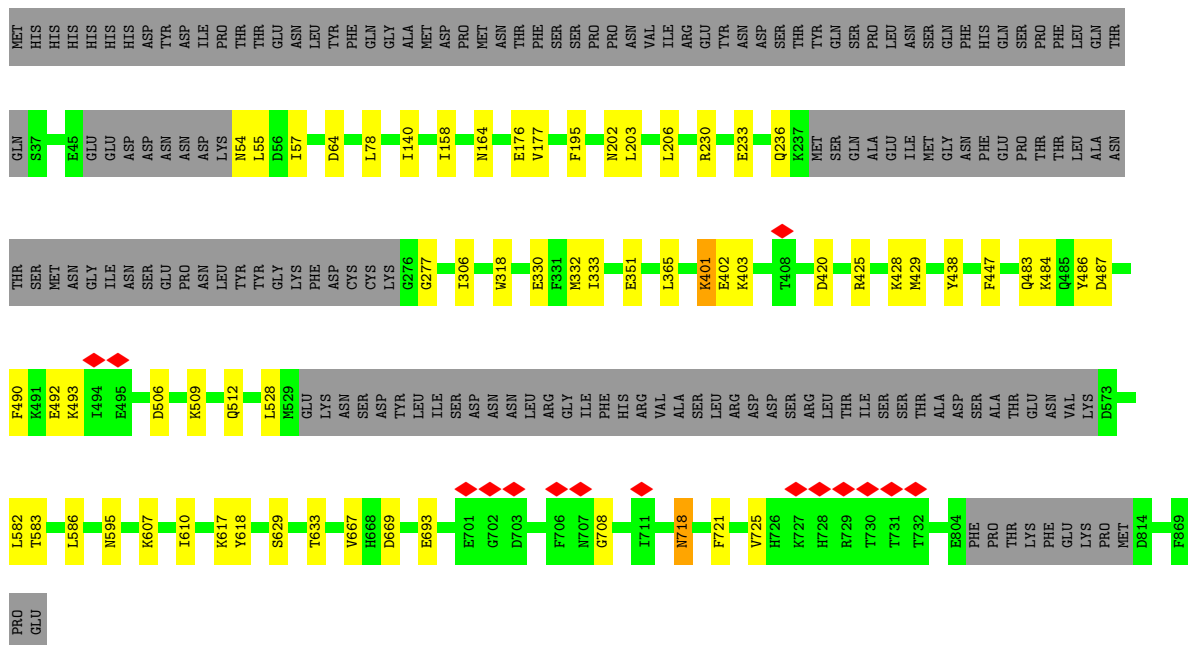
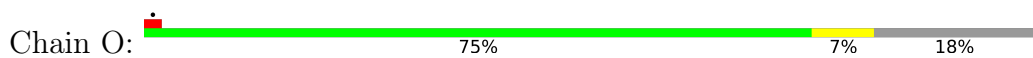


• Molecule 2: Spindle pole body component

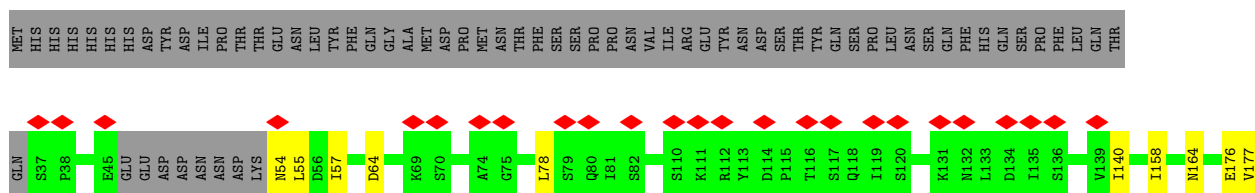
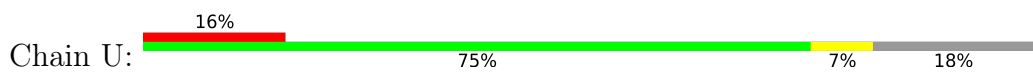




● Molecule 2: Spindle pole body component

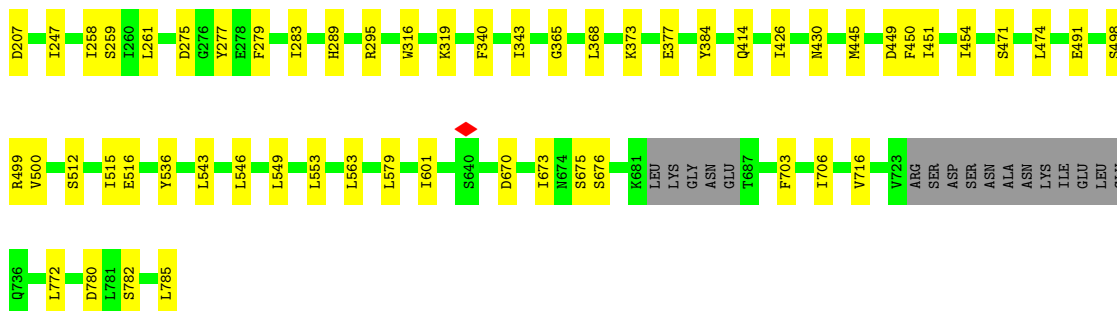


● Molecule 2: Spindle pole body component



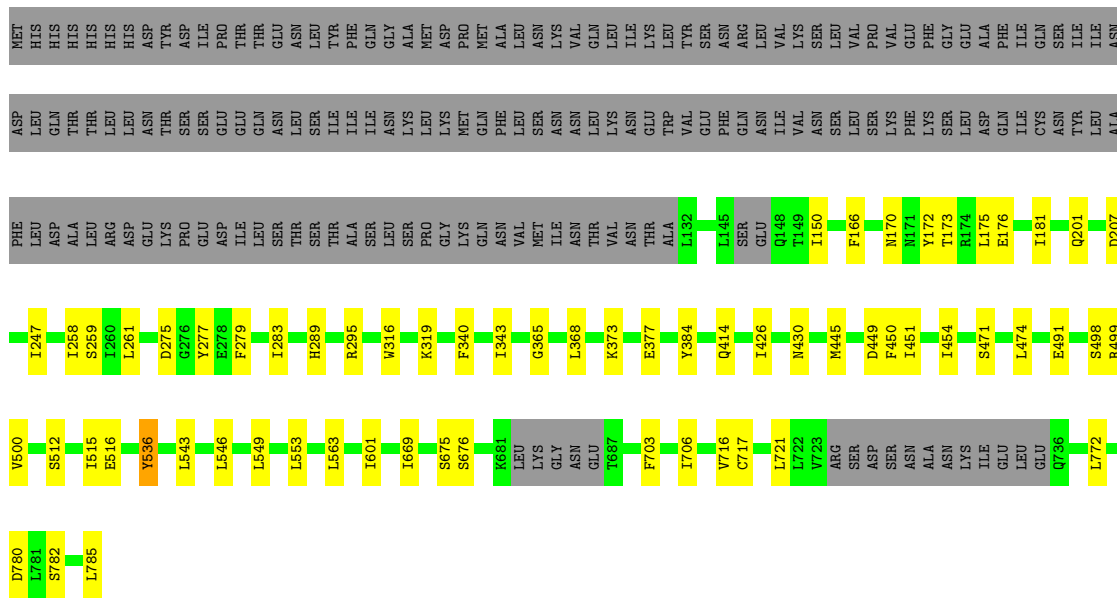






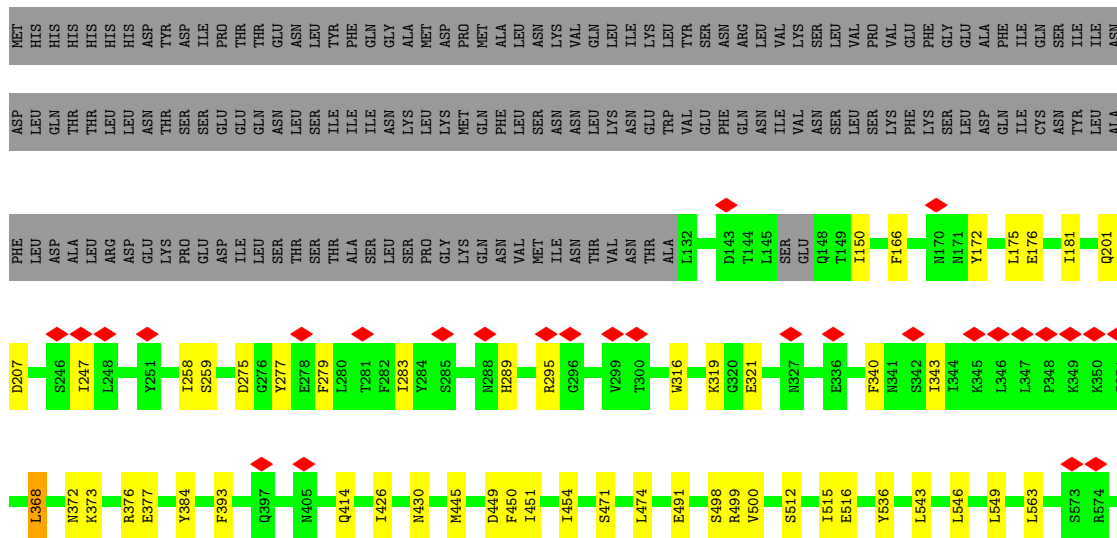
• Molecule 3: Spc98p

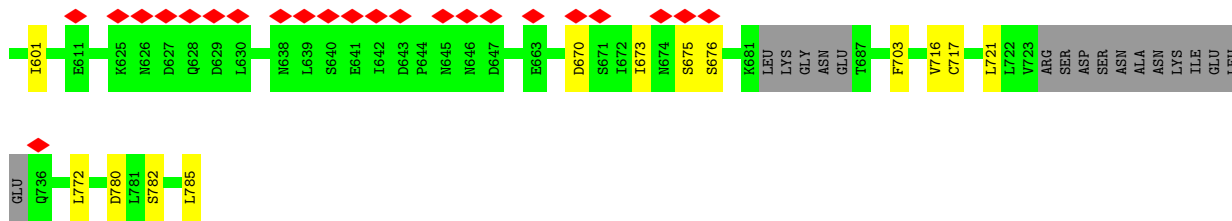
Chain P:



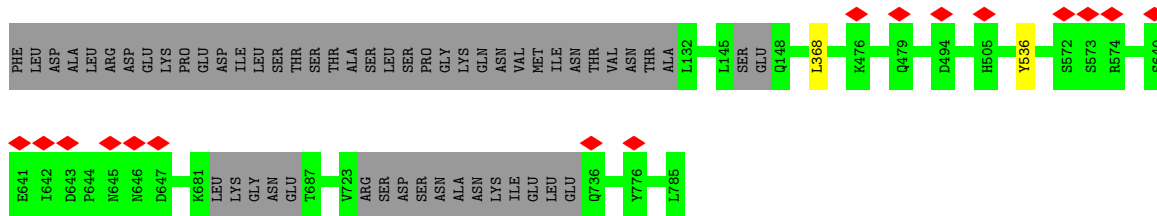
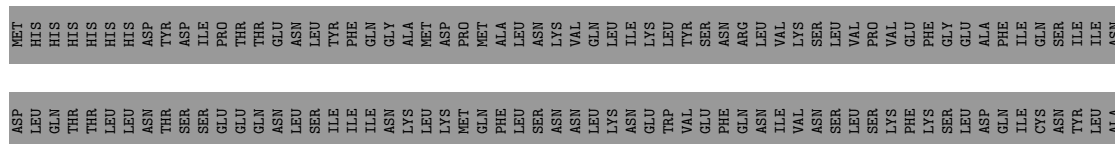
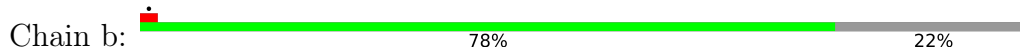
• Molecule 3: Spc98p

Chain V:

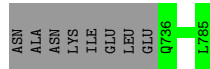
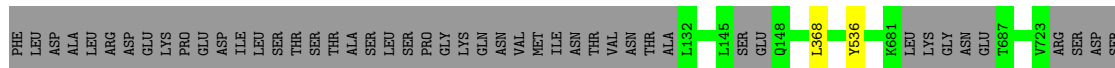
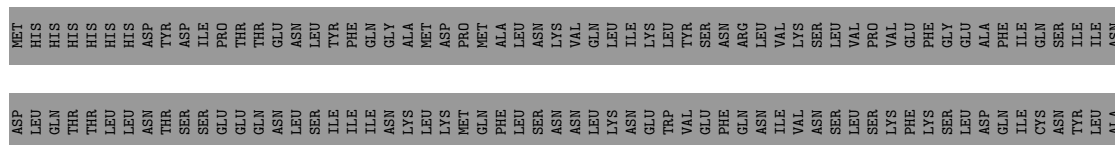
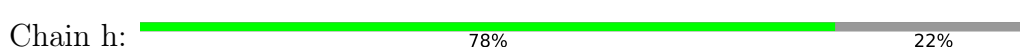




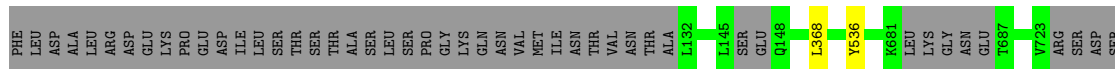
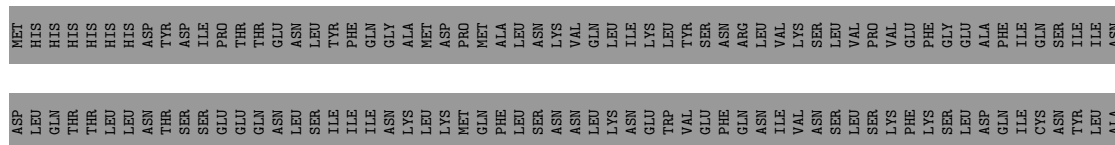
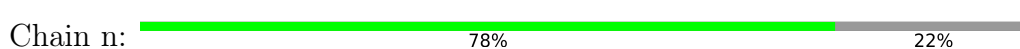
• Molecule 3: Spc98p

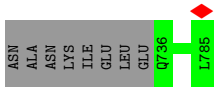


• Molecule 3: Spc98p



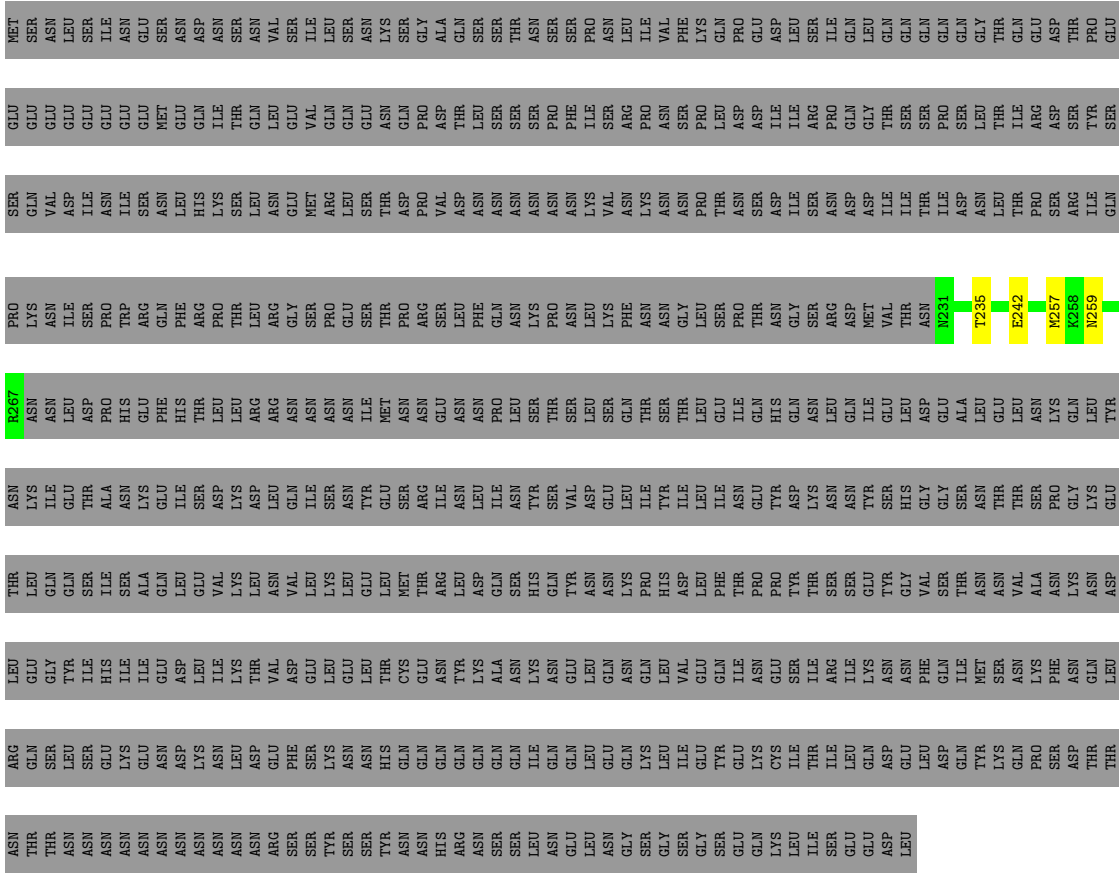
• Molecule 3: Spc98p





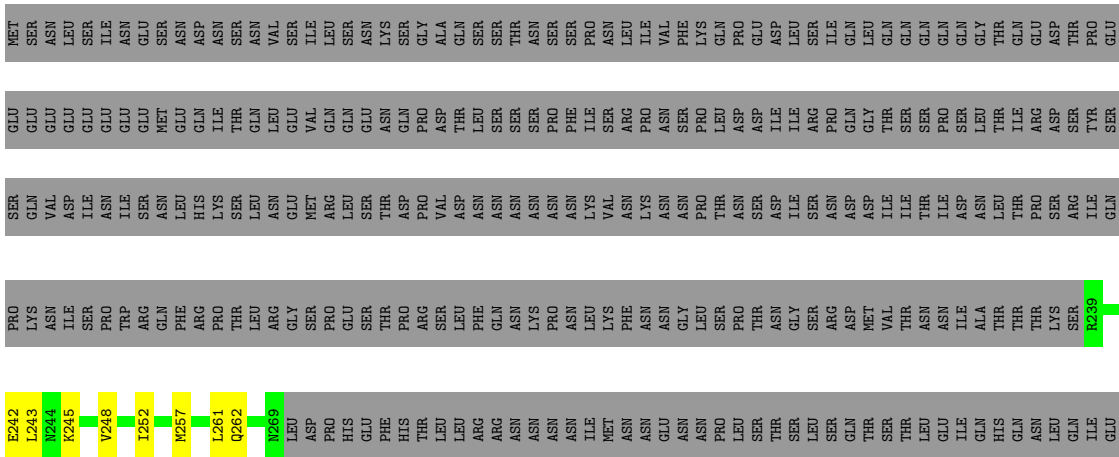
• Molecule 4: Mto2p-binding domain-containing protein

Chain E: 5% . 94%



• Molecule 4: Mto2p-binding domain-containing protein

Chain F: . . . 95%























## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	8261	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 ( $e^-/\text{\AA}^2$ )	47	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	2600	Depositor
Magnification	81000	Depositor
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	0.060	Depositor
Minimum map value	-0.025	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.002	Depositor
Recommended contour level	0.00502	Depositor
Map size ( $\text{\AA}$ )	547.84, 547.84, 547.84	wwPDB
Map dimensions	512, 512, 512	wwPDB
Map angles ( $^\circ$ )	90.0, 90.0, 90.0	wwPDB
Pixel spacing ( $\text{\AA}$ )	1.07, 1.07, 1.07	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	A	0.29	0/3245	0.49	0/4388
1	B	0.28	0/3278	0.49	0/4432
1	G	0.28	0/3245	0.49	0/4388
1	H	0.28	0/3278	0.49	0/4432
1	M	0.29	0/3245	0.49	0/4388
1	N	0.28	0/3278	0.49	0/4432
1	S	0.28	0/3245	0.49	0/4388
1	T	0.28	0/3278	0.49	0/4432
1	Y	0.29	0/3245	0.49	0/4388
1	Z	0.28	0/3278	0.49	0/4432
1	e	0.29	0/3245	0.49	0/4388
1	f	0.28	0/3278	0.49	0/4432
1	k	0.29	0/3245	0.49	0/4388
1	l	0.28	0/3278	0.49	0/4432
2	C	0.29	0/6114	0.50	0/8238
2	I	0.30	0/6114	0.50	0/8238
2	O	0.29	0/6114	0.50	0/8238
2	U	0.30	0/6114	0.50	0/8238
2	a	0.30	0/6114	0.50	0/8238
2	g	0.30	0/6114	0.50	0/8238
2	m	0.30	0/6114	0.50	0/8238
3	D	0.29	0/5433	0.48	0/7353
3	J	0.29	0/5433	0.48	0/7353
3	P	0.29	0/5433	0.48	0/7353
3	V	0.29	0/5433	0.48	0/7353
3	b	0.29	0/5433	0.48	0/7353
3	h	0.29	0/5433	0.48	0/7353
3	n	0.29	0/5433	0.48	0/7353
4	E	0.35	0/315	0.60	0/419
4	F	0.31	0/274	0.55	0/363
4	K	0.35	0/315	0.60	0/419
4	L	0.31	0/274	0.54	0/363
4	Q	0.35	0/315	0.60	0/419
4	R	0.30	0/274	0.55	0/363

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z  >5	RMSZ	# Z  >5
4	W	0.35	0/315	0.60	0/419
4	X	0.31	0/274	0.55	0/363
4	c	0.35	0/315	0.60	0/419
4	d	0.31	0/274	0.54	0/363
4	i	0.35	0/315	0.60	0/419
4	j	0.31	0/274	0.55	0/363
4	o	0.35	0/315	0.60	0/419
4	p	0.31	0/274	0.55	0/363
All	All	0.29	0/130613	0.49	0/176351

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

## 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	A	3188	0	3133	26	0
1	B	3220	0	3188	29	0
1	G	3188	0	3133	27	0
1	H	3220	0	3188	32	0
1	M	3188	0	3133	52	0
1	N	3220	0	3188	32	0
1	S	3188	0	3133	24	0
1	T	3220	0	3188	49	0
1	Y	3188	0	3133	23	0
1	Z	3220	0	3188	27	0
1	e	3188	0	3133	0	0
1	f	3220	0	3188	0	0
1	k	3188	0	3133	0	0
1	l	3220	0	3188	0	0
2	C	6001	0	5981	43	0
2	I	6001	0	5981	49	0
2	O	6001	0	5981	47	0

*Continued on next page...*

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	U	6001	0	5981	39	0
2	a	6001	0	5981	0	0
2	g	6001	0	5981	0	0
2	m	6001	0	5981	0	0
3	D	5313	0	5293	44	0
3	J	5313	0	5293	49	0
3	P	5313	0	5293	56	0
3	V	5313	0	5293	59	0
3	b	5313	0	5293	0	0
3	h	5313	0	5293	0	0
3	n	5313	0	5293	0	0
4	E	314	0	337	6	0
4	F	273	0	288	7	0
4	K	314	0	337	6	0
4	L	273	0	288	7	0
4	Q	314	0	337	9	0
4	R	273	0	288	7	0
4	W	314	0	337	4	0
4	X	273	0	288	7	0
4	c	314	0	337	0	0
4	d	273	0	288	0	0
4	i	314	0	337	0	0
4	j	273	0	288	0	0
4	o	314	0	337	0	0
4	p	273	0	288	0	0
All	All	128163	0	127540	683	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 4.

The worst 5 of 683 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:M:319:LEU:O	1:T:85:ASP:HB3	1.12	1.27
4:Q:234:THR:CG2	3:V:471:SER:HB3	1.66	1.24
1:M:319:LEU:HD22	1:T:84:SER:CA	1.74	1.16
1:M:319:LEU:O	1:T:85:ASP:CB	1.94	1.16
1:M:319:LEU:CB	1:T:84:SER:HB2	1.81	1.11

There are no symmetry-related clashes.

## 5.3 Torsion angles

### 5.3.1 Protein backbone

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	389/498 (78%)	385 (99%)	4 (1%)	0	100	100
1	B	392/498 (79%)	382 (97%)	10 (3%)	0	100	100
1	G	389/498 (78%)	385 (99%)	4 (1%)	0	100	100
1	H	392/498 (79%)	382 (97%)	10 (3%)	0	100	100
1	M	389/498 (78%)	385 (99%)	4 (1%)	0	100	100
1	N	392/498 (79%)	382 (97%)	10 (3%)	0	100	100
1	S	389/498 (78%)	385 (99%)	4 (1%)	0	100	100
1	T	392/498 (79%)	382 (97%)	10 (3%)	0	100	100
1	Y	389/498 (78%)	385 (99%)	4 (1%)	0	100	100
1	Z	392/498 (79%)	382 (97%)	10 (3%)	0	100	100
1	e	389/498 (78%)	385 (99%)	4 (1%)	0	100	100
1	f	392/498 (79%)	382 (97%)	10 (3%)	0	100	100
1	k	389/498 (78%)	385 (99%)	4 (1%)	0	100	100
1	l	392/498 (79%)	382 (97%)	10 (3%)	0	100	100
2	C	725/896 (81%)	711 (98%)	14 (2%)	0	100	100
2	I	725/896 (81%)	712 (98%)	13 (2%)	0	100	100
2	O	725/896 (81%)	711 (98%)	14 (2%)	0	100	100
2	U	725/896 (81%)	712 (98%)	13 (2%)	0	100	100
2	a	725/896 (81%)	712 (98%)	13 (2%)	0	100	100
2	g	725/896 (81%)	712 (98%)	13 (2%)	0	100	100
2	m	725/896 (81%)	712 (98%)	13 (2%)	0	100	100
3	D	627/810 (77%)	610 (97%)	17 (3%)	0	100	100
3	J	627/810 (77%)	610 (97%)	17 (3%)	0	100	100
3	P	627/810 (77%)	610 (97%)	17 (3%)	0	100	100
3	V	627/810 (77%)	610 (97%)	17 (3%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
3	b	627/810 (77%)	610 (97%)	17 (3%)	0	100	100
3	h	627/810 (77%)	610 (97%)	17 (3%)	0	100	100
3	n	627/810 (77%)	610 (97%)	17 (3%)	0	100	100
4	E	35/615 (6%)	35 (100%)	0	0	100	100
4	F	29/615 (5%)	29 (100%)	0	0	100	100
4	K	35/615 (6%)	35 (100%)	0	0	100	100
4	L	29/615 (5%)	29 (100%)	0	0	100	100
4	Q	35/615 (6%)	35 (100%)	0	0	100	100
4	R	29/615 (5%)	29 (100%)	0	0	100	100
4	W	35/615 (6%)	35 (100%)	0	0	100	100
4	X	29/615 (5%)	29 (100%)	0	0	100	100
4	c	35/615 (6%)	35 (100%)	0	0	100	100
4	d	29/615 (5%)	29 (100%)	0	0	100	100
4	i	35/615 (6%)	35 (100%)	0	0	100	100
4	j	29/615 (5%)	29 (100%)	0	0	100	100
4	o	35/615 (6%)	35 (100%)	0	0	100	100
4	p	29/615 (5%)	29 (100%)	0	0	100	100
All	All	15379/27524 (56%)	15069 (98%)	310 (2%)	0	100	100

There are no Ramachandran outliers to report.

### 5.3.2 Protein sidechains [i](#)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	363/452 (80%)	362 (100%)	1 (0%)	91	92
1	B	370/452 (82%)	370 (100%)	0	100	100
1	G	363/452 (80%)	362 (100%)	1 (0%)	91	92
1	H	370/452 (82%)	370 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	M	363/452 (80%)	362 (100%)	1 (0%)	91	92
1	N	370/452 (82%)	370 (100%)	0	100	100
1	S	363/452 (80%)	362 (100%)	1 (0%)	91	92
1	T	370/452 (82%)	370 (100%)	0	100	100
1	Y	363/452 (80%)	362 (100%)	1 (0%)	91	92
1	Z	370/452 (82%)	370 (100%)	0	100	100
1	e	363/452 (80%)	362 (100%)	1 (0%)	91	92
1	f	370/452 (82%)	370 (100%)	0	100	100
1	k	363/452 (80%)	362 (100%)	1 (0%)	91	92
1	l	370/452 (82%)	370 (100%)	0	100	100
2	C	676/847 (80%)	667 (99%)	9 (1%)	65	77
2	I	676/847 (80%)	667 (99%)	9 (1%)	65	77
2	O	676/847 (80%)	667 (99%)	9 (1%)	65	77
2	U	676/847 (80%)	667 (99%)	9 (1%)	65	77
2	a	676/847 (80%)	667 (99%)	9 (1%)	65	77
2	g	676/847 (80%)	667 (99%)	9 (1%)	65	77
2	m	676/847 (80%)	667 (99%)	9 (1%)	65	77
3	D	598/768 (78%)	596 (100%)	2 (0%)	91	92
3	J	598/768 (78%)	596 (100%)	2 (0%)	91	92
3	P	598/768 (78%)	596 (100%)	2 (0%)	91	92
3	V	598/768 (78%)	596 (100%)	2 (0%)	91	92
3	b	598/768 (78%)	596 (100%)	2 (0%)	91	92
3	h	598/768 (78%)	596 (100%)	2 (0%)	91	92
3	n	598/768 (78%)	596 (100%)	2 (0%)	91	92
4	E	36/594 (6%)	36 (100%)	0	100	100
4	F	31/594 (5%)	31 (100%)	0	100	100
4	K	36/594 (6%)	36 (100%)	0	100	100
4	L	31/594 (5%)	31 (100%)	0	100	100
4	Q	36/594 (6%)	36 (100%)	0	100	100
4	R	31/594 (5%)	31 (100%)	0	100	100
4	W	36/594 (6%)	36 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
4	X	31/594 (5%)	31 (100%)	0	100	100
4	c	36/594 (6%)	36 (100%)	0	100	100
4	d	31/594 (5%)	31 (100%)	0	100	100
4	i	36/594 (6%)	36 (100%)	0	100	100
4	j	31/594 (5%)	31 (100%)	0	100	100
4	o	36/594 (6%)	36 (100%)	0	100	100
4	p	31/594 (5%)	31 (100%)	0	100	100
All	All	14518/25949 (56%)	14434 (99%)	84 (1%)	82	88

5 of 84 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	a	718	ASN
3	h	536	TYR
3	b	536	TYR
2	g	403	LYS
2	m	401	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
3	J	424	GLN
1	M	320	ASN
2	O	718	ASN
2	g	856	GLN
2	m	856	GLN

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

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



## 5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

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.

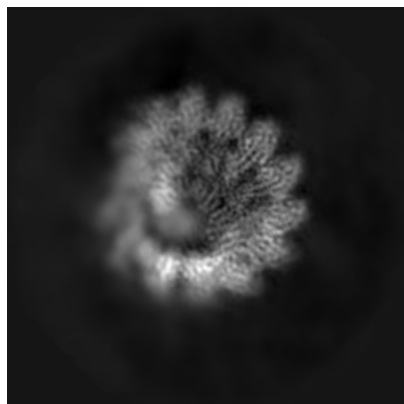
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-51972. These allow visual inspection of the internal detail of the map and identification of artifacts.

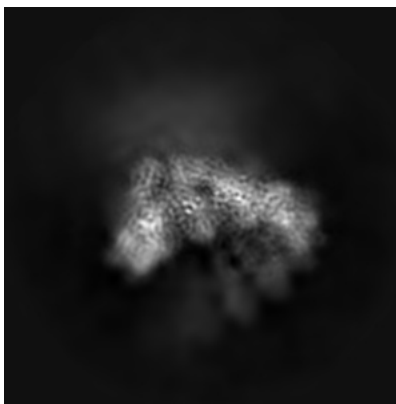
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

### 6.1 Orthogonal projections [i](#)

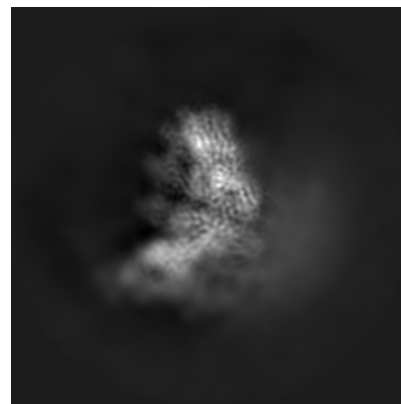
#### 6.1.1 Primary map



X

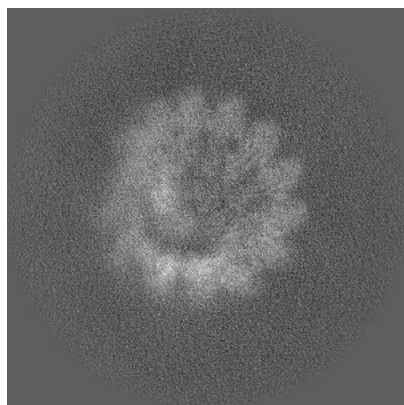


Y

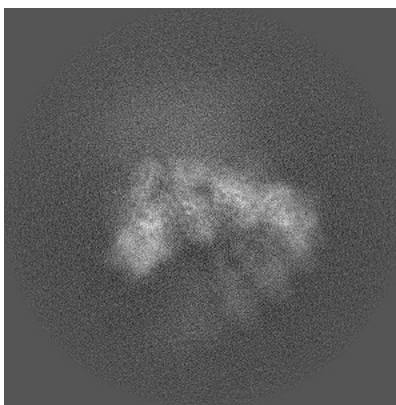


Z

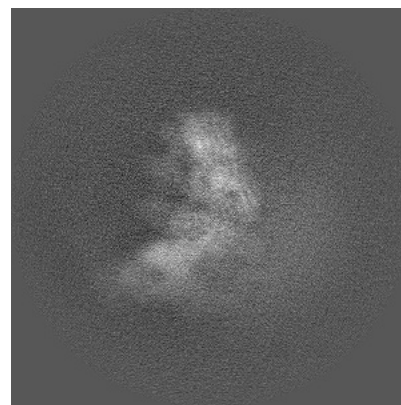
#### 6.1.2 Raw map



X



Y

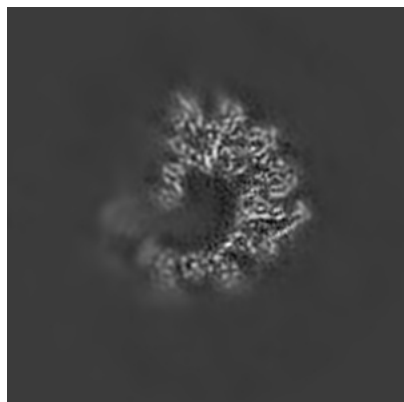


Z

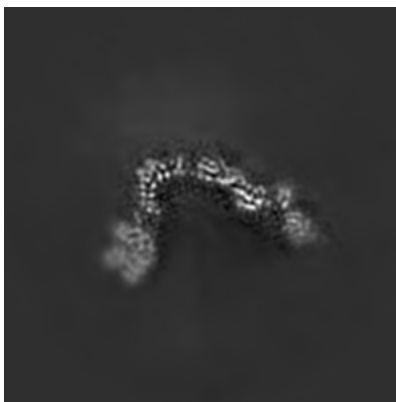
The images above show the map projected in three orthogonal directions.

## 6.2 Central slices [i](#)

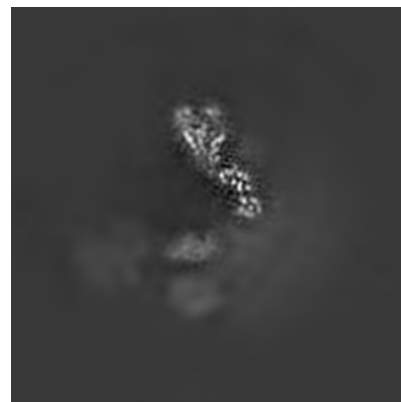
### 6.2.1 Primary map



X Index: 256

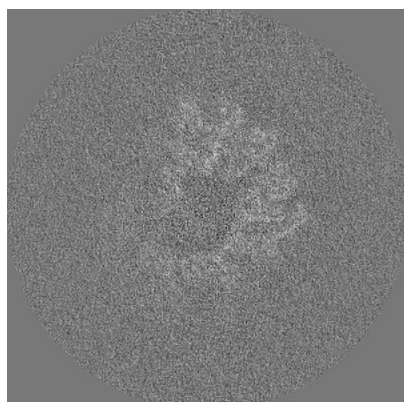


Y Index: 256

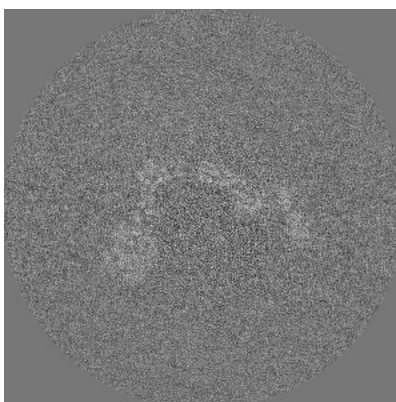


Z Index: 256

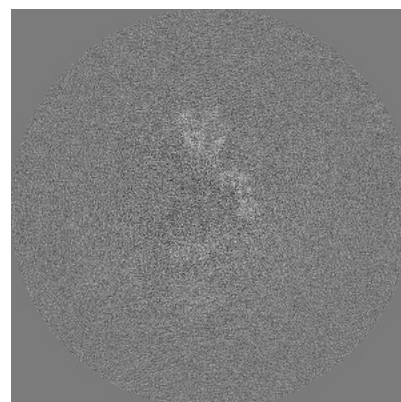
### 6.2.2 Raw map



X Index: 256



Y Index: 256

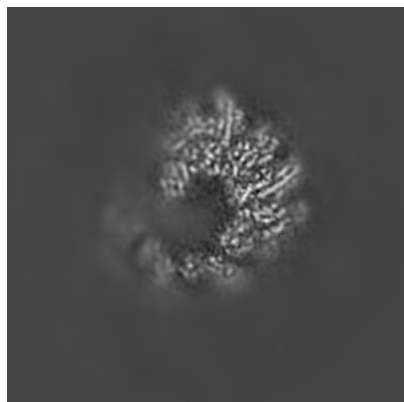


Z Index: 256

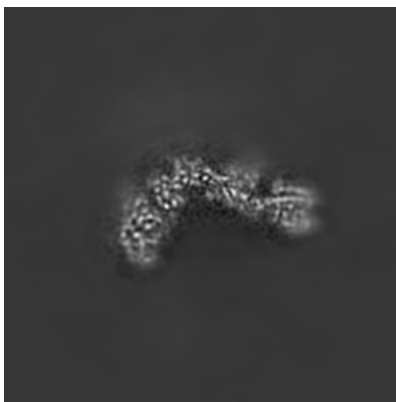
The images above show central slices of the map in three orthogonal directions.

## 6.3 Largest variance slices [i](#)

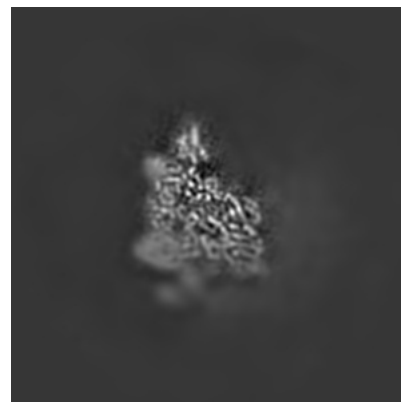
### 6.3.1 Primary map



X Index: 265

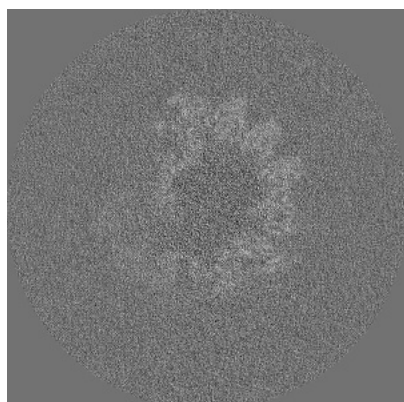


Y Index: 283

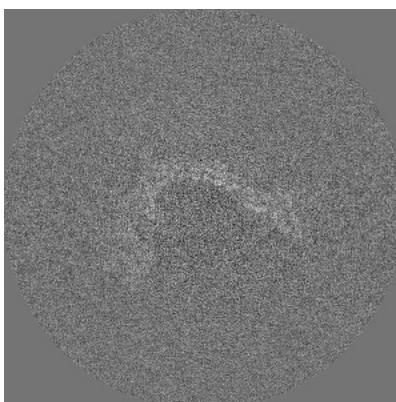


Z Index: 182

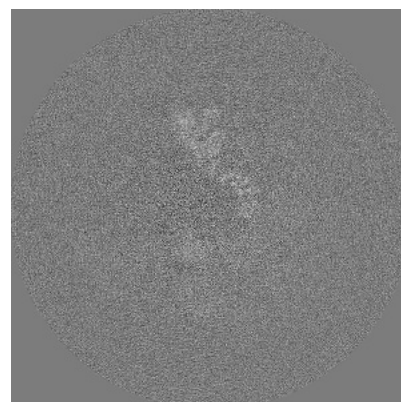
### 6.3.2 Raw map



X Index: 239



Y Index: 265

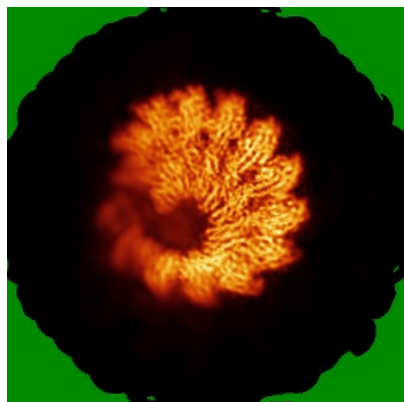


Z Index: 253

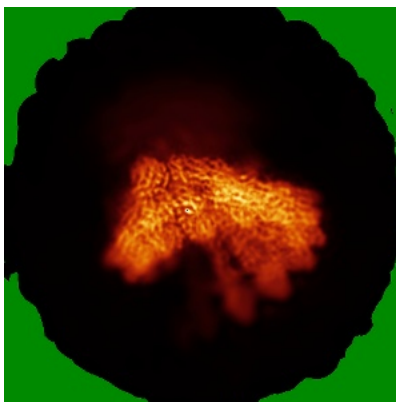
The images above show the largest variance slices of the map in three orthogonal directions.

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

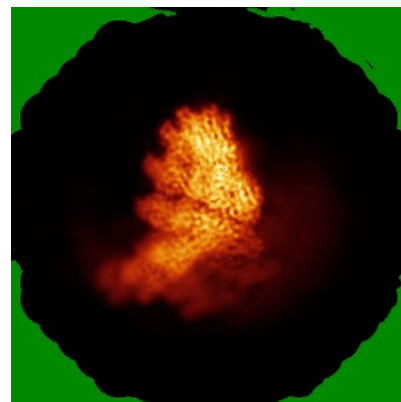
### 6.4.1 Primary map



X

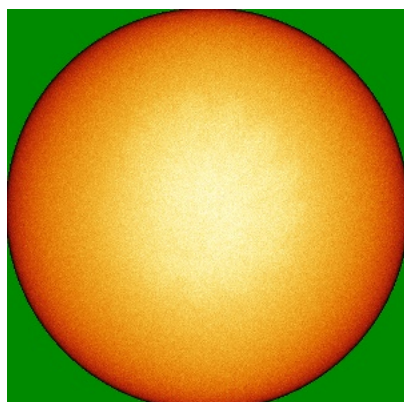


Y

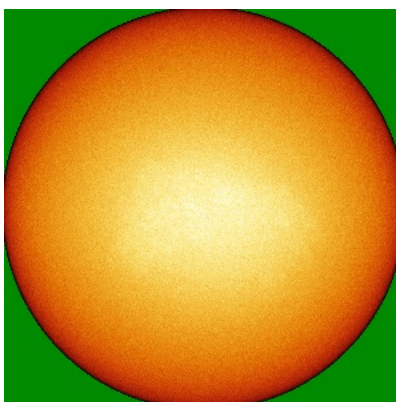


Z

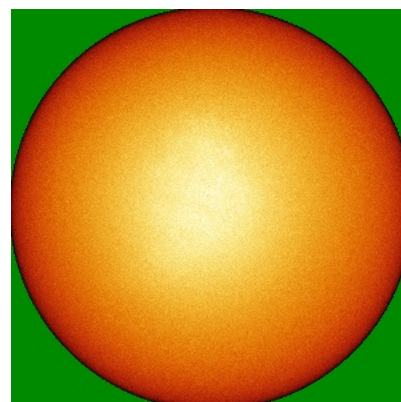
### 6.4.2 Raw map



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.



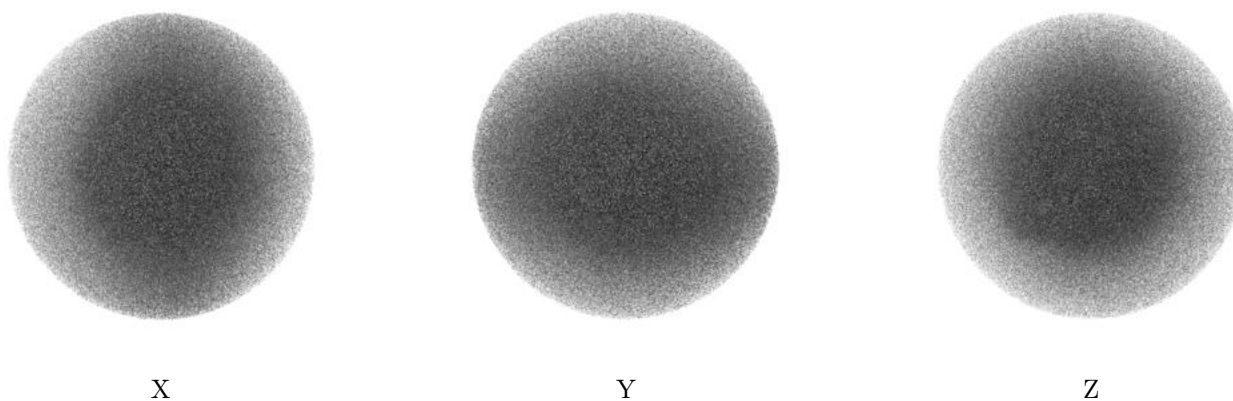
## 6.5 Orthogonal surface views [i](#)

### 6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.00502. 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.

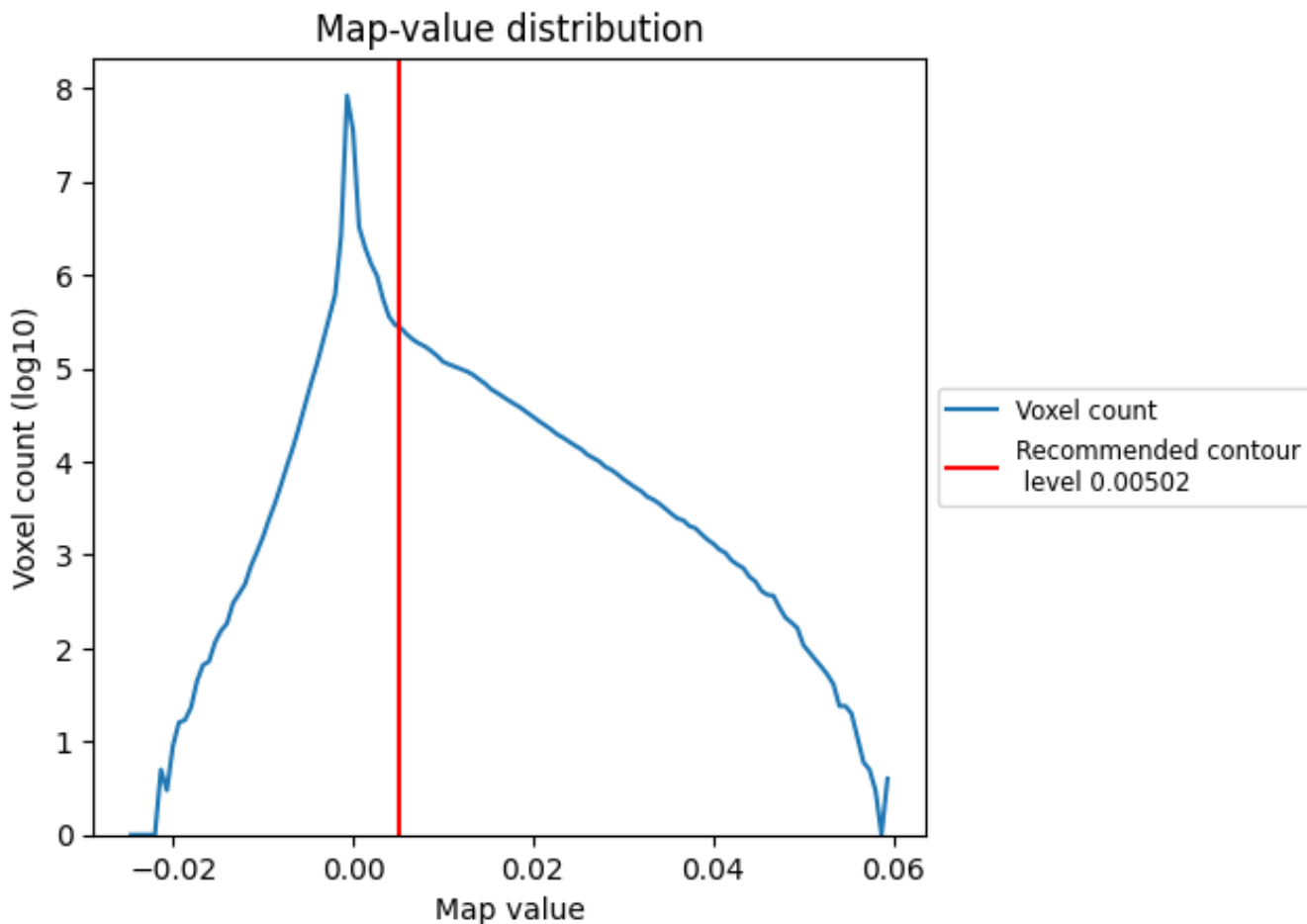
## 6.6 Mask visualisation [i](#)

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

## 7 Map analysis [i](#)

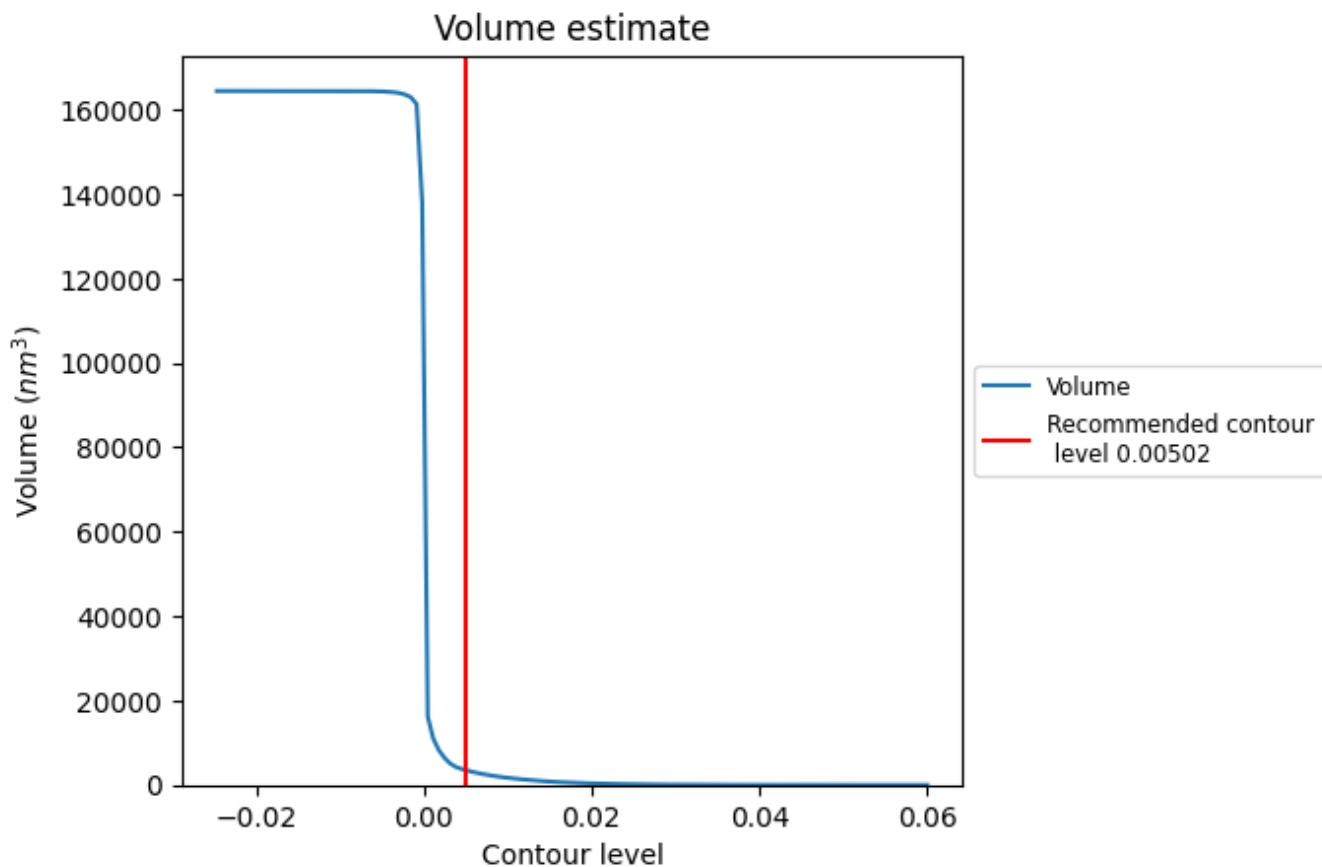
This section contains the results of statistical analysis of the map.

### 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 [\(i\)](#)

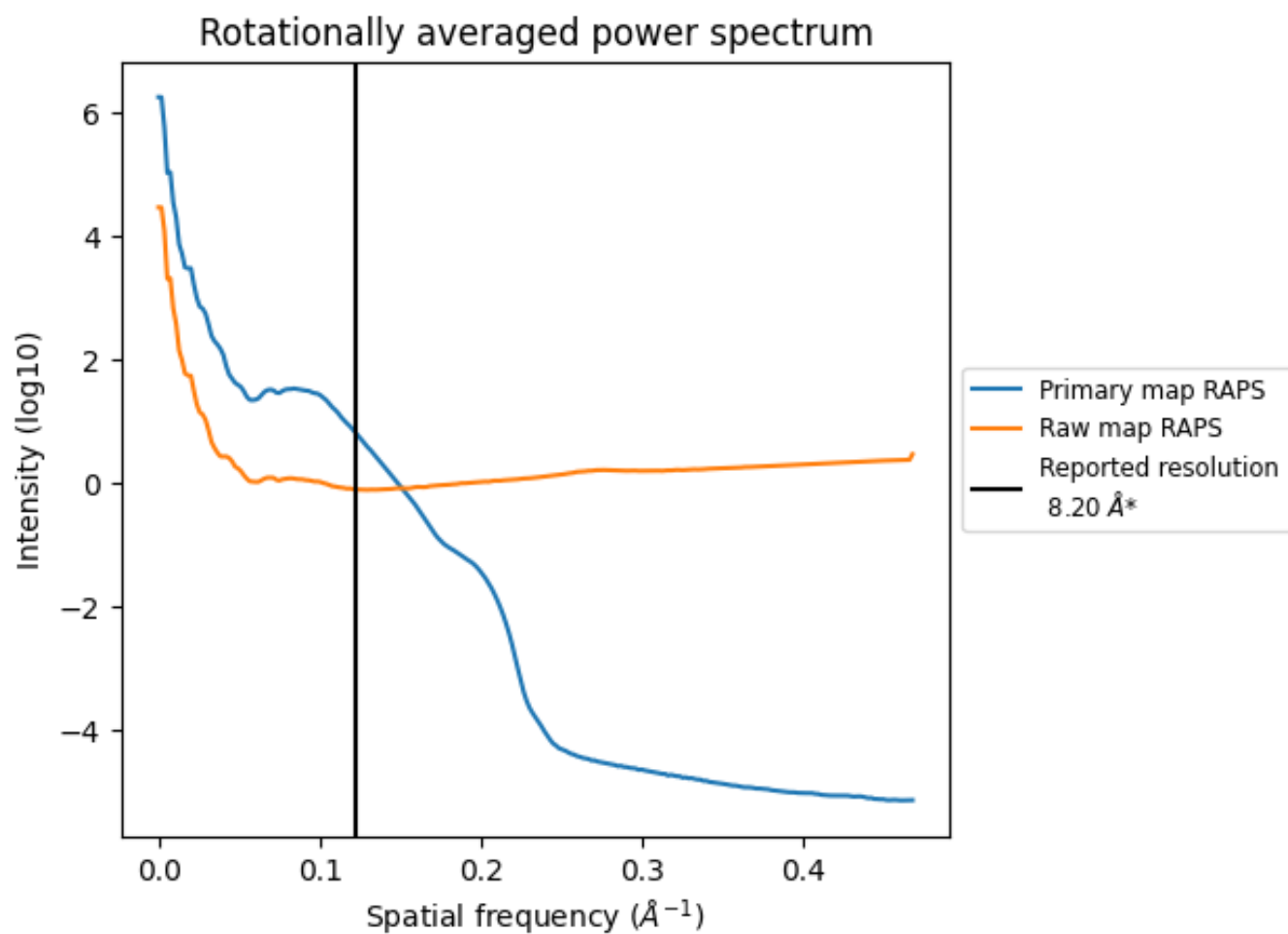


The volume at the recommended contour level is 3504  $\text{nm}^3$ ; this corresponds to an approximate mass of 3166 kDa.

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

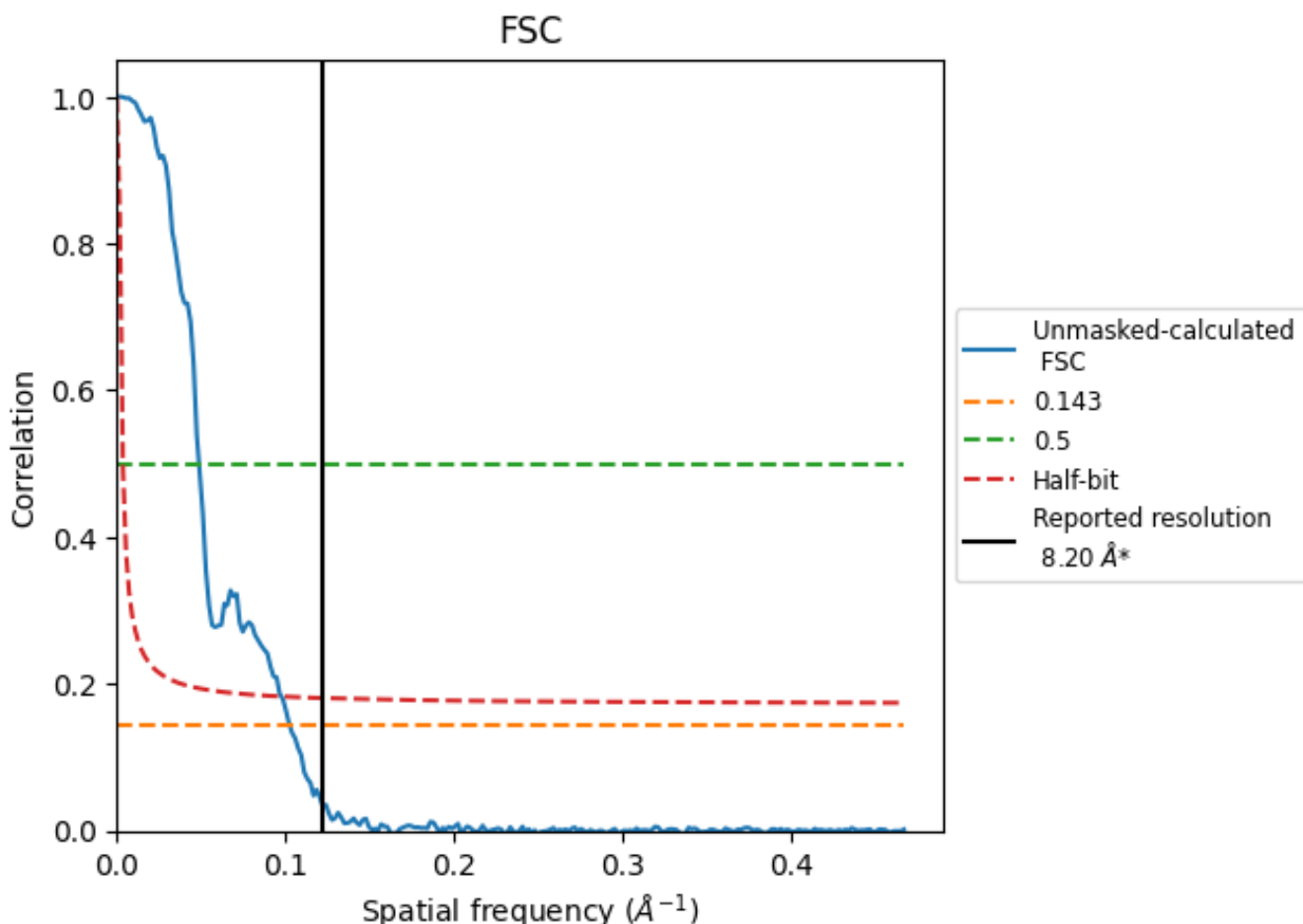


\*Reported resolution corresponds to spatial frequency of 0.122 Å<sup>-1</sup>

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

## 8.2 Resolution estimates [i](#)

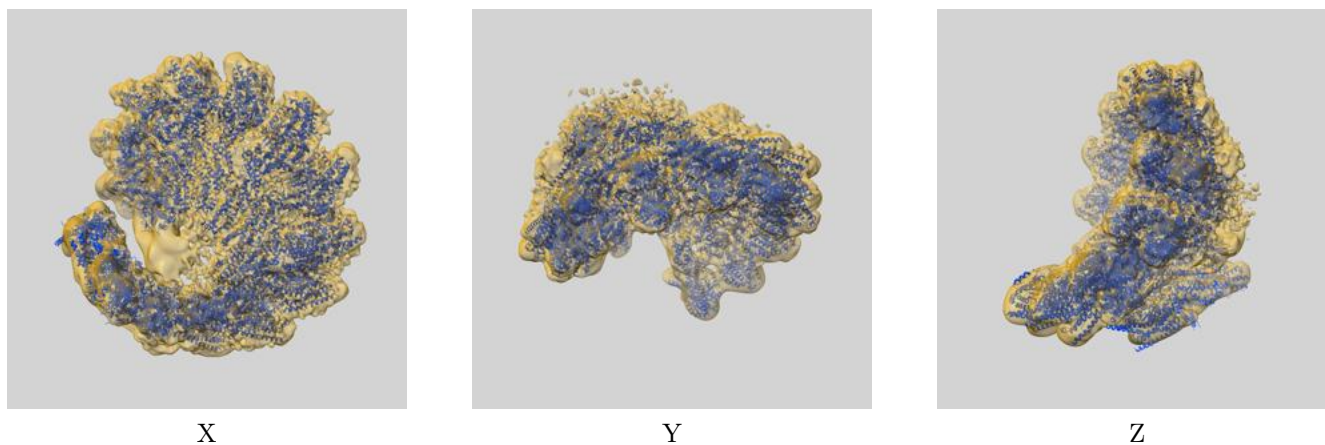
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	8.20	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	9.74	20.49	10.24

\*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 9.74 differs from the reported value 8.2 by more than 10 %

## 9 Map-model fit [i](#)

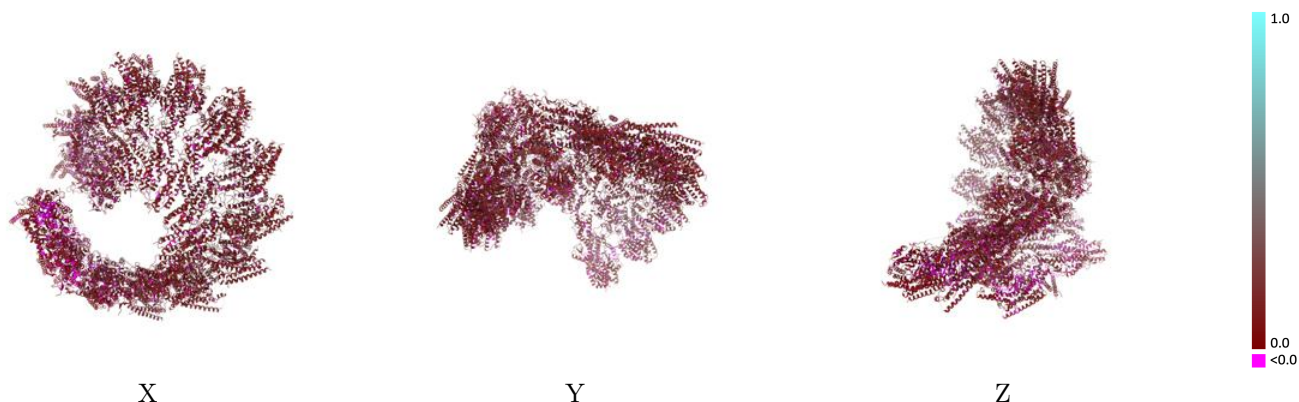
This section contains information regarding the fit between EMDB map EMD-51972 and PDB model 9H9R. Per-residue inclusion information can be found in section 3 on page 22.

### 9.1 Map-model overlay [i](#)



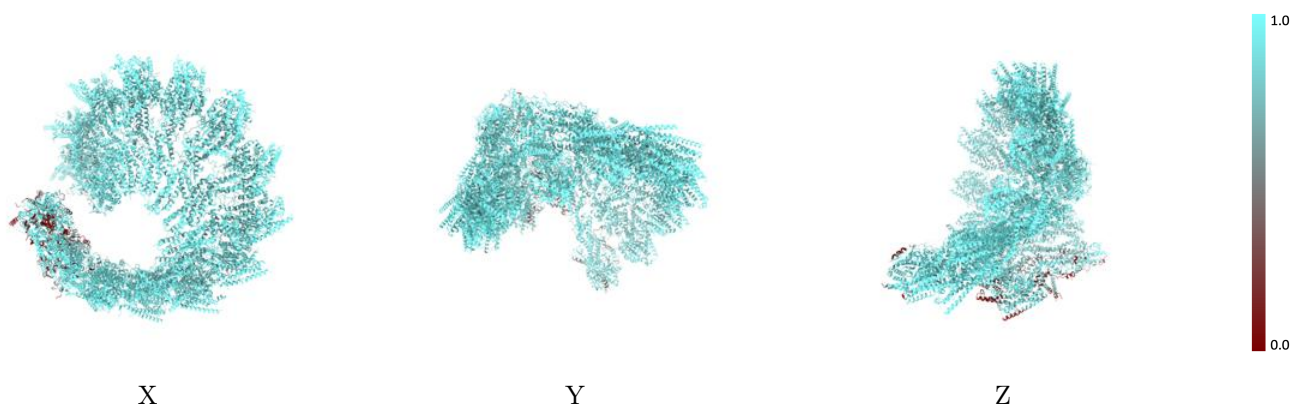
The images above show the 3D surface view of the map at the recommended contour level 0.00502 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



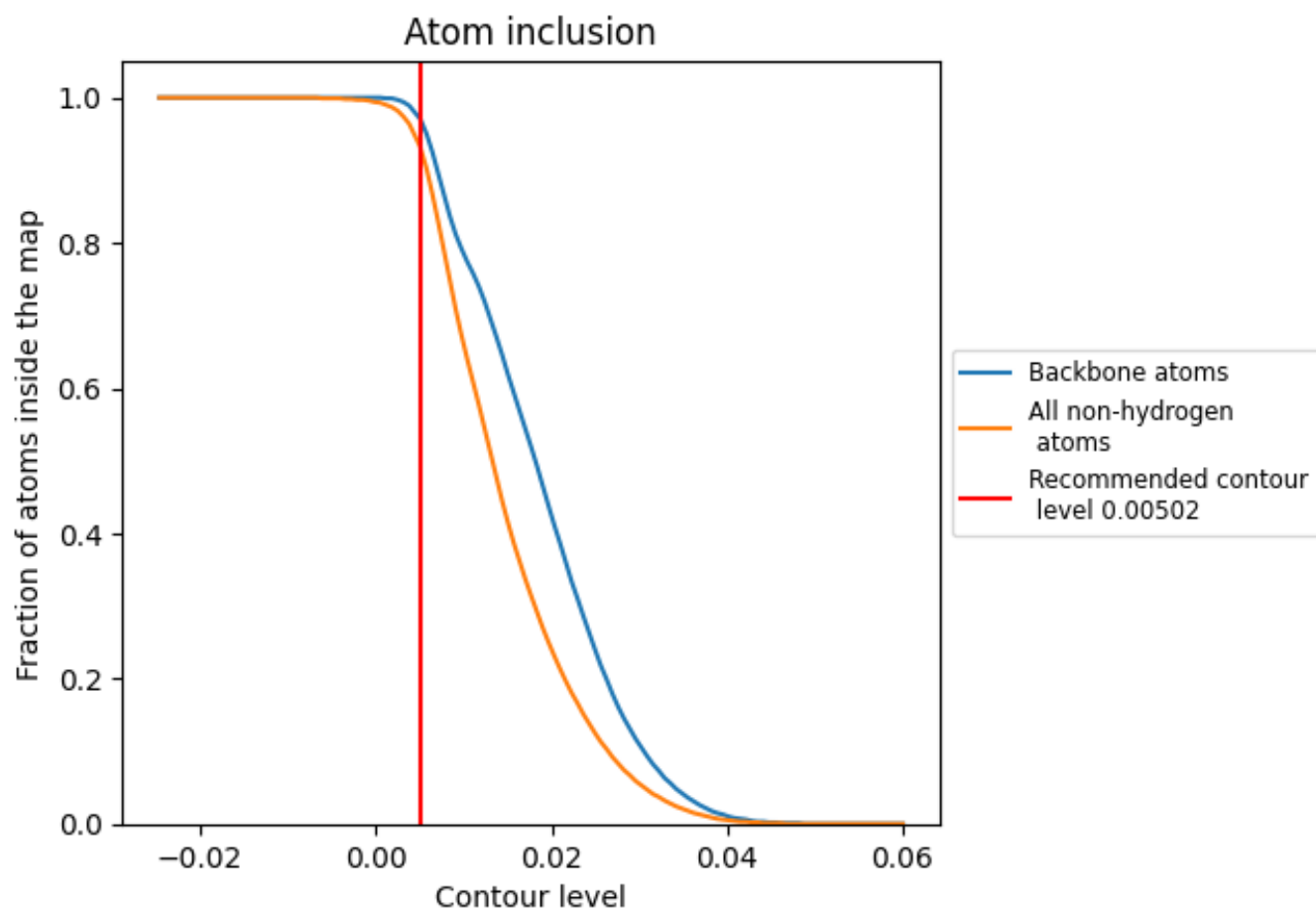
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.00502).







































































## 9.4 Atom inclusion [i](#)



At the recommended contour level, 97% of all backbone atoms, 93% 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 (0.00502) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.9330	 0.1290
A	 0.9510	 0.1730
B	 0.9610	 0.1690
C	 0.9310	 0.1730
D	 0.9270	 0.1720
E	 0.9540	 0.1420
F	 0.9700	 0.1640
G	 0.9760	 0.1510
H	 0.9650	 0.1590
I	 0.9330	 0.1520
J	 0.9330	 0.1550
K	 0.9610	 0.1290
L	 0.9660	 0.1510
M	 0.9810	 0.0790
N	 0.9850	 0.1250
O	 0.9520	 0.1230
P	 0.9600	 0.1360
Q	 0.9900	 0.0930
R	 0.9960	 0.1510
S	 0.7090	 0.0460
T	 0.8190	 0.0520
U	 0.7770	 0.0600
V	 0.8890	 0.0780
W	 0.6420	 0.0930
X	 0.7290	 0.0610
Y	 0.9840	 0.0860
Z	 0.8860	 0.0590
a	 0.9750	 0.1200
b	 0.9510	 0.1020
c	 0.9900	 0.1080
d	 1.0000	 0.1240
e	 0.9870	 0.1470
f	 0.9850	 0.1340
g	 0.9560	 0.1460
h	 0.9770	 0.1420



*Continued on next page...*

*Continued from previous page...*

Chain	Atom inclusion	Q-score
i	 0.9350	 0.1200
j	 0.9810	 0.1530
k	 0.9570	 0.1690
l	 0.9780	 0.1540
m	 0.9270	 0.1570
n	 0.9410	 0.1500
o	 0.9480	 0.1620
p	 0.9660	 0.1400