W O R L D W I D E

wwPDB
P R O T E I N   D A T A   B A N K

wwPDB EM Validation Summary Report ⓘ

Oct 23, 2025 – 12:21 PM EDT

PDB ID	:	9MLL / pdb_00009mll
EMDB ID	:	EMD-48375
Title	:	GammaH2AX containing nucleosomes, Parallel stack
Authors	:	Panigrahi, R.; Edwards, R.; Glover, J.N.M.
Deposited on	:	2024-12-19
Resolution	:	3.70 Å(reported)

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

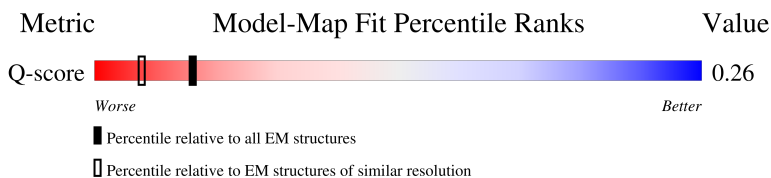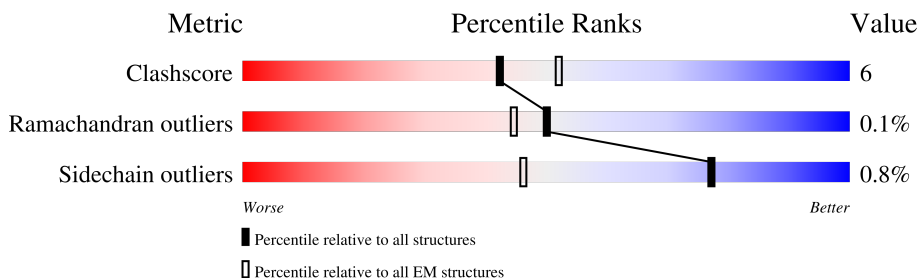|		
EMDB validation analysis	:	0.0.1.dev129
MolProbity	:	4-5-2 with Phenix2.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
EM percentile statistics	:	202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ	:	1.9.13
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.46

1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:
ELECTRON MICROSCOPY

The reported resolution of this entry is 3.70 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	Percentile Ranks	Value
Clashscore		6
Ramachandran outliers		0.1%
Sidechain outliers		0.8%

Worse ... *Better*

▮ Percentile relative to all structures

▯ Percentile relative to all EM structures

Metric	Model-Map Fit Percentile Ranks	Value
Q-score		0.26

Worse ... *Better*

▮ Percentile relative to all EM structures

▯ Percentile relative to EM structures of similar resolution

Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	210492	15764	-
Ramachandran outliers	207382	16835	-
Sidechain outliers	206894	16415	-
Q-score	-	25397	11569 (3.20 - 4.20)

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 <=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	157	52% 9% 39%
1	E	157	52% 8% 41%
1	L	157	51% 8% • 40%
1	P	157	54% 8% 39%

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Mol	Chain	Length	Quality of chain
2	B	103	72% 5% 23%
2	F	103	75% 7% 18%
2	M	103	76% 6% 18%
2	Q	103	65% 12% 23%
3	C	164	59% 7% 34%
3	G	164	57% 7% 37%
3	N	164	54% 9% 37%
3	R	164	61% 35%
4	D	126	67% 6% 27%
4	H	126	61% 10% 29%
4	O	126	63% 8% 29%
4	S	126	61% 11% 28%
5	I	145	50% 45% 6%
5	X	145	51% 37% 12%
6	J	145	73% 21% 6%
6	Y	145	66% 22% 12%

2 Entry composition ⓘ

There are 6 unique types of molecules in this entry. The entry contains 40979 atoms, of which 18340 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 Histone H3.1.

Mol	Chain	Residues	Atoms						AltConf	Trace
1	A	96	Total	C	H	N	O	S	0	0
			1626	500	832	154	136	4		
1	E	93	Total	C	H	N	O	S	0	0
			1561	482	799	143	133	4		
1	L	94	Total	C	H	N	O	S	0	0
			1585	488	812	147	134	4		
1	P	96	Total	C	H	N	O	S	0	0
			1616	499	826	151	136	4		

There are 84 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-20	MET	-	initiating methionine	UNP P68431
A	-19	GLY	-	expression tag	UNP P68431
A	-18	SER	-	expression tag	UNP P68431
A	-17	SER	-	expression tag	UNP P68431
A	-16	HIS	-	expression tag	UNP P68431
A	-15	HIS	-	expression tag	UNP P68431
A	-14	HIS	-	expression tag	UNP P68431
A	-13	HIS	-	expression tag	UNP P68431
A	-12	HIS	-	expression tag	UNP P68431
A	-11	HIS	-	expression tag	UNP P68431
A	-10	SER	-	expression tag	UNP P68431
A	-9	GLN	-	expression tag	UNP P68431
A	-8	ASP	-	expression tag	UNP P68431
A	-7	PRO	-	expression tag	UNP P68431
A	-6	GLU	-	expression tag	UNP P68431
A	-5	ASN	-	expression tag	UNP P68431
A	-4	LEU	-	expression tag	UNP P68431
A	-3	TYR	-	expression tag	UNP P68431
A	-2	PHE	-	expression tag	UNP P68431
A	-1	GLN	-	expression tag	UNP P68431
A	0	GLY	-	expression tag	UNP P68431
E	-20	MET	-	initiating methionine	UNP P68431

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Chain	Residue	Modelled	Actual	Comment	Reference
E	-19	GLY	-	expression tag	UNP P68431
E	-18	SER	-	expression tag	UNP P68431
E	-17	SER	-	expression tag	UNP P68431
E	-16	HIS	-	expression tag	UNP P68431
E	-15	HIS	-	expression tag	UNP P68431
E	-14	HIS	-	expression tag	UNP P68431
E	-13	HIS	-	expression tag	UNP P68431
E	-12	HIS	-	expression tag	UNP P68431
E	-11	HIS	-	expression tag	UNP P68431
E	-10	SER	-	expression tag	UNP P68431
E	-9	GLN	-	expression tag	UNP P68431
E	-8	ASP	-	expression tag	UNP P68431
E	-7	PRO	-	expression tag	UNP P68431
E	-6	GLU	-	expression tag	UNP P68431
E	-5	ASN	-	expression tag	UNP P68431
E	-4	LEU	-	expression tag	UNP P68431
E	-3	TYR	-	expression tag	UNP P68431
E	-2	PHE	-	expression tag	UNP P68431
E	-1	GLN	-	expression tag	UNP P68431
E	0	GLY	-	expression tag	UNP P68431
L	-20	MET	-	initiating methionine	UNP P68431
L	-19	GLY	-	expression tag	UNP P68431
L	-18	SER	-	expression tag	UNP P68431
L	-17	SER	-	expression tag	UNP P68431
L	-16	HIS	-	expression tag	UNP P68431
L	-15	HIS	-	expression tag	UNP P68431
L	-14	HIS	-	expression tag	UNP P68431
L	-13	HIS	-	expression tag	UNP P68431
L	-12	HIS	-	expression tag	UNP P68431
L	-11	HIS	-	expression tag	UNP P68431
L	-10	SER	-	expression tag	UNP P68431
L	-9	GLN	-	expression tag	UNP P68431
L	-8	ASP	-	expression tag	UNP P68431
L	-7	PRO	-	expression tag	UNP P68431
L	-6	GLU	-	expression tag	UNP P68431
L	-5	ASN	-	expression tag	UNP P68431
L	-4	LEU	-	expression tag	UNP P68431
L	-3	TYR	-	expression tag	UNP P68431
L	-2	PHE	-	expression tag	UNP P68431
L	-1	GLN	-	expression tag	UNP P68431
L	0	GLY	-	expression tag	UNP P68431
P	-20	MET	-	initiating methionine	UNP P68431

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Chain	Residue	Modelled	Actual	Comment	Reference
P	-19	GLY	-	expression tag	UNP P68431
P	-18	SER	-	expression tag	UNP P68431
P	-17	SER	-	expression tag	UNP P68431
P	-16	HIS	-	expression tag	UNP P68431
P	-15	HIS	-	expression tag	UNP P68431
P	-14	HIS	-	expression tag	UNP P68431
P	-13	HIS	-	expression tag	UNP P68431
P	-12	HIS	-	expression tag	UNP P68431
P	-11	HIS	-	expression tag	UNP P68431
P	-10	SER	-	expression tag	UNP P68431
P	-9	GLN	-	expression tag	UNP P68431
P	-8	ASP	-	expression tag	UNP P68431
P	-7	PRO	-	expression tag	UNP P68431
P	-6	GLU	-	expression tag	UNP P68431
P	-5	ASN	-	expression tag	UNP P68431
P	-4	LEU	-	expression tag	UNP P68431
P	-3	TYR	-	expression tag	UNP P68431
P	-2	PHE	-	expression tag	UNP P68431
P	-1	GLN	-	expression tag	UNP P68431
P	0	GLY	-	expression tag	UNP P68431

- Molecule 2 is a protein called Histone H4.

Mol	Chain	Residues	Atoms						AltConf	Trace
2	B	79	Total 1291	C 395	H 664	N 121	O 110	S 1	0	0
2	F	84	Total 1396	C 424	H 723	N 133	O 115	S 1	0	0
2	M	84	Total 1396	C 424	H 723	N 133	O 115	S 1	0	0
2	Q	79	Total 1291	C 395	H 664	N 121	O 110	S 1	0	0

- Molecule 3 is a protein called Histone H2AX.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	108	Total 1715	C 523	H 887	N 163	O 142	0	0
3	G	104	Total 1637	C 502	H 843	N 154	O 138	0	0
3	N	103	Total 1627	C 499	H 838	N 153	O 137	0	0

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Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	H	N	O		
3	R	107	1691	517	874	159	141	0	0

There are 92 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	-20	MET	-	initiating methionine	UNP P16104
C	-19	GLY	-	expression tag	UNP P16104
C	-18	SER	-	expression tag	UNP P16104
C	-17	SER	-	expression tag	UNP P16104
C	-16	HIS	-	expression tag	UNP P16104
C	-15	HIS	-	expression tag	UNP P16104
C	-14	HIS	-	expression tag	UNP P16104
C	-13	HIS	-	expression tag	UNP P16104
C	-12	HIS	-	expression tag	UNP P16104
C	-11	HIS	-	expression tag	UNP P16104
C	-10	SER	-	expression tag	UNP P16104
C	-9	GLN	-	expression tag	UNP P16104
C	-8	ASP	-	expression tag	UNP P16104
C	-7	PRO	-	expression tag	UNP P16104
C	-6	GLU	-	expression tag	UNP P16104
C	-5	ASN	-	expression tag	UNP P16104
C	-4	LEU	-	expression tag	UNP P16104
C	-3	TYR	-	expression tag	UNP P16104
C	-2	PHE	-	expression tag	UNP P16104
C	-1	GLN	-	expression tag	UNP P16104
C	0	GLY	-	expression tag	UNP P16104
C	137	GLU	THR	conflict	UNP P16104
C	139	ASP	ALA	conflict	UNP P16104
G	-20	MET	-	initiating methionine	UNP P16104
G	-19	GLY	-	expression tag	UNP P16104
G	-18	SER	-	expression tag	UNP P16104
G	-17	SER	-	expression tag	UNP P16104
G	-16	HIS	-	expression tag	UNP P16104
G	-15	HIS	-	expression tag	UNP P16104
G	-14	HIS	-	expression tag	UNP P16104
G	-13	HIS	-	expression tag	UNP P16104
G	-12	HIS	-	expression tag	UNP P16104
G	-11	HIS	-	expression tag	UNP P16104
G	-10	SER	-	expression tag	UNP P16104
G	-9	GLN	-	expression tag	UNP P16104
G	-8	ASP	-	expression tag	UNP P16104

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Chain	Residue	Modelled	Actual	Comment	Reference
G	-7	PRO	-	expression tag	UNP P16104
G	-6	GLU	-	expression tag	UNP P16104
G	-5	ASN	-	expression tag	UNP P16104
G	-4	LEU	-	expression tag	UNP P16104
G	-3	TYR	-	expression tag	UNP P16104
G	-2	PHE	-	expression tag	UNP P16104
G	-1	GLN	-	expression tag	UNP P16104
G	0	GLY	-	expression tag	UNP P16104
G	137	GLU	THR	conflict	UNP P16104
G	139	ASP	ALA	conflict	UNP P16104
N	-20	MET	-	initiating methionine	UNP P16104
N	-19	GLY	-	expression tag	UNP P16104
N	-18	SER	-	expression tag	UNP P16104
N	-17	SER	-	expression tag	UNP P16104
N	-16	HIS	-	expression tag	UNP P16104
N	-15	HIS	-	expression tag	UNP P16104
N	-14	HIS	-	expression tag	UNP P16104
N	-13	HIS	-	expression tag	UNP P16104
N	-12	HIS	-	expression tag	UNP P16104
N	-11	HIS	-	expression tag	UNP P16104
N	-10	SER	-	expression tag	UNP P16104
N	-9	GLN	-	expression tag	UNP P16104
N	-8	ASP	-	expression tag	UNP P16104
N	-7	PRO	-	expression tag	UNP P16104
N	-6	GLU	-	expression tag	UNP P16104
N	-5	ASN	-	expression tag	UNP P16104
N	-4	LEU	-	expression tag	UNP P16104
N	-3	TYR	-	expression tag	UNP P16104
N	-2	PHE	-	expression tag	UNP P16104
N	-1	GLN	-	expression tag	UNP P16104
N	0	GLY	-	expression tag	UNP P16104
N	137	GLU	THR	conflict	UNP P16104
N	139	ASP	ALA	conflict	UNP P16104
R	-20	MET	-	initiating methionine	UNP P16104
R	-19	GLY	-	expression tag	UNP P16104
R	-18	SER	-	expression tag	UNP P16104
R	-17	SER	-	expression tag	UNP P16104
R	-16	HIS	-	expression tag	UNP P16104
R	-15	HIS	-	expression tag	UNP P16104
R	-14	HIS	-	expression tag	UNP P16104
R	-13	HIS	-	expression tag	UNP P16104
R	-12	HIS	-	expression tag	UNP P16104

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Chain	Residue	Modelled	Actual	Comment	Reference
R	-11	HIS	-	expression tag	UNP P16104
R	-10	SER	-	expression tag	UNP P16104
R	-9	GLN	-	expression tag	UNP P16104
R	-8	ASP	-	expression tag	UNP P16104
R	-7	PRO	-	expression tag	UNP P16104
R	-6	GLU	-	expression tag	UNP P16104
R	-5	ASN	-	expression tag	UNP P16104
R	-4	LEU	-	expression tag	UNP P16104
R	-3	TYR	-	expression tag	UNP P16104
R	-2	PHE	-	expression tag	UNP P16104
R	-1	GLN	-	expression tag	UNP P16104
R	0	GLY	-	expression tag	UNP P16104
R	137	GLU	THR	conflict	UNP P16104
R	139	ASP	ALA	conflict	UNP P16104

- Molecule 4 is a protein called Histone H2B type 1-J.

Mol	Chain	Residues	Atoms						AltConf	Trace
4	D	92	Total 1460	C 453	H 741	N 129	O 135	S 2	0	0
4	H	89	Total 1415	C 441	H 718	N 123	O 131	S 2	0	0
4	O	89	Total 1415	C 441	H 718	N 123	O 131	S 2	0	0
4	S	91	Total 1450	C 450	H 736	N 128	O 134	S 2	0	0

- Molecule 5 is a DNA chain called DNA (145-MER).

Mol	Chain	Residues	Atoms						AltConf	Trace
5	I	137	Total 4326	C 1325	H 1537	N 505	O 822	P 137	0	0
5	X	128	Total 4043	C 1237	H 1434	N 476	O 768	P 128	0	0

- Molecule 6 is a DNA chain called DNA (145-MER).

Mol	Chain	Residues	Atoms						AltConf	Trace
6	J	137	Total 4365	C 1338	H 1537	N 531	O 822	P 137	0	0
6	Y	128	Total 4073	C 1247	H 1434	N 496	O 768	P 128	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: Histone H3.1

Chain A:

- Molecule 1: Histone H3.1

Chain E:

- Molecule 1: Histone H3.1

Chain L:

- Molecule 1: Histone H3.1

Chain P:

R43 A48 E51 I52 R53 K80 D107 M121 P122 L127 R130 I131 R132 G133 E134 ARG ALA

• Molecule 2: Histone H4

Chain B:

72%   5%   23%

MET SER GLY ARG GLY LYS GLY GLY LYS GLY LEU GLY LYS GLY GLY ALA LYS ARG HIS ARG LYS VAL LEU ARG D25 R37 R40 K45 T81 D86 Y89 G103

• Molecule 2: Histone H4

Chain F:

75%   7%   18%

MET SER GLY ARG GLY LYS GLY GLY LYS GLY LEU GLY LYS GLY GLY ALA LYS ARG HIS R20 K21 V22 L38 E54 T81 V82 T83 A84 M85 K92 Y99 G103

• Molecule 2: Histone H4

Chain M:

76%   6%   18%

MET SER GLY ARG GLY LYS GLY GLY LYS GLY LEU GLY LYS GLY GLY ALA LYS ARG HIS R20 K21 V22 L23 R24 R40 V44 I47 Y73 K80 D86 Y89 G103

• Molecule 2: Histone H4

Chain Q:

65%   12%   23%

MET SER GLY ARG GLY LYS GLY GLY LYS GLY LEU GLY LYS GLY GLY ALA LYS ARG HIS ARG LYS VAL LEU ARG D25 R36 R40 E53 E54 T55 R56 K60 E64 E75 T83 A84 M85 D86 K92 Y99 G103

• Molecule 3: Histone H2AX

Chain C:

59%   7%   34%

MET GLY SER SER HIS HIS HIS HIS HIS HIS SER GLN ASP PRO GLU ASN LEU TYR PHE GLN GLY MET SER GLY ARG GLY LYS THR GLY GLY LYS ALA R12 L24 E42 E57 E62 L66 R72 D73 R82 L86 V101 T102 K119 THR SER ALA THR

VAL GLY PRO LYS ALA PRO SER GLY GLY LYS LYS ALA GLU GLN ASP SER GLN GLU TYR

• Molecule 3: Histone H2AX

Chain G:

57%   7%   37%

MET GLY SER SER HIS HIS HIS HIS HIS HIS SER GLN ASP PRO GLU ASN LEU TYR PHE GLN GLY MET SER GLY ARG GLY LYS THR GLY GLY LYS ALA ARG ALA LYS A15 L52 L56 I63 N69 R72 D73 N74 K75 K76 G100 Q105 L116 L117 P118 LYS LYS

THR SER ALA THR VAL GLY PRO LYS ALA PRO SER GLY LYS LYS ALA GLU GLN ASP SER GLN TYR

• Molecule 3: Histone H2AX

Chain N:

54%   9%   37%

MET GLY SER HIS HIS HIS HIS HIS HIS SER GLN ASP PRO GLU ASN LEU TYR PHE GLN GLY MET SER GLY ARG GLY LYS THR GLY GLY LYS ALA ARG ALA LYS ALA K16 S20 L24 E42 E57 E62 L66 R72 D73 T77 R78 I79 I80 H83

V101 P118 LYS LYS THR SER ALA THR VAL GLY PRO LYS ALA PRO SER GLY LYS LYS ALA GLU GLN ASP SER GLN TYR

• Molecule 3: Histone H2AX

Chain R:

61%   • •   35%

MET GLY SER HIS HIS HIS HIS HIS HIS SER GLN ASP PRO GLU ASN LEU TYR PHE GLN GLY MET SER GLY ARG GLY LYS THR GLY GLY LYS ALA ARG A13 L52 L56 I63 K75 G100 Q105 A114 L117 P118 K119 LYS THR SER ALA THR VAL GLY PRO

LYS ALA PRO SER GLY LYS LYS ALA GLU GLN ASP SER GLN TYR

• Molecule 4: Histone H2B type 1-J

Chain D:

67%   6%   27%

MET PRO GLU PRO ALA LYS SER ALA PRO ALA PRO LYS LYS GLY SER LYS LYS ALA VAL THR LYS ALA GLN LYS LYS ASP GLY LYS LYS ARG LYS ARG SER R34 I40 K44 K47 Q48 E77 R80 Y84 A125 LYS

• Molecule 4: Histone H2B type 1-J

Chain H:

61%   10%   29%

MET PRO GLU PRO ALA LYS SER ALA PRO ALA PRO LYS LYS GLY SER LYS LYS ALA VAL THR LYS ALA GLN LYS LYS ASP GLY LYS LYS ARG LYS ARG SER ARG K35 I40 K47 S56 M63 R87 T91 S92 A98 L102 H110 S113 T116 T120

T123 SER ALA LYS

• Molecule 4: Histone H2B type 1-J

Chain O:

63%   8%   29%

MET PRO GLU PRO ALA LYS SER ALA PRO ALA PRO LYS LYS GLY SER LYS LYS ALA VAL THR LYS ALA GLN LYS LYS ASP GLY LYS LYS ARG LYS ARG SER ARG K35 I40 Y41 K44 V45 L46 K47 Q48 P51 R80 L81 Y84 T123 SER ALA LYS

• Molecule 4: Histone H2B type 1-J

Chain S:

• Molecule 5: DNA (145-MER)

Chain I:

• Molecule 5: DNA (145-MER)

Chain X:

• Molecule 6: DNA (145-MER)

Chain J:

• Molecule 6: DNA (145-MER)

Chain Y:

4 Experimental information ⓘ

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	118190	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose $(e^-/Å^2)$	50.0	Depositor
Minimum defocus (nm)	1300	Depositor
Maximum defocus (nm)	2400	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	0.253	Depositor
Minimum map value	-0.126	Depositor
Average map value	0.002	Depositor
Map value standard deviation	0.013	Depositor
Recommended contour level	0.0463	Depositor
Map size (Å)	288.96, 288.96, 288.96	wwPDB
Map dimensions	336, 336, 336	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.85999995, 0.85999995, 0.85999995	Depositor

5 Model quality ⓘ

5.1 Standard geometry ⓘ

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	0.20	0/805	0.47	0/1079
1	E	0.22	0/772	0.54	0/1036
1	L	0.23	0/783	0.54	0/1050
1	P	0.16	0/802	0.41	0/1076
2	B	0.16	0/634	0.40	0/848
2	F	0.23	0/680	0.55	0/908
2	M	0.20	0/680	0.51	0/908
2	Q	0.19	0/634	0.47	0/848
3	C	0.17	0/839	0.44	0/1131
3	G	0.15	0/805	0.44	0/1088
3	N	0.17	0/800	0.44	0/1081
3	R	0.17	0/828	0.42	0/1117
4	D	0.20	0/730	0.45	0/982
4	H	0.17	0/708	0.45	0/953
4	O	0.21	0/708	0.49	0/953
4	S	0.18	0/725	0.44	0/975
5	I	0.29	0/3124	0.75	0/4814
5	X	0.28	0/2923	0.72	0/4505
6	J	0.29	0/3176	0.68	0/4905
6	Y	0.29	0/2963	0.68	0/4575
All	All	0.24	0/24119	0.61	0/34832

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
4	H	0	1
4	S	0	1
All	All	0	2

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
4	H	87	ARG	Sidechain
4	S	87	ARG	Sidechain

5.2   Too-close contacts ⓘ

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	794	832	831	20	0
1	E	762	799	798	15	0
1	L	773	812	811	10	0
1	P	790	826	826	16	0
2	B	627	664	663	6	0
2	F	673	723	722	5	0
2	M	673	723	722	4	0
2	Q	627	664	663	9	0
3	C	828	887	886	7	0
3	G	794	843	842	8	0
3	N	789	838	837	7	0
3	R	817	874	873	8	0
4	D	719	741	740	7	0
4	H	697	718	717	8	0
4	O	697	718	717	7	0
4	S	714	736	735	9	0
5	I	2789	1537	1538	60	0
5	X	2609	1434	1435	47	0
6	J	2828	1537	1538	27	0
6	Y	2639	1434	1435	28	0
All	All	22639	18340	18329	265	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 6.

The worst 5 of 265 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:P:80:LYS:NZ	2:Q:75:GLU:OE2	2.05	0.90
1:E:107:ASP:OD2	1:E:132:ARG:NH1	2.19	0.76
1:A:63:ILE:O	1:A:94:GLN:NE2	2.19	0.75
5:I:-27:DC:H2"	5:I:-26:DT:H71	1.71	0.72
3:R:52:LEU:O	3:R:56:LEU:HD13	1.91	0.71

There are no symmetry-related clashes.

5.3   Torsion angles (i)

5.3.1   Protein backbone (i)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	94/157 (60%)	93 (99%)	1 (1%)	0	100	100
1	E	91/157 (58%)	91 (100%)	0	0	100	100
1	L	92/157 (59%)	91 (99%)	1 (1%)	0	100	100
1	P	94/157 (60%)	94 (100%)	0	0	100	100
2	B	77/103 (75%)	73 (95%)	4 (5%)	0	100	100
2	F	82/103 (80%)	80 (98%)	2 (2%)	0	100	100
2	M	82/103 (80%)	78 (95%)	4 (5%)	0	100	100
2	Q	77/103 (75%)	76 (99%)	1 (1%)	0	100	100
3	C	106/164 (65%)	105 (99%)	1 (1%)	0	100	100
3	G	102/164 (62%)	97 (95%)	5 (5%)	0	100	100
3	N	101/164 (62%)	100 (99%)	1 (1%)	0	100	100
3	R	105/164 (64%)	100 (95%)	5 (5%)	0	100	100
4	D	90/126 (71%)	89 (99%)	1 (1%)	0	100	100
4	H	87/126 (69%)	87 (100%)	0	0	100	100
4	O	87/126 (69%)	85 (98%)	1 (1%)	1 (1%)	12	43
4	S	89/126 (71%)	89 (100%)	0	0	100	100

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
All	All	1456/2200 (66%)	1428 (98%)	27 (2%)	1 (0%)	50 78

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
4	O	51	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	A	84/130 (65%)	84 (100%)	0	100	100
1	E	81/130 (62%)	79 (98%)	2 (2%)	42	62
1	L	82/130 (63%)	80 (98%)	2 (2%)	44	63
1	P	84/130 (65%)	84 (100%)	0	100	100
2	B	64/79 (81%)	64 (100%)	0	100	100
2	F	69/79 (87%)	68 (99%)	1 (1%)	62	76
2	M	69/79 (87%)	68 (99%)	1 (1%)	62	76
2	Q	64/79 (81%)	64 (100%)	0	100	100
3	C	83/126 (66%)	82 (99%)	1 (1%)	67	79
3	G	80/126 (64%)	80 (100%)	0	100	100
3	N	80/126 (64%)	78 (98%)	2 (2%)	42	62
3	R	82/126 (65%)	81 (99%)	1 (1%)	67	79
4	D	78/105 (74%)	78 (100%)	0	100	100
4	H	76/105 (72%)	76 (100%)	0	100	100
4	O	76/105 (72%)	76 (100%)	0	100	100
4	S	78/105 (74%)	78 (100%)	0	100	100
All	All	1230/1760 (70%)	1220 (99%)	10 (1%)	77	85

5 of 10 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	N	77	THR
3	N	79	ILE
3	R	117	LEU
2	F	81	THR
1	L	46	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 24 such sidechains are listed below:

Mol	Chain	Res	Type
2	M	94	GLN
4	O	68	ASN
4	O	50	HIS
4	O	85	ASN
4	D	85	ASN

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 ⓘ

There are no ligands in this entry.

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Map visualisation ⓘ

This section contains visualisations of the EMDB entry EMD-48375. 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 ⓘ
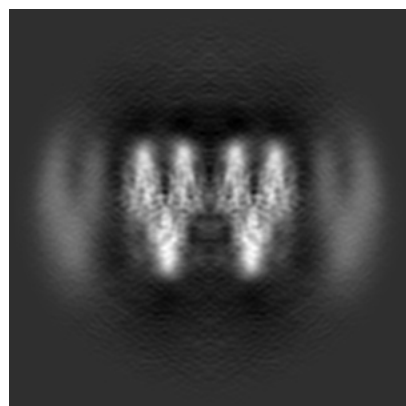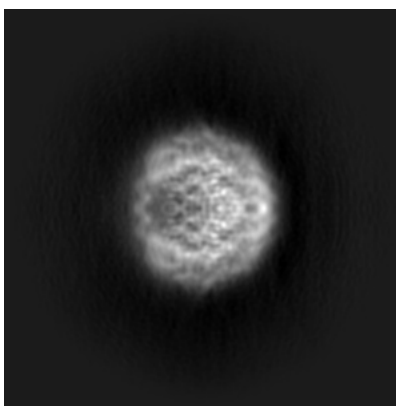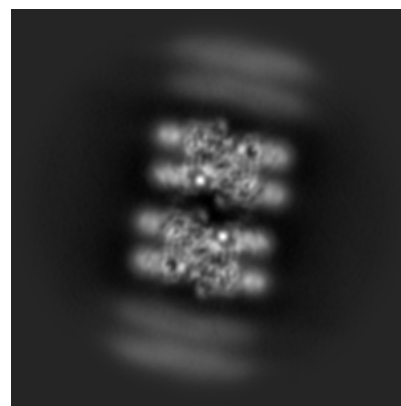
6.1.1 Primary map

X   Y   Z

6.1.2 Raw map

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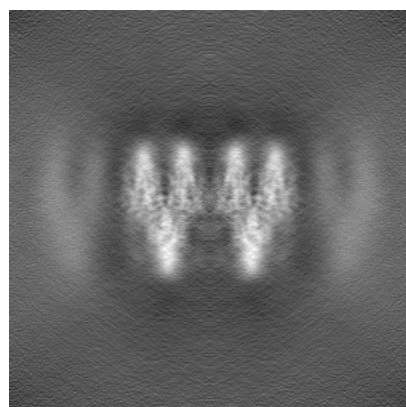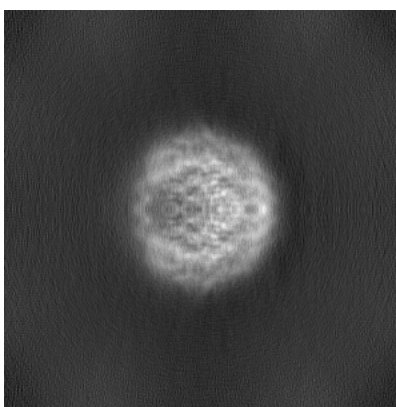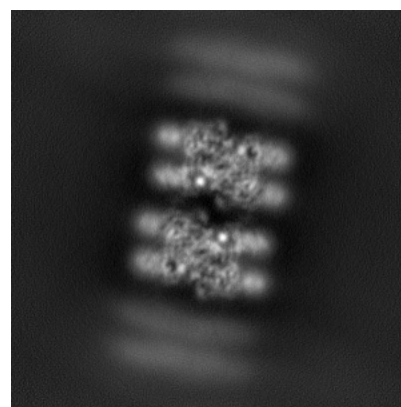
The images above show the map projected in three orthogonal directions.

6.2 Central slices ⓘ
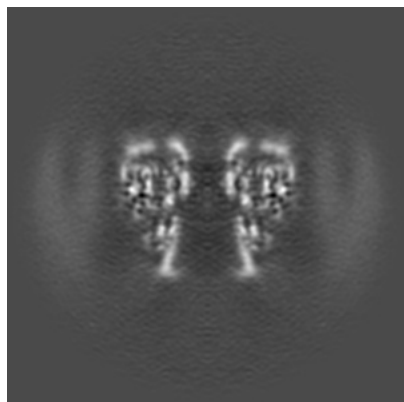
6.2.1 Primary map
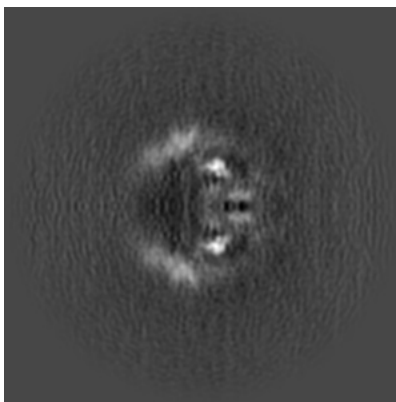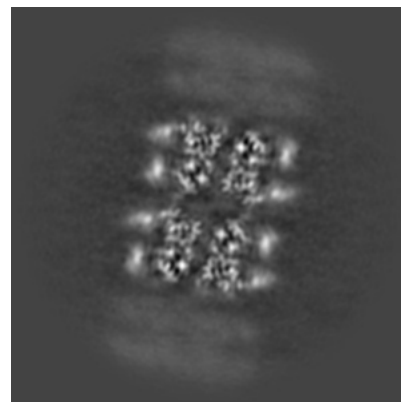
| X Index: 168 | Y Index: 168 | Z Index: 168 |

6.2.2 Raw map
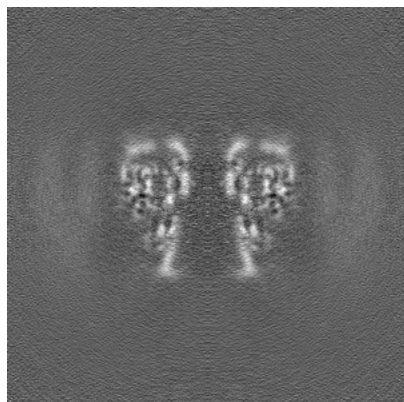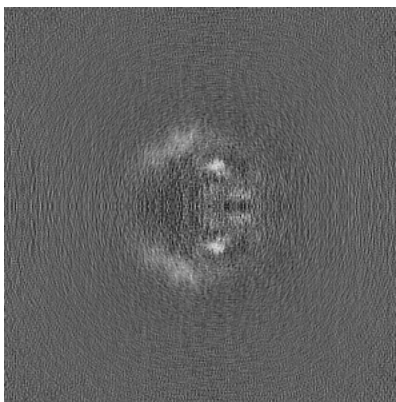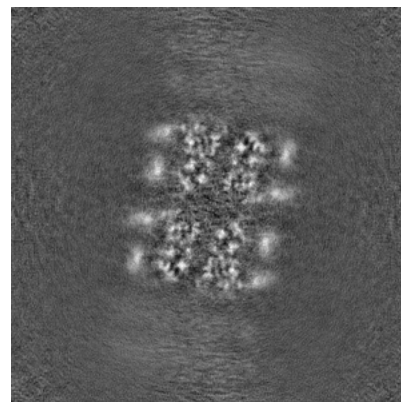
| X Index: 168 | Y Index: 168 | Z Index: 168 |

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

6.3　Largest variance slices ⓘ

6.3.1　Primary map
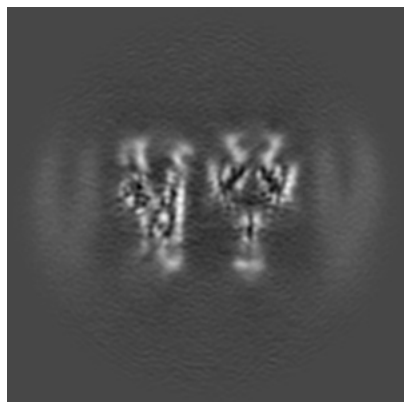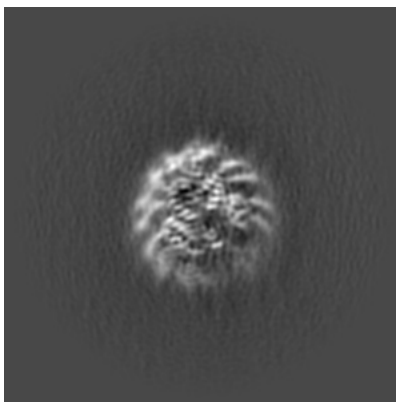
X Index: 177　　　　　Y Index: 136　　　　　Z Index: 184
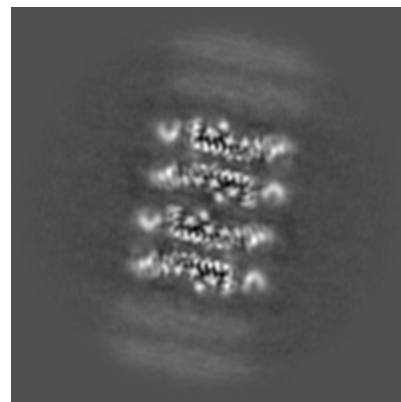
6.3.2　Raw map
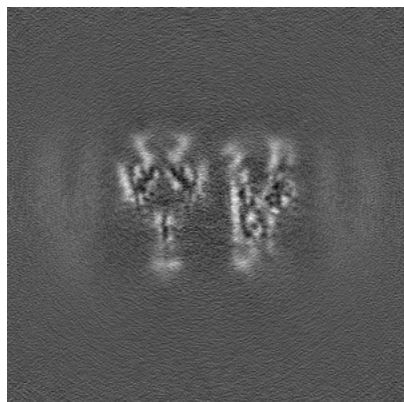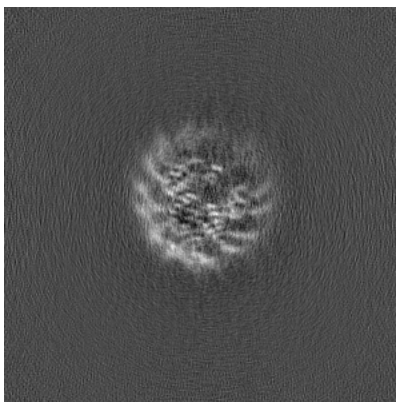
X Index: 159　　　　　Y Index: 200　　　　　Z Index: 184
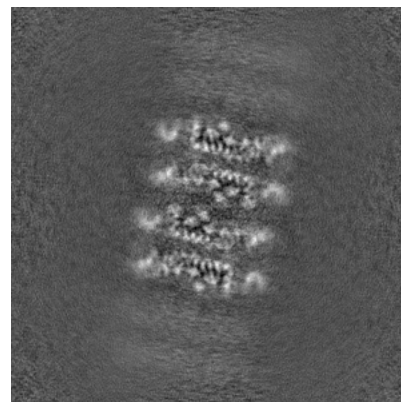
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal standard-deviation projections (False-color) ⓘ

6.4.1 Primary map
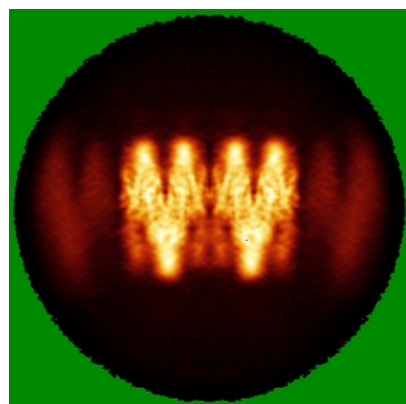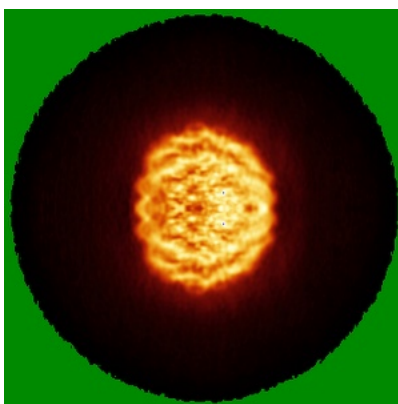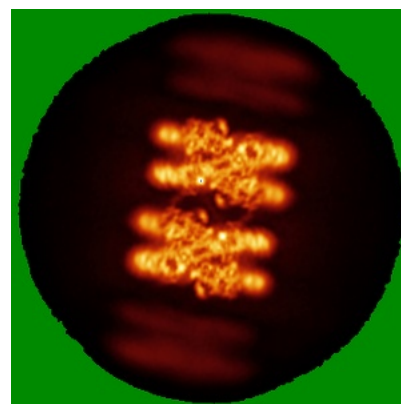
| X | Y | Z |

6.4.2 Raw map

| X | Y | Z |
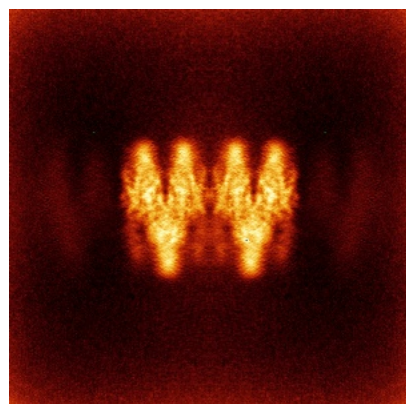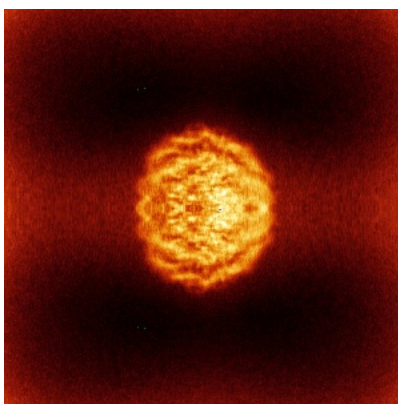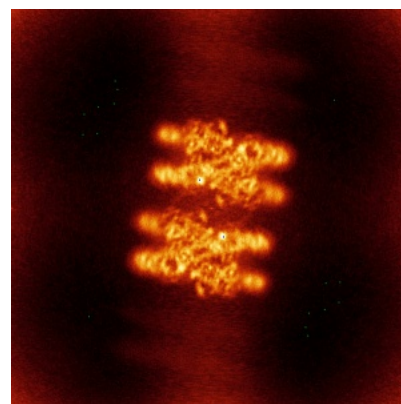
The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

6.5   Orthogonal surface views (i)

6.5.1   Primary map

X   Y   Z
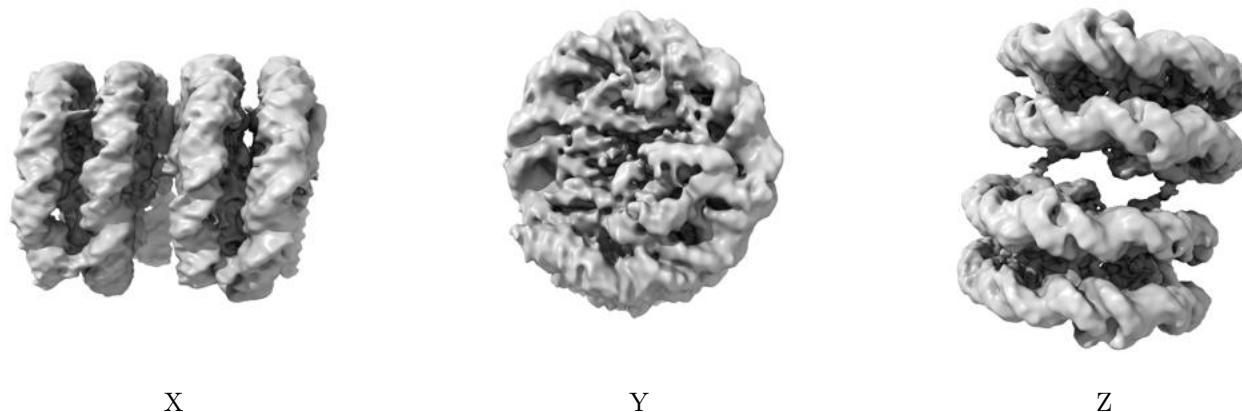
The images above show the 3D surface view of the map at the recommended contour level 0.0463. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2   Raw map

X   Y   Z
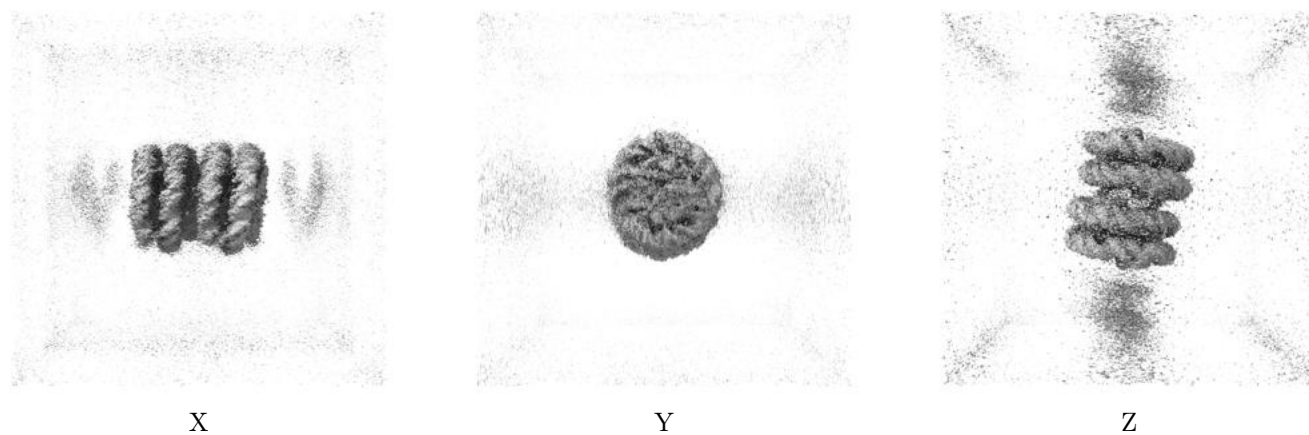
These images show the 3D surface of the raw map. The raw map's contour level was selected so that its surface encloses the same volume as the primary map does at its recommended contour level.

6.6   Mask visualisation (i)

This section shows the 3D surface view of the primary map at 50% transparency overlaid with the specified mask at 0% transparency

A mask typically either:

- Encompasses the whole structure

- Separates out a domain, a functional unit, a monomer or an area of interest from a larger structure

6.6.1   emd_48375_msk_1.map (i)

X   Y   Z
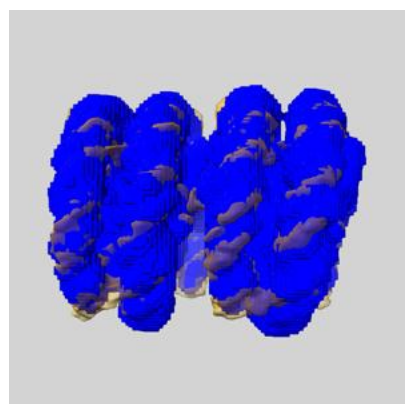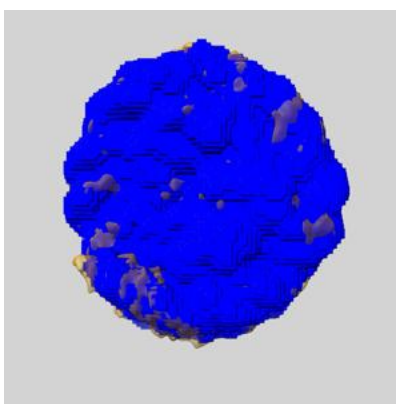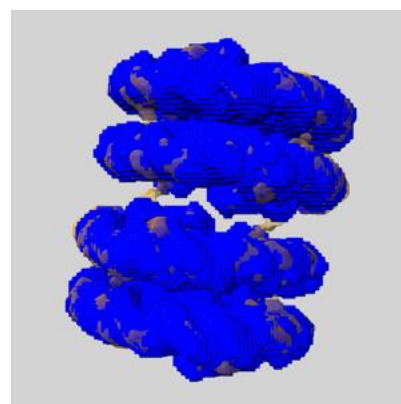
7   Map analysis ⓘ

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

7.1   Map-value distribution ⓘ
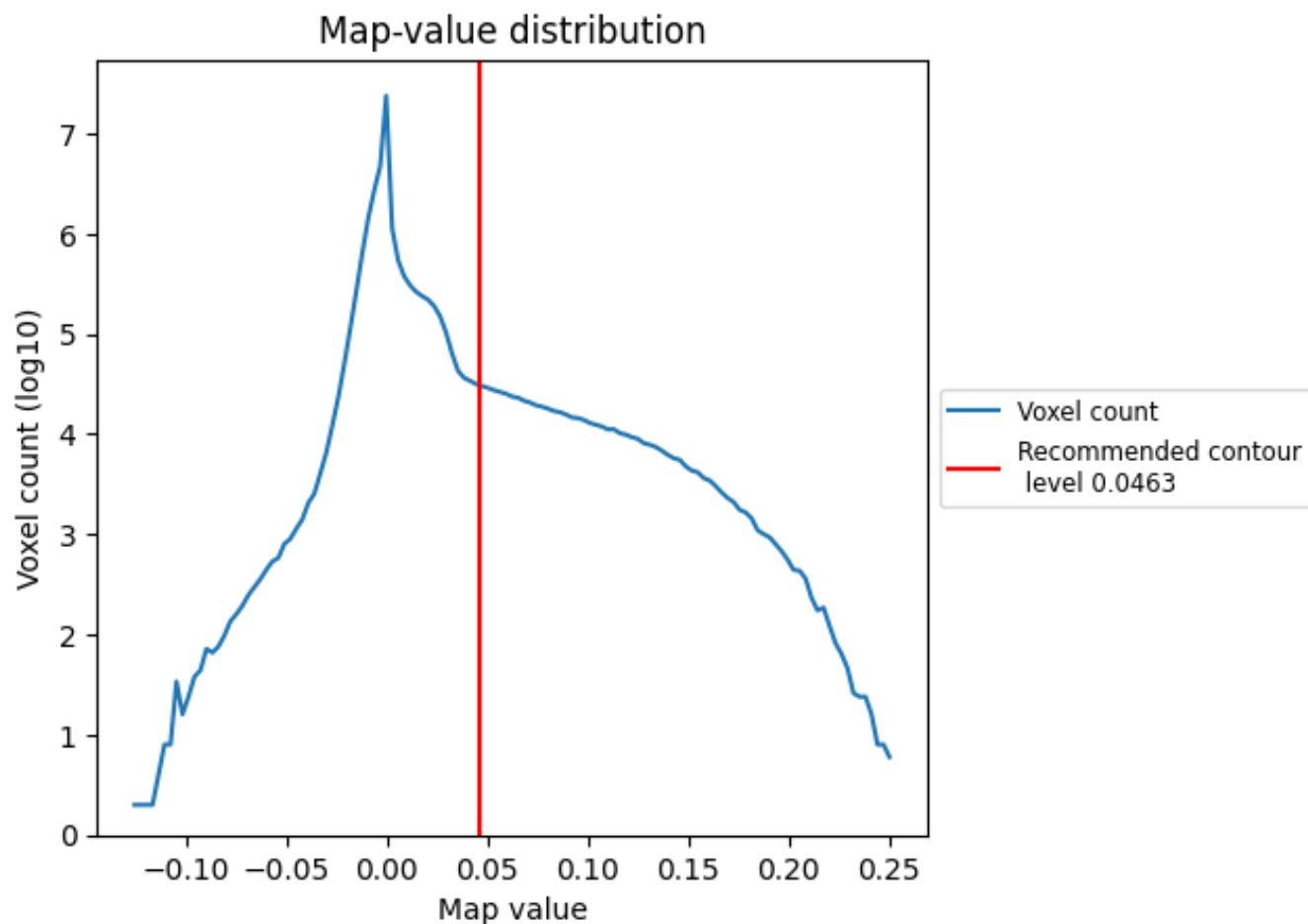
The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

7.2   Volume estimate ⓘ
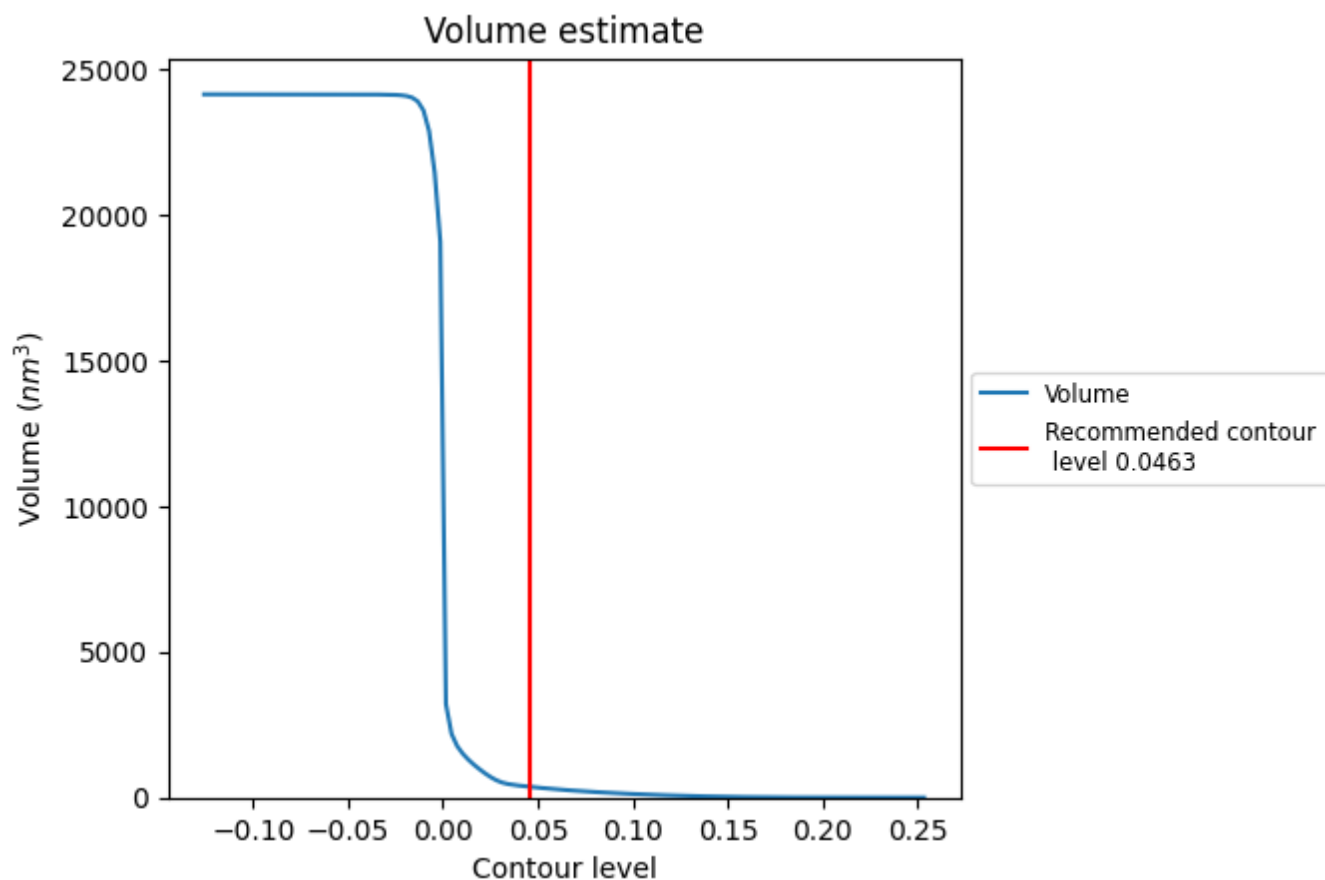
The volume at the recommended contour level is 366 nm^3; this corresponds to an approximate mass of 331 kDa.

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 ⓘ
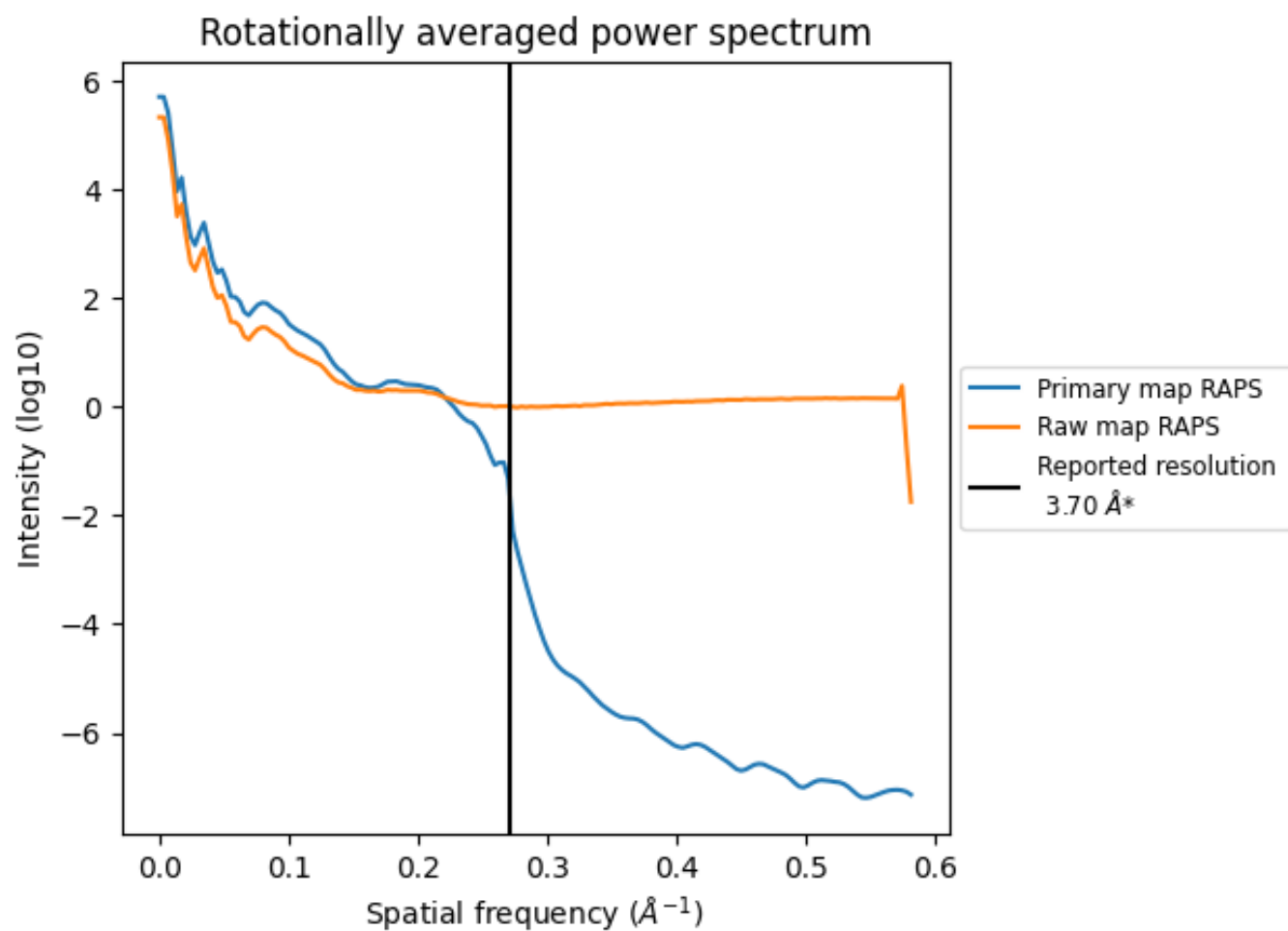
*Reported resolution corresponds to spatial frequency of 0.270 Å^{-1}

8　Fourier-Shell correlation ⓘ

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 ⓘ
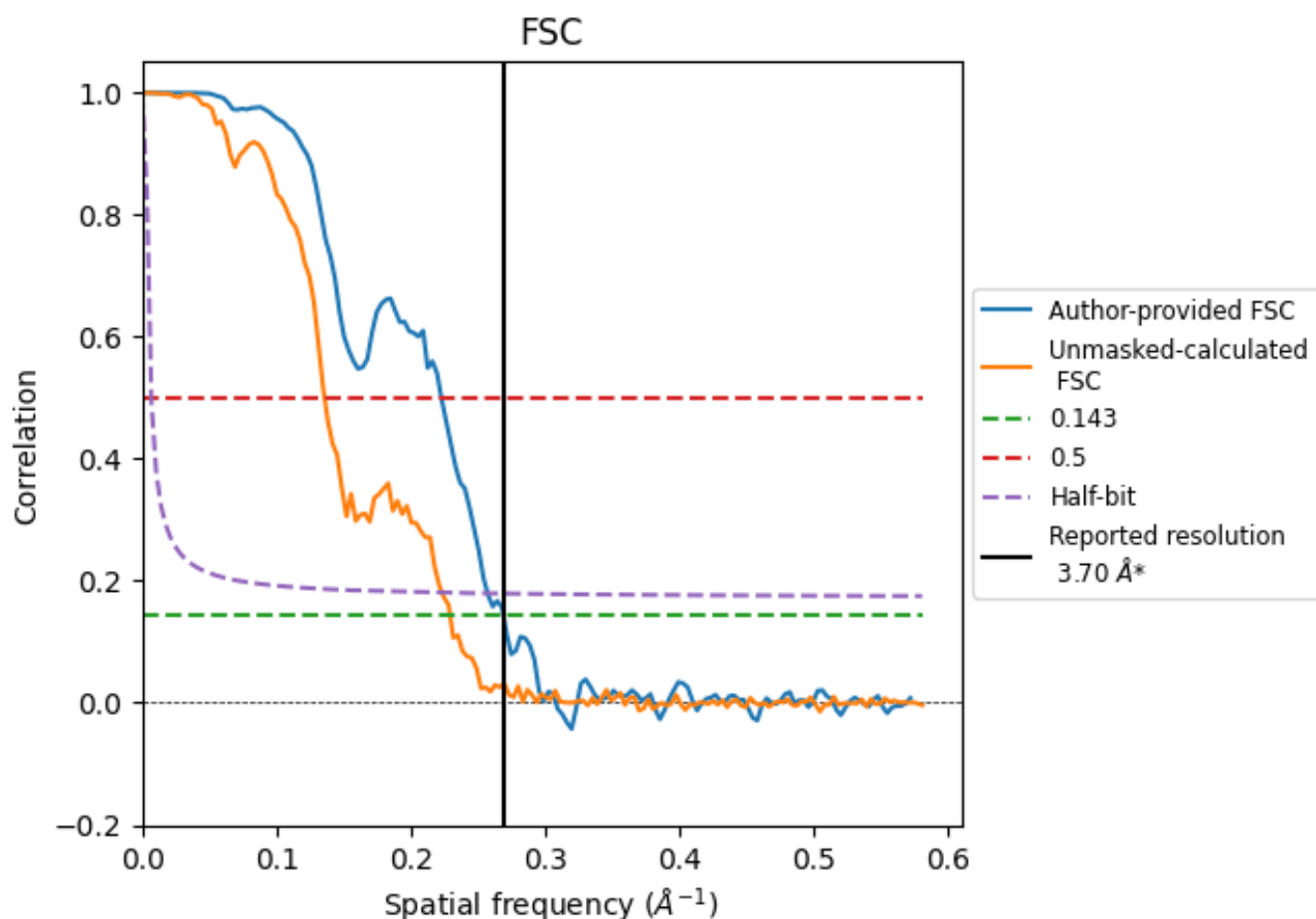
*Reported resolution corresponds to spatial frequency of 0.270 Å^{-1}

8.2　Resolution estimates ⓘ

Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.70	-	-
Author-provided FSC curve	3.71	4.48	3.88
Unmasked-calculated*	4.36	7.36	4.47

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 4.36 differs from the reported value 3.7 by more than 10 %

9   Map-model fit ⓘ

This section contains information regarding the fit between EMDB map EMD-48375 and PDB model 9MLL. Per-residue inclusion information can be found in section 3 on page 10.

9.1   Map-model overlay ⓘ
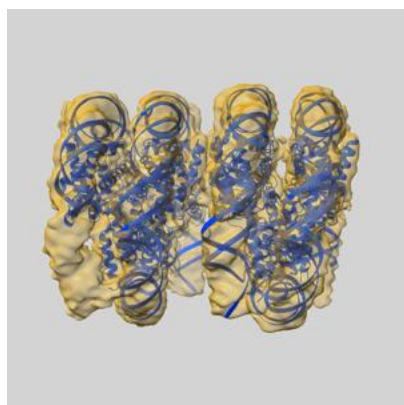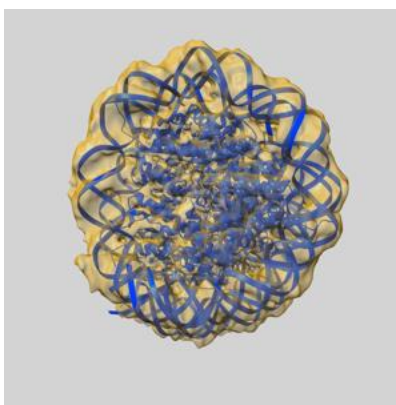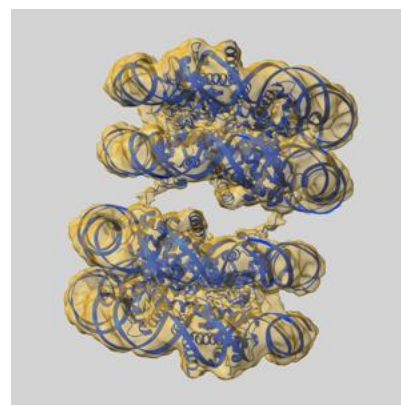
X   Y   Z

The images above show the 3D surface view of the map at the recommended contour level 0.0463 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 ⓘ

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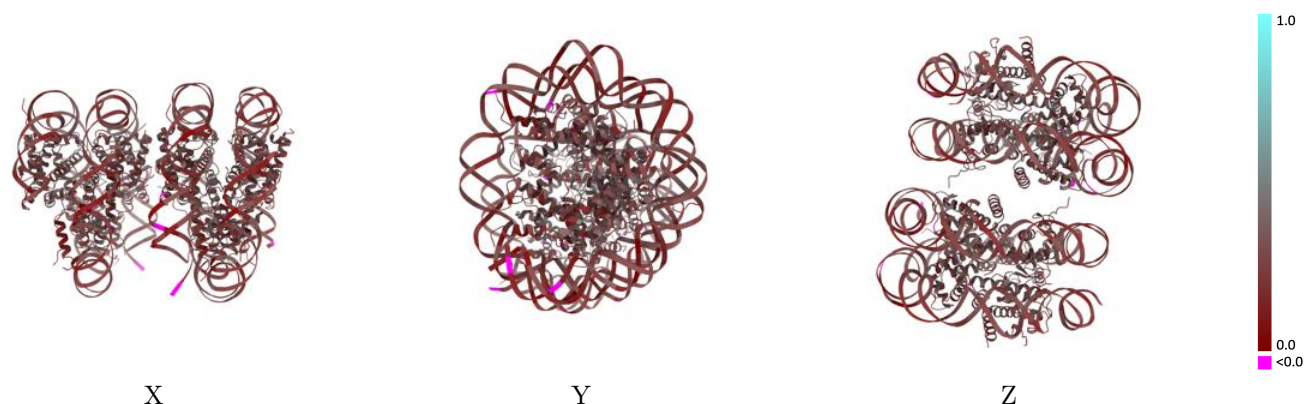
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions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

X	Y	Z
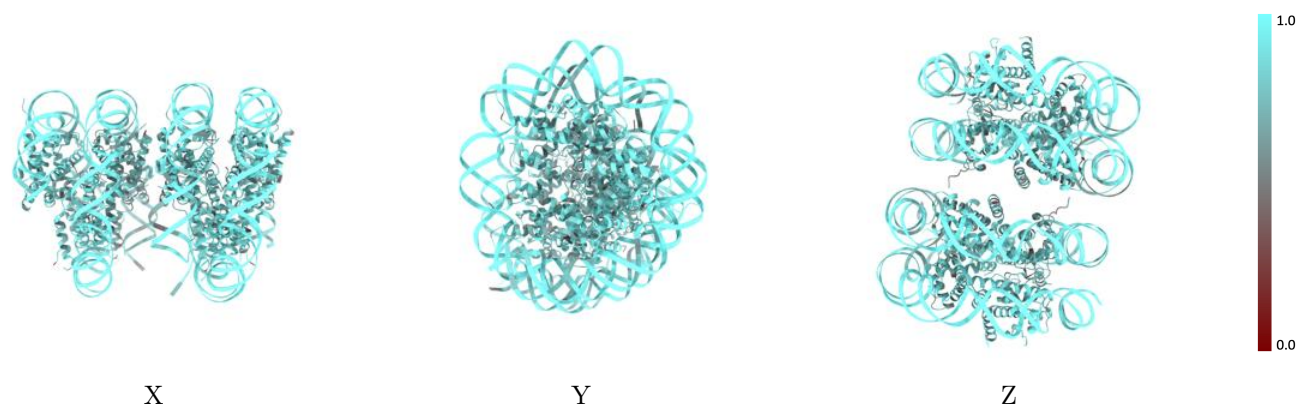
The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.0463).

9.4 Atom inclusion ⓘ
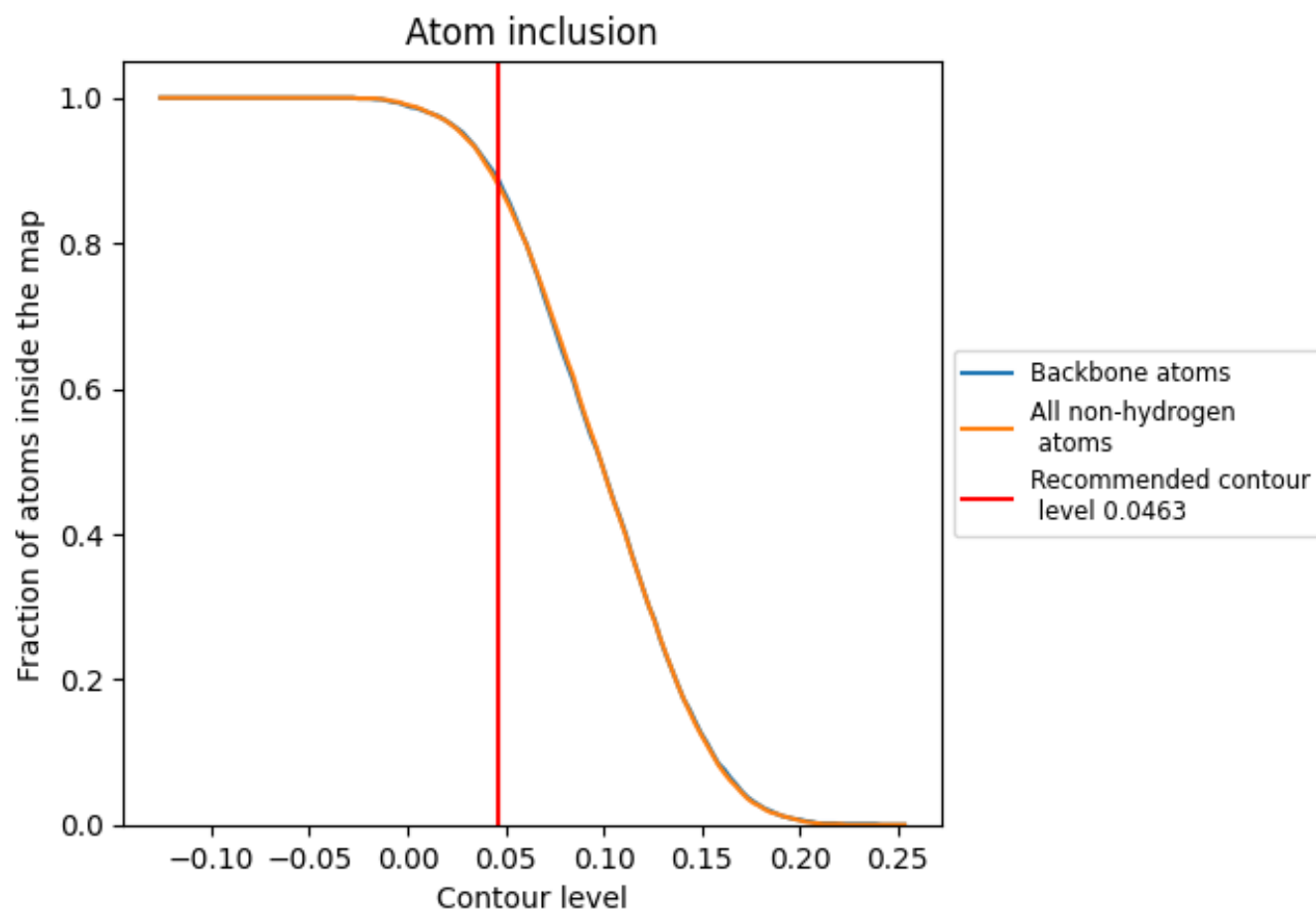
At the recommended contour level, 89% of all backbone atoms, 88% of all non-hydrogen atoms, are inside the map.

9.5   Map-model fit summary ⓘ

The table lists the average atom inclusion at the recommended contour level (0.0463) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.8800	0.2600
A	0.8620	0.2750
B	0.8740	0.3210
C	0.8480	0.3000
D	0.8620	0.3060
E	0.8340	0.2650
F	0.8140	0.3000
G	0.8170	0.3040
H	0.8270	0.3010
I	0.9440	0.2290
J	0.9200	0.2180
L	0.8320	0.2570
M	0.8140	0.3080
N	0.8200	0.3000
O	0.8330	0.3020
P	0.8400	0.2510
Q	0.8720	0.3070
R	0.8350	0.3020
S	0.8780	0.3050
X	0.9310	0.2200
Y	0.9470	0.2290

1.0

0.0
<0.0