WORLDWIDE PDB

PROTEIN DATA BANK

Full wwPDB EM Validation Report (i)

Jul 7, 2024 – 06:03 am BST

PDB ID	:	7PEU
EMDB ID	:	EMD-13357
Title	:	Trinucleosome of the 4x177 nucleosome array containing H1
Authors	:	Dombrowski, M.; Cramer, P.
Deposited on	:	2021-08-11
Resolution	:	7.20 Å(reported)
Based on initial model	:	7K5Y
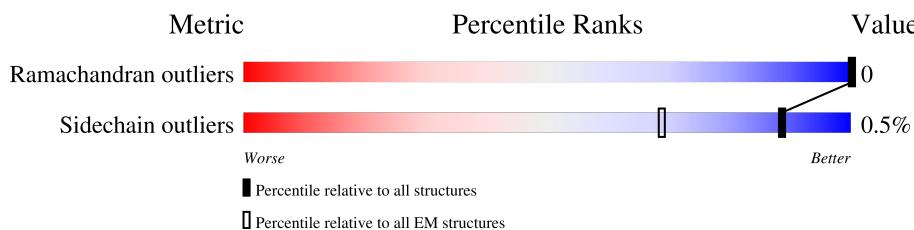
1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:
ELECTRON MICROSCOPY
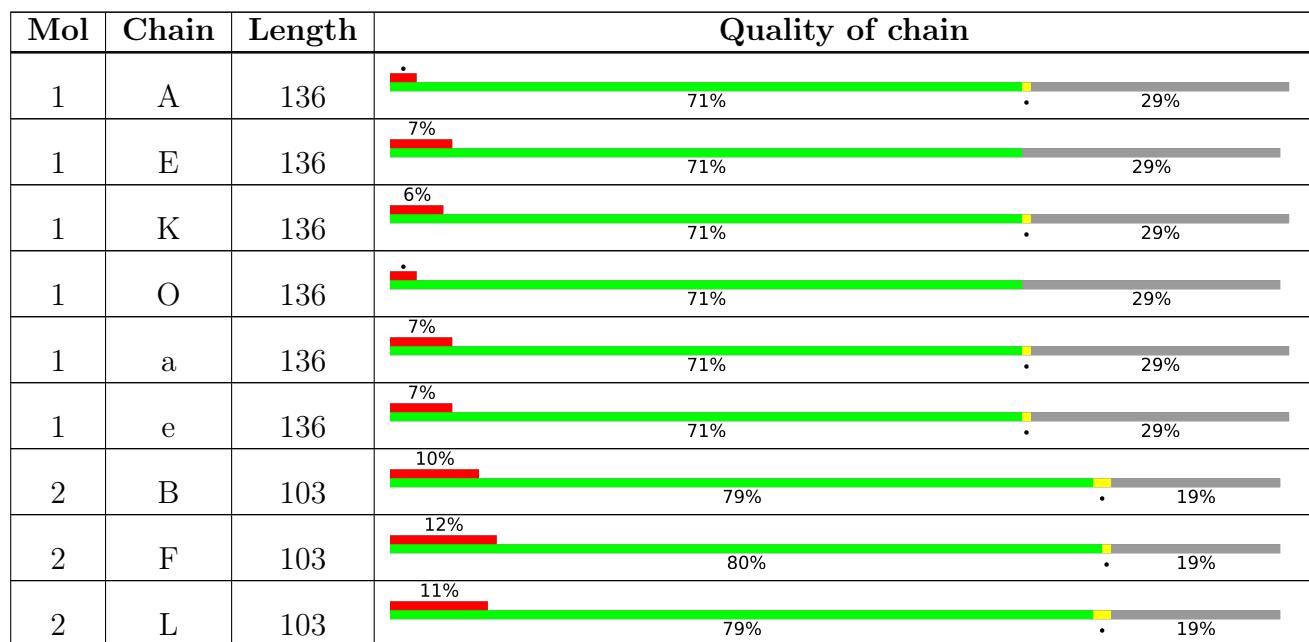
The reported resolution of this entry is 7.20 Å.

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	Percentile Ranks	Value
Ramachandran outliers		0
Sidechain outliers		0.5%

Worse   *Better*

▌ Percentile relative to all structures

▯ Percentile relative to all EM structures

Metric	Whole archive (#Entries)	EM structures (#Entries)
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=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	136	71% • 29%
1	E	136	7% / 71% 29%
1	K	136	6% / 71% • 29%
1	O	136	71% 29%
1	a	136	7% / 71% • 29%
1	e	136	7% / 71% • 29%
2	B	103	10% / 79% • 19%
2	F	103	12% / 80% • 19%
2	L	103	11% / 79% • 19%

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Mol	Chain	Length	Quality of chain
2	P	103	11% / 78% / 19%
2	b	103	13% / 80% / 19%
2	f	103	11% / 80% / 19%
3	C	147	13% / 74% / 26%
3	G	147	12% / 74% / 26%
3	M	147	14% / 74% / 26%
3	Q	147	12% / 74% / 26%
3	c	147	15% / 73% / 26%
3	g	147	20% / 74% / 26%
4	D	126	9% / 75% / 25%
4	H	126	9% / 75% / 25%
4	N	126	10% / 75% / 25%
4	R	126	8% / 75% / 25%
4	d	126	13% / 75% / 25%
4	h	126	16% / 75% / 25%
5	u	218	25% / 34% / 66%
6	I	522	97%
7	J	520	98%

2 Entry composition ⓘ

There are 7 unique types of molecules in this entry. The entry contains 40119 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 Histone H3.2.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	97	Total 798	C 505	N 153	O 138	S 2	0	0
1	E	97	Total 798	C 505	N 153	O 138	S 2	0	0
1	a	97	Total 798	C 505	N 153	O 138	S 2	0	0
1	e	97	Total 798	C 505	N 153	O 138	S 2	0	0
1	K	97	Total 798	C 505	N 153	O 138	S 2	0	0
1	O	97	Total 798	C 505	N 153	O 138	S 2	0	0

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	110	ALA	CYS	engineered mutation	UNP Q71DI3
E	110	ALA	CYS	engineered mutation	UNP Q71DI3
a	110	ALA	CYS	engineered mutation	UNP Q71DI3
e	110	ALA	CYS	engineered mutation	UNP Q71DI3
K	110	ALA	CYS	engineered mutation	UNP Q71DI3
O	110	ALA	CYS	engineered mutation	UNP Q71DI3

- Molecule 2 is a protein called Histone H4.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	83	Total 662	C 418	N 129	O 114	S 1	0	0
2	F	83	Total 662	C 418	N 129	O 114	S 1	0	0
2	b	83	Total 662	C 418	N 129	O 114	S 1	0	0
2	f	83	Total 662	C 418	N 129	O 114	S 1	0	0

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Mol	Chain	Residues	Atoms					AltConf	Trace
2	L	83	Total	C	N	O	S	0	0
			662	418	129	114	1		
2	P	83	Total	C	N	O	S	0	0
			662	418	129	114	1		

- Molecule 3 is a protein called Histone H2A type 1-B/E.

Mol	Chain	Residues	Atoms				AltConf	Trace
3	C	109	Total	C	N	O	0	0
			840	529	166	145		
3	G	109	Total	C	N	O	0	0
			840	529	166	145		
3	c	109	Total	C	N	O	0	0
			840	529	166	145		
3	g	109	Total	C	N	O	0	0
			840	529	166	145		
3	M	109	Total	C	N	O	0	0
			840	529	166	145		
3	Q	109	Total	C	N	O	0	0
			840	529	166	145		

There are 102 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	-17	HIS	-	expression tag	UNP P04908
C	-16	HIS	-	expression tag	UNP P04908
C	-15	HIS	-	expression tag	UNP P04908
C	-14	HIS	-	expression tag	UNP P04908
C	-13	HIS	-	expression tag	UNP P04908
C	-12	HIS	-	expression tag	UNP P04908
C	-11	GLU	-	expression tag	UNP P04908
C	-10	ASN	-	expression tag	UNP P04908
C	-9	LEU	-	expression tag	UNP P04908
C	-8	TYR	-	expression tag	UNP P04908
C	-7	PHE	-	expression tag	UNP P04908
C	-6	GLN	-	expression tag	UNP P04908
C	-5	SER	-	expression tag	UNP P04908
C	-4	ASN	-	expression tag	UNP P04908
C	-3	ALA	-	expression tag	UNP P04908
C	-2	PRO	-	expression tag	UNP P04908
C	-1	TRP	-	expression tag	UNP P04908
G	-17	HIS	-	expression tag	UNP P04908

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Chain	Residue	Modelled	Actual	Comment	Reference
G	-16	HIS	-	expression tag	UNP P04908
G	-15	HIS	-	expression tag	UNP P04908
G	-14	HIS	-	expression tag	UNP P04908
G	-13	HIS	-	expression tag	UNP P04908
G	-12	HIS	-	expression tag	UNP P04908
G	-11	GLU	-	expression tag	UNP P04908
G	-10	ASN	-	expression tag	UNP P04908
G	-9	LEU	-	expression tag	UNP P04908
G	-8	TYR	-	expression tag	UNP P04908
G	-7	PHE	-	expression tag	UNP P04908
G	-6	GLN	-	expression tag	UNP P04908
G	-5	SER	-	expression tag	UNP P04908
G	-4	ASN	-	expression tag	UNP P04908
G	-3	ALA	-	expression tag	UNP P04908
G	-2	PRO	-	expression tag	UNP P04908
G	-1	TRP	-	expression tag	UNP P04908
c	-17	HIS	-	expression tag	UNP P04908
c	-16	HIS	-	expression tag	UNP P04908
c	-15	HIS	-	expression tag	UNP P04908
c	-14	HIS	-	expression tag	UNP P04908
c	-13	HIS	-	expression tag	UNP P04908
c	-12	HIS	-	expression tag	UNP P04908
c	-11	GLU	-	expression tag	UNP P04908
c	-10	ASN	-	expression tag	UNP P04908
c	-9	LEU	-	expression tag	UNP P04908
c	-8	TYR	-	expression tag	UNP P04908
c	-7	PHE	-	expression tag	UNP P04908
c	-6	GLN	-	expression tag	UNP P04908
c	-5	SER	-	expression tag	UNP P04908
c	-4	ASN	-	expression tag	UNP P04908
c	-3	ALA	-	expression tag	UNP P04908
c	-2	PRO	-	expression tag	UNP P04908
c	-1	TRP	-	expression tag	UNP P04908
g	-17	HIS	-	expression tag	UNP P04908
g	-16	HIS	-	expression tag	UNP P04908
g	-15	HIS	-	expression tag	UNP P04908
g	-14	HIS	-	expression tag	UNP P04908
g	-13	HIS	-	expression tag	UNP P04908
g	-12	HIS	-	expression tag	UNP P04908
g	-11	GLU	-	expression tag	UNP P04908
g	-10	ASN	-	expression tag	UNP P04908
g	-9	LEU	-	expression tag	UNP P04908

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Chain	Residue	Modelled	Actual	Comment	Reference
g	-8	TYR	-	expression tag	UNP P04908
g	-7	PHE	-	expression tag	UNP P04908
g	-6	GLN	-	expression tag	UNP P04908
g	-5	SER	-	expression tag	UNP P04908
g	-4	ASN	-	expression tag	UNP P04908
g	-3	ALA	-	expression tag	UNP P04908
g	-2	PRO	-	expression tag	UNP P04908
g	-1	TRP	-	expression tag	UNP P04908
M	-17	HIS	-	expression tag	UNP P04908
M	-16	HIS	-	expression tag	UNP P04908
M	-15	HIS	-	expression tag	UNP P04908
M	-14	HIS	-	expression tag	UNP P04908
M	-13	HIS	-	expression tag	UNP P04908
M	-12	HIS	-	expression tag	UNP P04908
M	-11	GLU	-	expression tag	UNP P04908
M	-10	ASN	-	expression tag	UNP P04908
M	-9	LEU	-	expression tag	UNP P04908
M	-8	TYR	-	expression tag	UNP P04908
M	-7	PHE	-	expression tag	UNP P04908
M	-6	GLN	-	expression tag	UNP P04908
M	-5	SER	-	expression tag	UNP P04908
M	-4	ASN	-	expression tag	UNP P04908
M	-3	ALA	-	expression tag	UNP P04908
M	-2	PRO	-	expression tag	UNP P04908
M	-1	TRP	-	expression tag	UNP P04908
Q	-17	HIS	-	expression tag	UNP P04908
Q	-16	HIS	-	expression tag	UNP P04908
Q	-15	HIS	-	expression tag	UNP P04908
Q	-14	HIS	-	expression tag	UNP P04908
Q	-13	HIS	-	expression tag	UNP P04908
Q	-12	HIS	-	expression tag	UNP P04908
Q	-11	GLU	-	expression tag	UNP P04908
Q	-10	ASN	-	expression tag	UNP P04908
Q	-9	LEU	-	expression tag	UNP P04908
Q	-8	TYR	-	expression tag	UNP P04908
Q	-7	PHE	-	expression tag	UNP P04908
Q	-6	GLN	-	expression tag	UNP P04908
Q	-5	SER	-	expression tag	UNP P04908
Q	-4	ASN	-	expression tag	UNP P04908
Q	-3	ALA	-	expression tag	UNP P04908
Q	-2	PRO	-	expression tag	UNP P04908
Q	-1	TRP	-	expression tag	UNP P04908

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

Mol	Chain	Residues	Atoms					AltConf	Trace
4	D	95	Total 744	C 467	N 136	O 139	S 2	0	0
4	H	95	Total 744	C 467	N 136	O 139	S 2	0	0
4	d	95	Total 744	C 467	N 136	O 139	S 2	0	0
4	h	95	Total 744	C 467	N 136	O 139	S 2	0	0
4	N	95	Total 744	C 467	N 136	O 139	S 2	0	0
4	R	95	Total 744	C 467	N 136	O 139	S 2	0	0

• Molecule 5 is a protein called Histone H1.4.

Mol	Chain	Residues	Atoms				AltConf	Trace
5	u	75	Total 535	C 336	N 97	O 102	0	0

• Molecule 6 is a DNA chain called DNA (522-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
6	I	520	Total 10572	C 5020	N 1907	O 3125	P 520	0	0
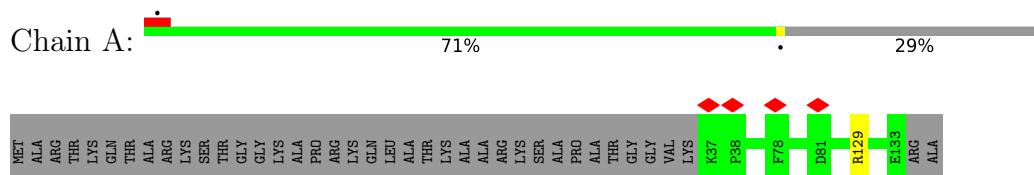
• Molecule 7 is a DNA chain called DNA (522-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
7	J	520	Total 10748	C 5077	N 2036	O 3115	P 520	0	0
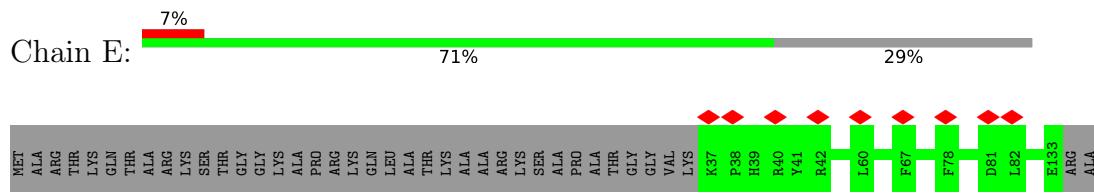
3 Residue-property plots ⓘ

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.
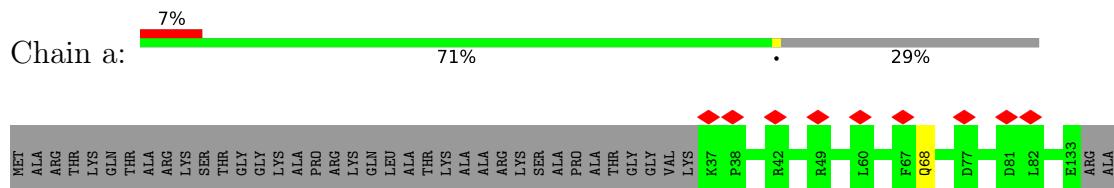
- Molecule 1: Histone H3.2
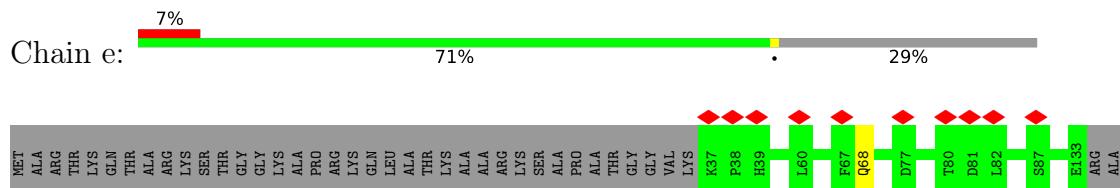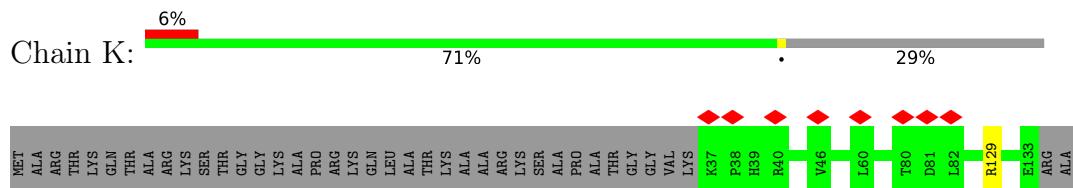
Chain A:

- Molecule 1: Histone H3.2

Chain E:

- Molecule 1: Histone H3.2

Chain a:
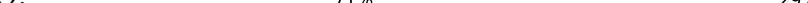
- Molecule 1: Histone H3.2
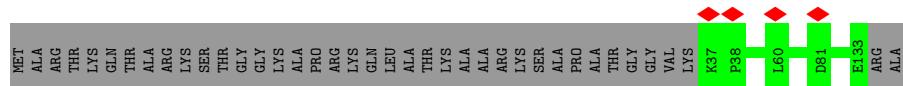
Chain e:

- Molecule 1: Histone H3.2

Chain K:

- Molecule 1: Histone H3.2

Chain O:

71% 29%

MET ALA ARG THR LYS GLN THR ALA ARG LYS SER THR GLY GLY LYS ALA PRO ARG LYS GLN LEU ALA THR LYS ALA ALA ARG LYS SER ALA PRO ALA THR GLY GLY VAL LYS K37 P38 L60 D81 E133 ARG ALA
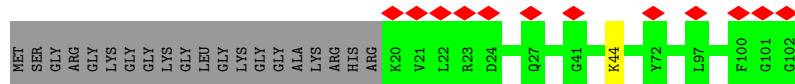
• Molecule 2: Histone H4

Chain B:

10%

79% 19%

MET SER GLY ARG GLY LYS GLY GLY LYS GLY LEU GLY LYS GLY GLY ALA LYS ARG HIS ARG K20 V21 L22 R23 D24 L62 Y72 K91 L97 F100 G101 G102

• Molecule 2: Histone H4

Chain F:

12%

80% 19%

MET SER GLY ARG GLY LYS GLY GLY LYS GLY LEU GLY LYS GLY GLY ALA LYS ARG HIS ARG K20 V21 L22 R23 D24 Q27 G41 K44 Y72 L97 F100 G101 G102
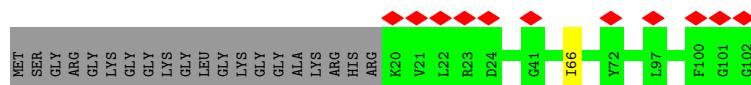
• Molecule 2: Histone H4

Chain b:

13%

80% 19%

MET SER GLY ARG GLY LYS GLY GLY LYS GLY LEU GLY LYS GLY GLY ALA LYS ARG HIS ARG K20 V21 L22 R23 D24 G41 G42 V43 K44 L58 Y72 L97 F100 G101 G102
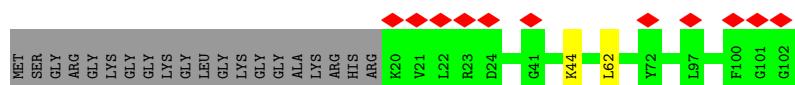
• Molecule 2: Histone H4

Chain f:

11%

80% 19%

MET SER GLY ARG GLY LYS GLY GLY LYS GLY LEU GLY LYS GLY GLY ALA LYS ARG HIS ARG K20 V21 L22 R23 D24 G41 I66 Y72 L97 F100 G101 G102
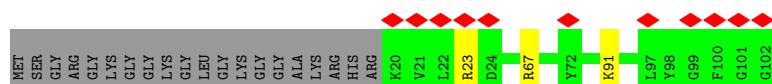
• Molecule 2: Histone H4

Chain L:

11%

79% 19%

MET SER GLY ARG GLY LYS GLY GLY LYS GLY LEU GLY LYS GLY GLY ALA LYS ARG HIS ARG K20 V21 L22 R23 D24 G41 K44 L62 Y72 L97 F100 G101 G102
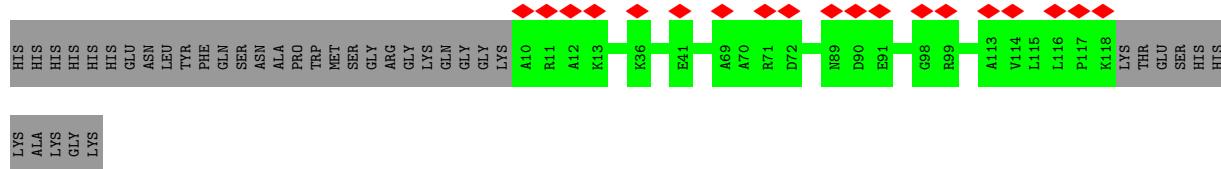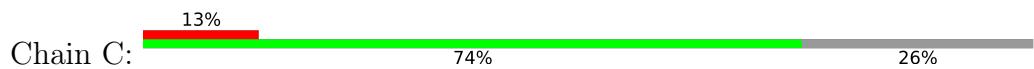
• Molecule 2: Histone H4

Chain P:

11%

78% 19%

MET SER GLY ARG GLY LYS GLY GLY LYS GLY LEU GLY LYS GLY GLY ALA LYS ARG HIS ARG K20 V21 L22 R23 D24 R67 Y72 K91 L97 Y98 G99 F100 G101 G102

• Molecule 3: Histone H2A type 1-B/E

Chain C:

• Molecule 3: Histone H2A type 1-B/E

Chain G:

• Molecule 3: Histone H2A type 1-B/E

Chain c:

• Molecule 3: Histone H2A type 1-B/E

Chain g:

• Molecule 3: Histone H2A type 1-B/E

Chain M:

HIS HIS LYS ALA LYS LYS

• Molecule 3: Histone H2A type 1-B/E

Chain Q:

12%

74%   26%

HIS HIS HIS HIS HIS GLU ASN LEU TYR PHE GLN SER ASN ALA PRO TRP MET SER GLY ARG GLY LYS GLN GLY GLY LYS A10 R11 A12 K13 A14 K15 K36 E41 D72 E91 K95 G98 R99 A113 V114 L115 L116 P117 K118 LYS THR GLU SER HIS HIS LYS

ALA LYS GLY LYS

• Molecule 4: Histone H2B type 1-K

Chain D:

9%

75%   25%

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 K30 R31 S32 R33 K34 E35 D51 T52 H82 S123 A124 LYS

• Molecule 4: Histone H2B type 1-K

Chain H:

9%

75%   25%

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 K30 R31 S32 R33 K34 E35 D51 T52 Y121 T122 S123 A124 LYS

• Molecule 4: Histone H2B type 1-K

Chain d:

13%

75%   25%

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 K30 R31 S32 R33 K34 E35 V48 H49 P50 D51 I89 K116 T119 K120 Y121 T122 S123 A124 LYS

• Molecule 4: Histone H2B type 1-K

Chain h:

16%

75%   25%

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 K30 R31 S32 R33 K34 E35 V44 P50 D51 H82 K85 I89 L106 A107 G114 T115 K116 Y121 T122 S123 A124 LYS

• Molecule 4: Histone H2B type 1-K

Chain N:

10%

75%   25%

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 K30 R31 S32 R33 K34 E35 D51 T52 I73 H82 A107 T122 S123 A124 LYS

• Molecule 4: Histone H2B type 1-K

Chain R:

8%

75% 25%

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 K30 R31 S32 R33 K34 E35 K85 L100 A107 T122 S123 A124 LYS

• Molecule 5: Histone H1.4

Chain u:

25%

34% 66%

SER GLU THR ALA ALA ALA PRO ALA PRO ALA PRO ALA PRO ALA GLU ALA PRO VAL LYS LYS THR LYS LYS LYS ALA ARG LYS SER ALA GLY ALA ALA LYS ARG LYS ALA S35 G36 P37 P38 V39 S40 E41 L42 I43 T44 K45 A46 V47 A48 A49 S50 K51 E52 R53 S54 G55 V56 A60 L61 K62

K63 A64 L65 A66 A67 A68 G69 Y70 D71 V72 E73 K74 N75 L81 G82 S85 L86 V87 S88 K89 G90 T91 L92 V93 K105 L106 N107 K108 K109 ALA ALA SER GLY GLU ALA LYS PRO LYS ALA LYS LYS ALA GLY ALA ALA LYS LYS LYS PRO ALA GLY ALA ALA LYS LYS PRO

LYS LYS ALA THR GLY ALA ALA THR PRO LYS LYS SER ALA LYS LYS THR PRO LYS LYS ALA LYS LYS PRO ALA ALA ALA GLY ALA LYS LYS ALA LYS SER PRO LYS LYS ALA LYS ALA ALA LYS PRO LYS LYS ALA LYS SER PRO LYS ALA LYS ALA VAL LYS PRO LYS ALA

ALA LYS PRO LYS THR ALA LYS PRO LYS ALA ALA LYS PRO LYS LYS ALA ALA ALA LYS LYS LYS

• Molecule 6: DNA (522-MER)

Chain I:

97%

DA DT T3 C4 C5 G6 G7 A8 T9 C10 C92 G112 T150 C163 G164 T165 G166 C167 G175 T180 C217 T237 T337 C338 T357 C358 C359 T513 T514 C515 C516 A517 G518 T519 G520 C521 C522

• Molecule 7: DNA (522-MER)

Chain J:

98%

G181 G182 C183 A184 C185 T186 G187 G188 G336 A340 T343 G344 G345 C351 C360 A385 G514 T524 G525 C526 T527 C528 G529 T541 G542 A689 G690 G691 G692 G693 A694 T695 C696 C697 G698 G699 A700

4   Experimental information ⓘ

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	174476	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 $(e^-/\text{Å}^2)$	60	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	0.213	Depositor
Minimum map value	-0.046	Depositor
Average map value	0.001	Depositor
Map value standard deviation	0.009	Depositor
Recommended contour level	0.0635	Depositor
Map size (Å)	419.99997, 419.99997, 419.99997	wwPDB
Map dimensions	200, 200, 200	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	2.1, 2.1, 2.1	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	0.39	0/810	0.70	0/1087
1	E	0.33	0/810	0.69	0/1087
1	K	0.35	0/810	0.65	0/1087
1	O	0.34	0/810	0.65	0/1087
1	a	0.32	0/810	0.70	0/1087
1	e	0.42	0/810	0.77	0/1087
2	B	0.35	0/669	0.73	1/894 (0.1%)
2	F	0.32	0/669	0.66	0/894
2	L	0.34	0/669	0.72	1/894 (0.1%)
2	P	0.34	0/669	0.73	0/894
2	b	0.33	0/669	0.74	1/894 (0.1%)
2	f	0.33	0/669	0.73	1/894 (0.1%)
3	C	0.31	0/850	0.62	0/1146
3	G	0.34	0/850	0.64	0/1146
3	M	0.33	0/850	0.67	0/1146
3	Q	0.32	0/850	0.62	0/1146
3	c	0.33	0/850	0.70	1/1146 (0.1%)
3	g	0.34	0/850	0.70	0/1146
4	D	0.41	0/755	0.77	0/1014
4	H	0.34	0/755	0.69	0/1014
4	N	0.39	0/755	0.75	0/1014
4	R	0.34	0/755	0.66	1/1014 (0.1%)
4	d	0.30	0/755	0.67	0/1014
4	h	0.36	0/755	0.67	0/1014
5	u	0.29	0/538	0.70	1/718 (0.1%)
6	I	0.69	2/11840 (0.0%)	1.05	13/18249 (0.1%)
7	J	0.67	2/12078 (0.0%)	1.00	12/18663 (0.1%)
All	All	0.56	4/42960 (0.0%)	0.90	32/62476 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
3	c	0	1

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	I	150	DT	O3'-P	-5.54	1.54	1.61
7	J	541	DT	C1'-N1	5.23	1.56	1.49
7	J	343	DT	C1'-N1	5.14	1.55	1.49
6	I	357	DT	O3'-P	5.13	1.67	1.61

All (32) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	I	150	DT	P-O3'-C3'	-10.64	106.93	119.70
6	I	217	DC	O4'-C4'-C3'	-7.56	101.47	106.00
3	c	72	ASP	CB-CG-OD1	7.39	124.95	118.30
7	J	344	DG	O5'-P-OP1	-7.19	99.23	105.70
6	I	175	DG	O4'-C1'-N9	6.62	112.63	108.00
6	I	150	DT	OP2-P-O3'	6.50	119.51	105.20
7	J	514	DG	O4'-C1'-N9	6.06	112.24	108.00
6	I	112	DG	O4'-C4'-C3'	-6.03	102.09	104.50
6	I	359	DC	C4'-C3'-O3'	-5.94	94.84	109.70
7	J	529	DG	O4'-C1'-N9	5.83	112.08	108.00
7	J	524	DT	O4'-C1'-N1	5.78	112.05	108.00
6	I	167	DC	O4'-C1'-N1	5.78	112.05	108.00
7	J	340	DA	P-O3'-C3'	5.75	126.60	119.70
7	J	527	DT	O4'-C1'-N1	5.74	112.02	108.00
7	J	542	DG	C3'-C2'-C1'	-5.73	95.62	102.50
2	b	58	LEU	CA-CB-CG	5.68	128.37	115.30
6	I	92	DC	O4'-C4'-C3'	-5.65	102.24	104.50
7	J	336	DG	O4'-C1'-N9	5.49	111.84	108.00
6	I	165	DT	O4'-C1'-N1	5.48	111.83	108.00
2	L	62	LEU	CA-CB-CG	5.43	127.80	115.30
4	R	100	LEU	CA-CB-CG	5.41	127.73	115.30
7	J	351	DC	O4'-C1'-N1	5.38	111.76	108.00
5	u	92	LEU	CA-CB-CG	5.26	127.40	115.30
6	I	237	DT	O4'-C4'-C3'	-5.25	102.40	104.50
2	f	66	ILE	CG1-CB-CG2	-5.21	99.93	111.40
7	J	345	DG	C1'-O4'-C4'	-5.20	104.90	110.10
7	J	526	DC	O4'-C1'-N1	5.17	111.62	108.00
2	B	62	LEU	CA-CB-CG	5.17	127.19	115.30
6	I	163	DC	O5'-P-OP1	-5.16	101.05	105.70
6	I	180	DT	C3'-C2'-C1'	-5.13	96.34	102.50

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
6	I	175	DG	C1'-O4'-C4'	-5.07	105.03	110.10
7	J	351	DC	C3'-C2'-C1'	-5.07	96.42	102.50

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
3	c	42	ARG	Sidechain

5.2 Too-close contacts ⓘ

Due to software issues we are unable to calculate clashes - this section is therefore empty.

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	95/136 (70%)	94 (99%)	1 (1%)	0	100	100
1	E	95/136 (70%)	94 (99%)	1 (1%)	0	100	100
1	K	95/136 (70%)	95 (100%)	0	0	100	100
1	O	95/136 (70%)	93 (98%)	2 (2%)	0	100	100
1	a	95/136 (70%)	95 (100%)	0	0	100	100
1	e	95/136 (70%)	94 (99%)	1 (1%)	0	100	100
2	B	81/103 (79%)	80 (99%)	1 (1%)	0	100	100
2	F	81/103 (79%)	80 (99%)	1 (1%)	0	100	100
2	L	81/103 (79%)	78 (96%)	3 (4%)	0	100	100
2	P	81/103 (79%)	80 (99%)	1 (1%)	0	100	100
2	b	81/103 (79%)	80 (99%)	1 (1%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	f	81/103 (79%)	80 (99%)	1 (1%)	0	100	100
3	C	107/147 (73%)	105 (98%)	2 (2%)	0	100	100
3	G	107/147 (73%)	106 (99%)	1 (1%)	0	100	100
3	M	107/147 (73%)	104 (97%)	3 (3%)	0	100	100
3	Q	107/147 (73%)	105 (98%)	2 (2%)	0	100	100
3	c	107/147 (73%)	103 (96%)	4 (4%)	0	100	100
3	g	107/147 (73%)	103 (96%)	4 (4%)	0	100	100
4	D	93/126 (74%)	93 (100%)	0	0	100	100
4	H	93/126 (74%)	92 (99%)	1 (1%)	0	100	100
4	N	93/126 (74%)	92 (99%)	1 (1%)	0	100	100
4	R	93/126 (74%)	93 (100%)	0	0	100	100
4	d	93/126 (74%)	93 (100%)	0	0	100	100
4	h	93/126 (74%)	92 (99%)	1 (1%)	0	100	100
5	u	73/218 (34%)	72 (99%)	1 (1%)	0	100	100
All	All	2329/3290 (71%)	2296 (99%)	33 (1%)	0	100	100

There are no Ramachandran outliers to report.

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	84/110 (76%)	83 (99%)	1 (1%)	71	83
1	E	84/110 (76%)	84 (100%)	0	100	100
1	K	84/110 (76%)	83 (99%)	1 (1%)	71	83
1	O	84/110 (76%)	84 (100%)	0	100	100
1	a	84/110 (76%)	83 (99%)	1 (1%)	71	83
1	e	84/110 (76%)	83 (99%)	1 (1%)	71	83
2	B	68/79 (86%)	67 (98%)	1 (2%)	65	80

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	F	68/79 (86%)	67 (98%)	1 (2%)	65	80
2	L	68/79 (86%)	67 (98%)	1 (2%)	65	80
2	P	68/79 (86%)	65 (96%)	3 (4%)	28	53
2	b	68/79 (86%)	68 (100%)	0	100	100
2	f	68/79 (86%)	68 (100%)	0	100	100
3	C	85/116 (73%)	85 (100%)	0	100	100
3	G	85/116 (73%)	85 (100%)	0	100	100
3	M	85/116 (73%)	85 (100%)	0	100	100
3	Q	85/116 (73%)	85 (100%)	0	100	100
3	c	85/116 (73%)	85 (100%)	0	100	100
3	g	85/116 (73%)	85 (100%)	0	100	100
4	D	81/105 (77%)	81 (100%)	0	100	100
4	H	81/105 (77%)	81 (100%)	0	100	100
4	N	81/105 (77%)	81 (100%)	0	100	100
4	R	81/105 (77%)	81 (100%)	0	100	100
4	d	81/105 (77%)	81 (100%)	0	100	100
4	h	81/105 (77%)	81 (100%)	0	100	100
5	u	57/145 (39%)	57 (100%)	0	100	100
All	All	1965/2605 (75%)	1955 (100%)	10 (0%)	89	93

All (10) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	129	ARG
2	B	91	LYS
2	F	44	LYS
1	a	68	GLN
1	e	68	GLN
1	K	129	ARG
2	L	44	LYS
2	P	23	ARG
2	P	67	ARG
2	P	91	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	E	93	GLN
1	a	55	GLN
1	a	93	GLN
1	e	93	GLN
4	h	84	ASN
1	O	55	GLN

5.3.3　RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5　Carbohydrates ⓘ

There are no monosaccharides 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.
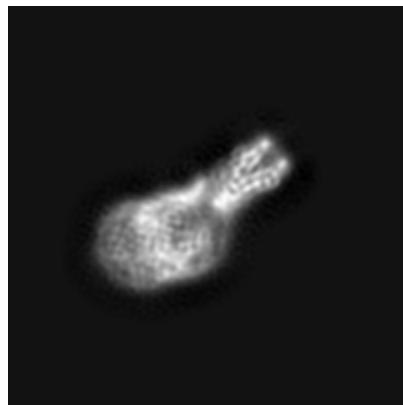
6 Map visualisation (i)

This section contains visualisations of the EMDB entry EMD-13357. These allow visual inspection of the internal detail of the map and identification of artifacts.
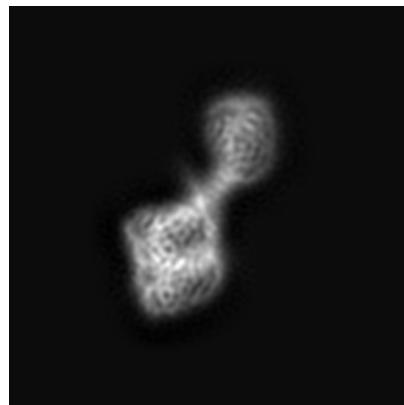
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections (i)
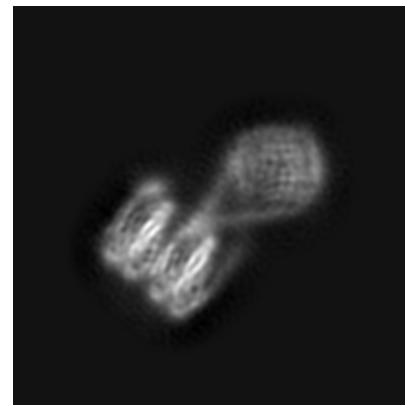
6.1.1 Primary map

X	Y	Z

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

6.2 Central slices (i)

6.2.1 Primary map

X Index: 100	Y Index: 100	Z Index: 100
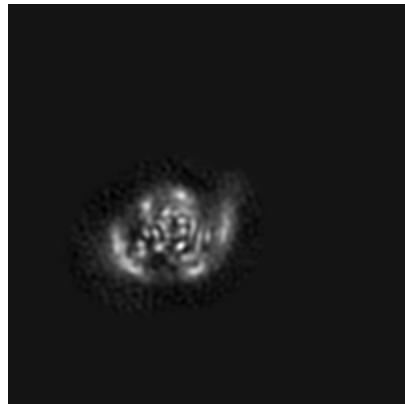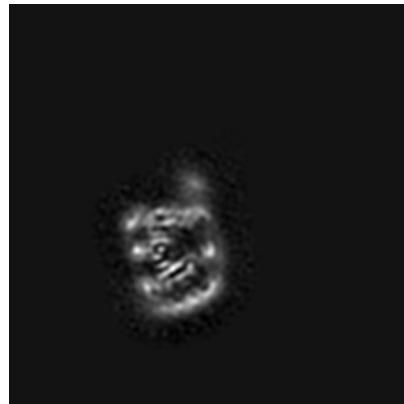
The images above show central slices of the map in three orthogonal directions.

6.3　Largest variance slices ⓘ

6.3.1　Primary map
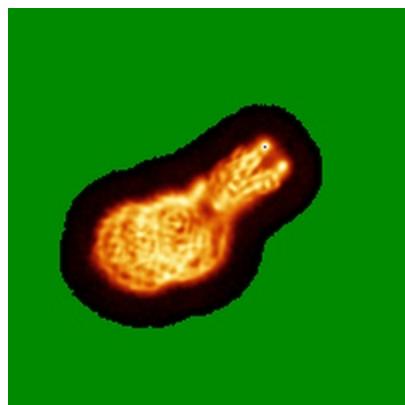
| X Index: 70 | Y Index: 74 | Z Index: 74 |
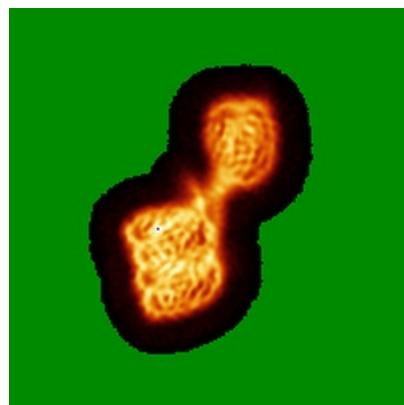
The images above show the largest variance slices of the map in three orthogonal directions.

6.4　Orthogonal standard-deviation projections (False-color) ⓘ
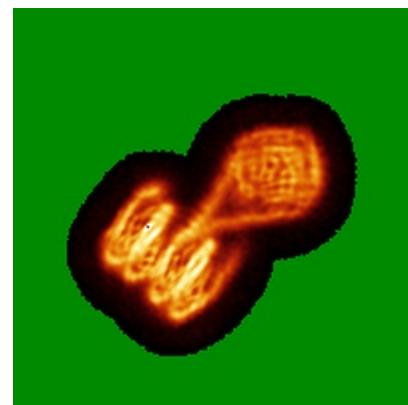
6.4.1　Primary map

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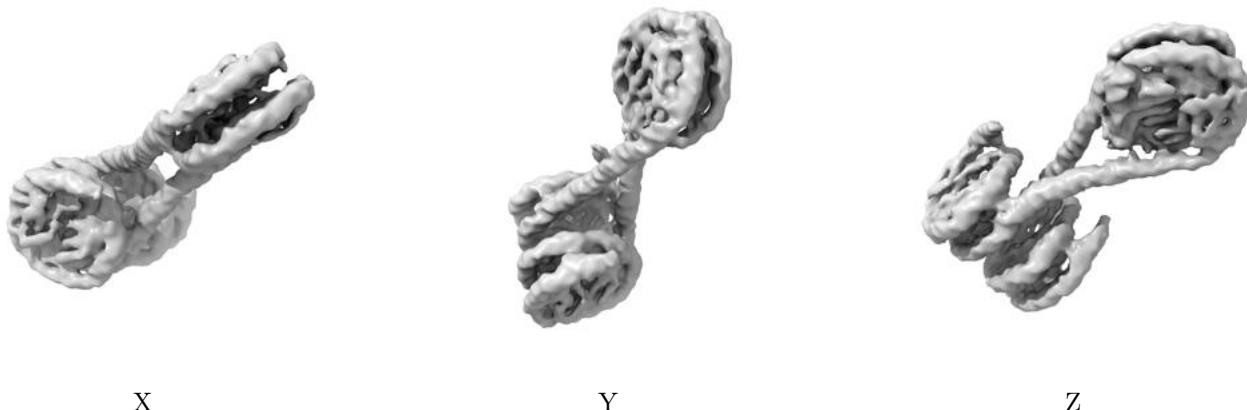
The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

6.5 Orthogonal surface views ⓘ

6.5.1 Primary map

X   Y   Z

The images above show the 3D surface view of the map at the recommended contour level 0.0635. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.
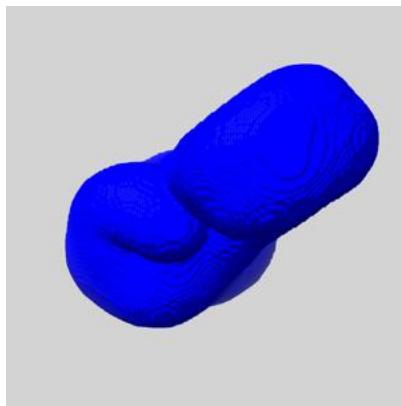
6.6　Mask visualisation ⓘ

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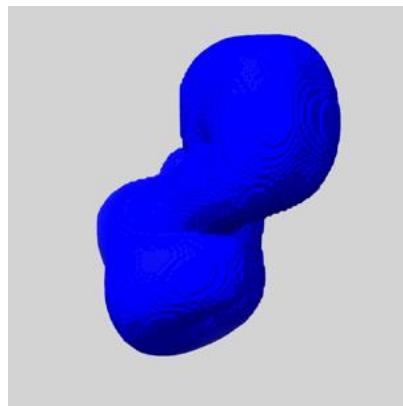
A mask typically either:

- Encompasses the whole structure

- Separates out a domain, a functional unit, a monomer or an area of interest from a larger structure
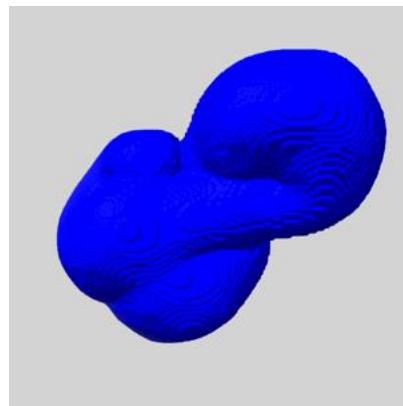
6.6.1　emd_13357_msk_1.map ⓘ

X　　　　　　　　　　　　　　Y　　　　　　　　　　　　　　Z
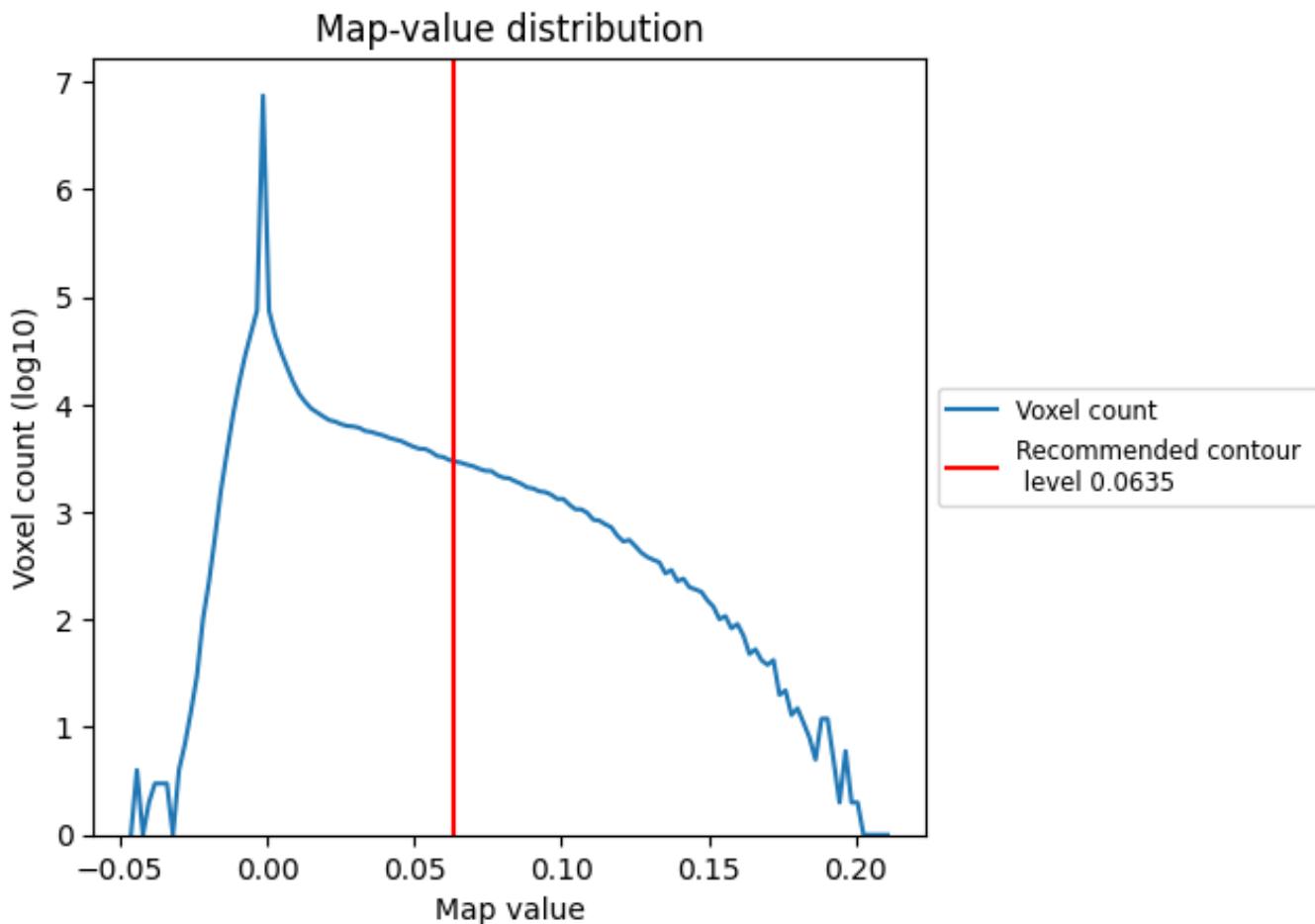
7 Map analysis ⓘ
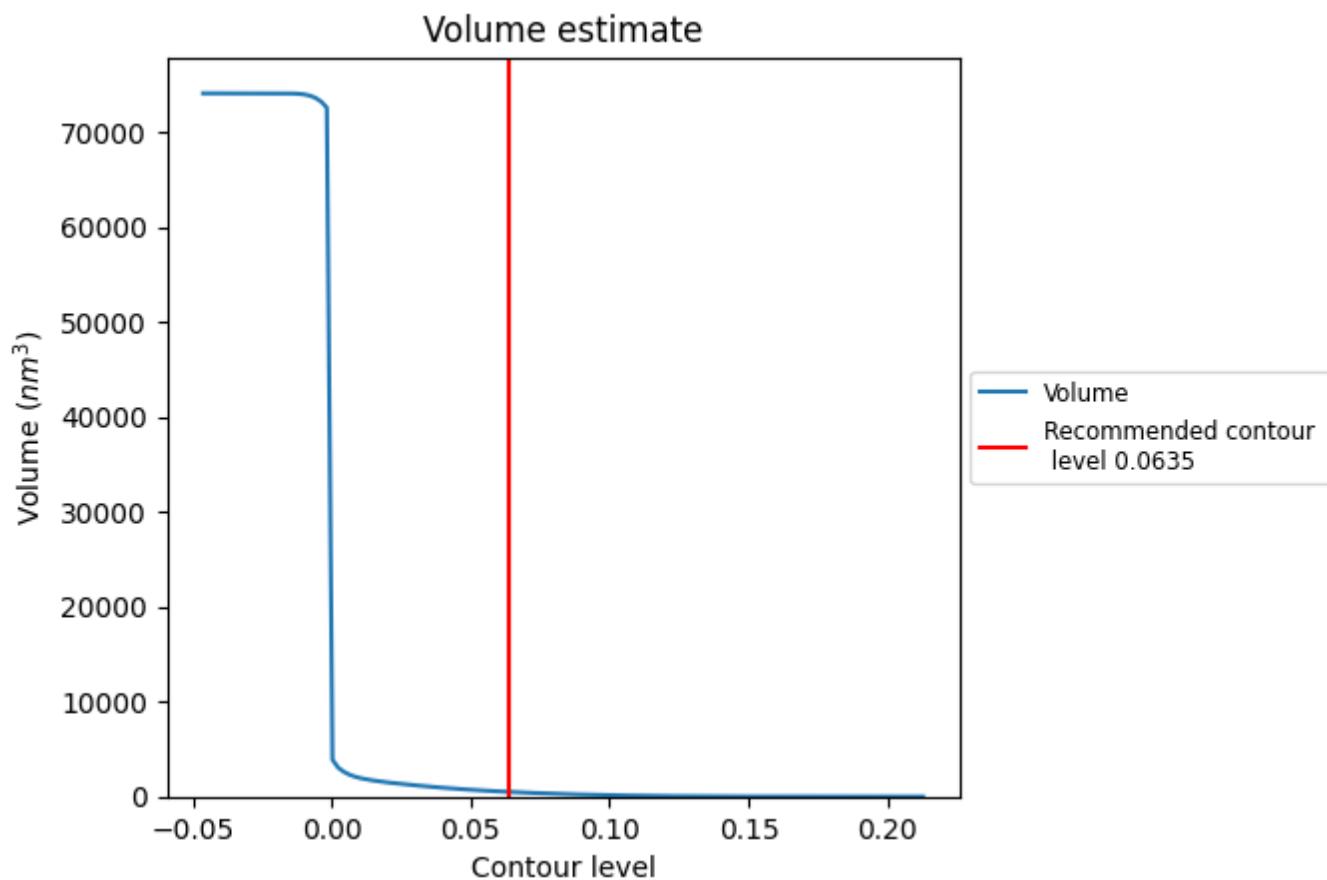
This section contains the results of statistical analysis of the map.

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.
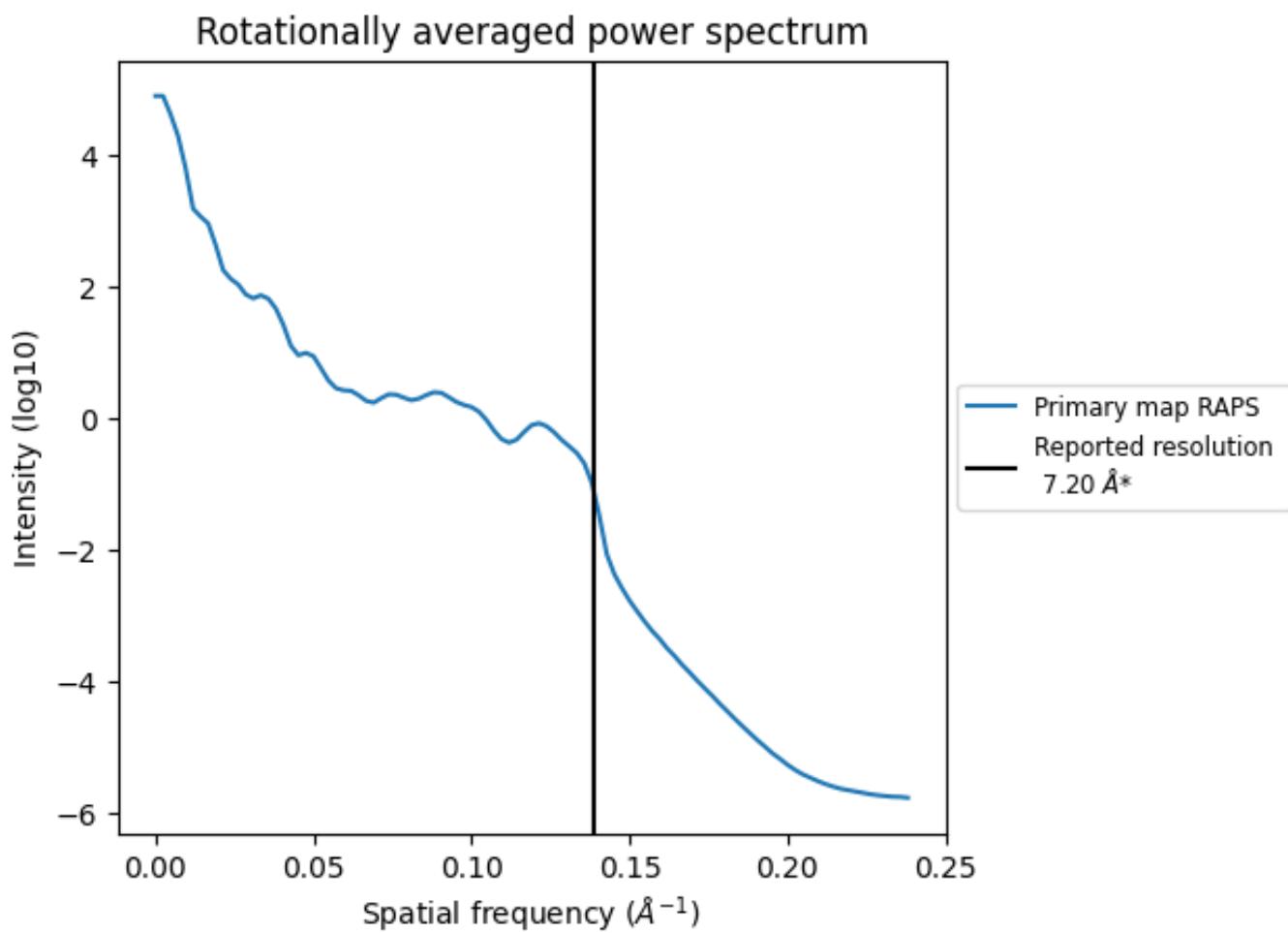
7.2 Volume estimate ⓘ

The volume at the recommended contour level is 496 nm^3; this corresponds to an approximate mass of 448 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 ⓘ
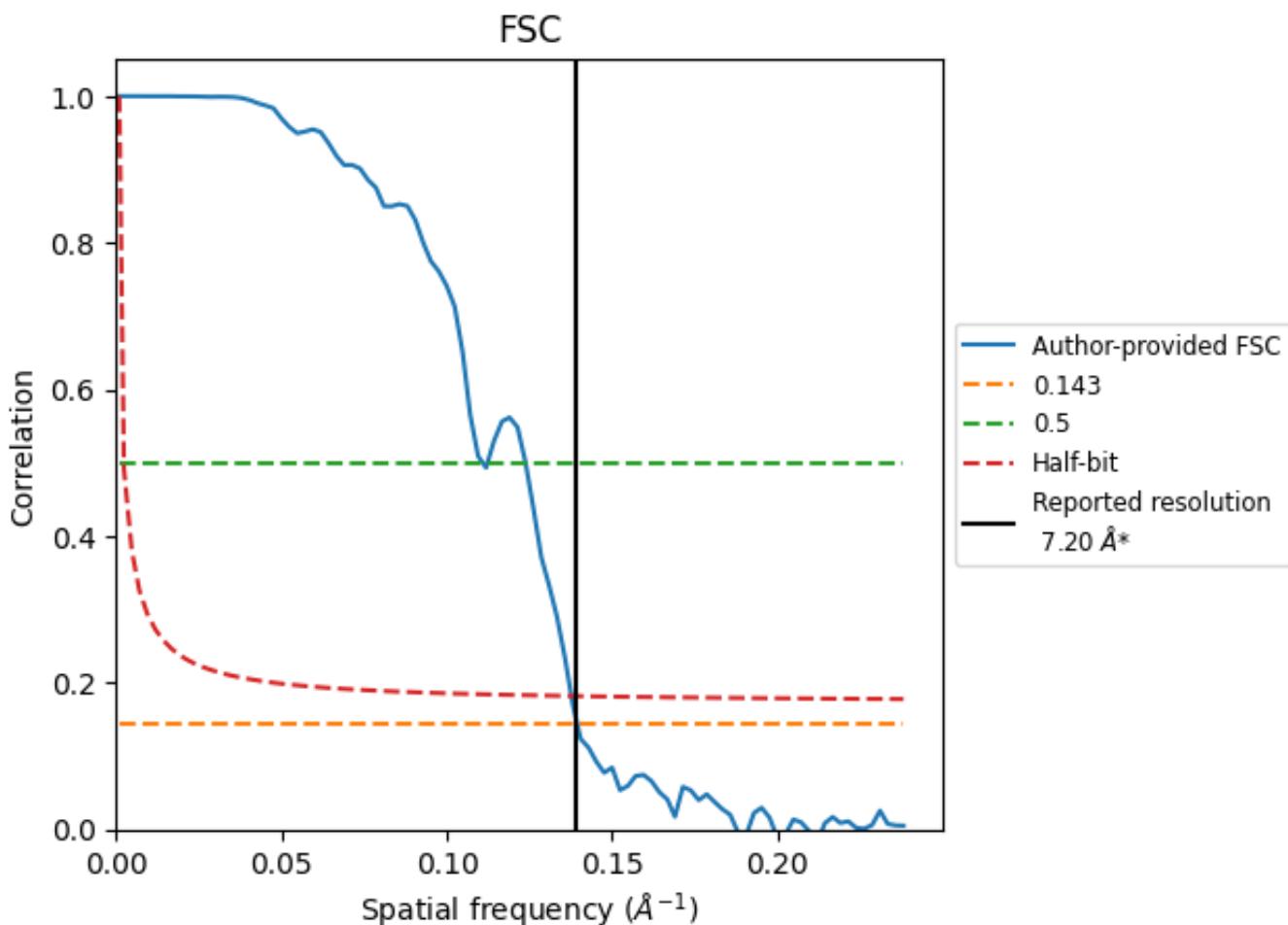
*Reported resolution corresponds to spatial frequency of 0.139 Å^{-1}

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 0.139 Å^{-1}

8.2 Resolution estimates (i)
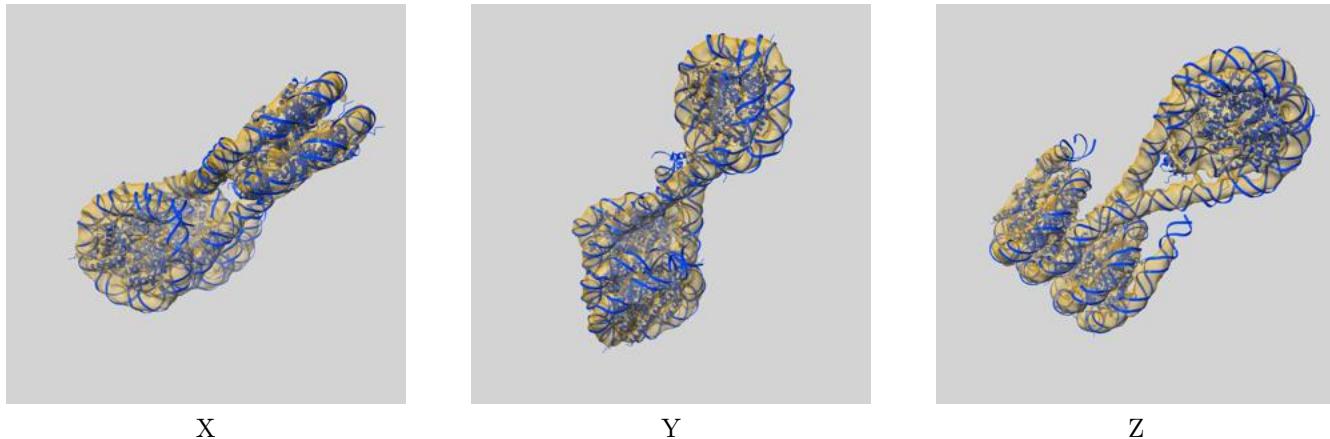
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	7.20	-	-
Author-provided FSC curve	7.17	9.02	7.26
Unmasked-calculated*	-	-	-

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps.

9 Map-model fit (i)
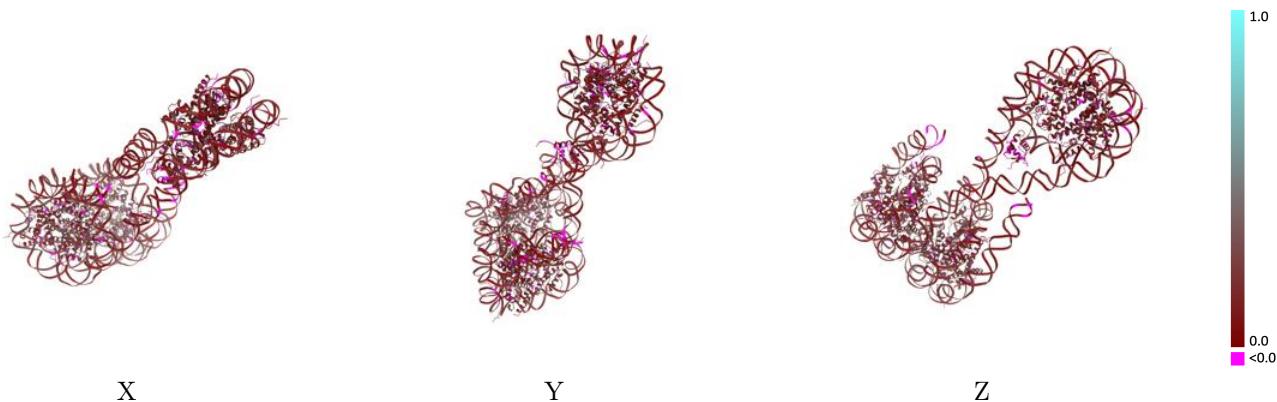
This section contains information regarding the fit between EMDB map EMD-13357 and PDB model 7PEU. Per-residue inclusion information can be found in section 3 on page 9.

9.1 Map-model overlay (i)
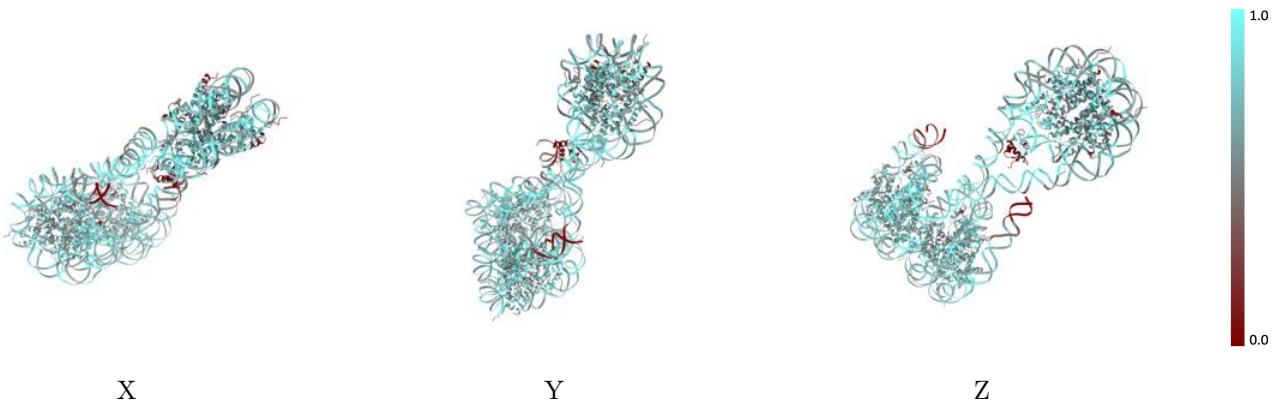
| X | Y | Z |

The images above show the 3D surface view of the map at the recommended contour level 0.0635 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
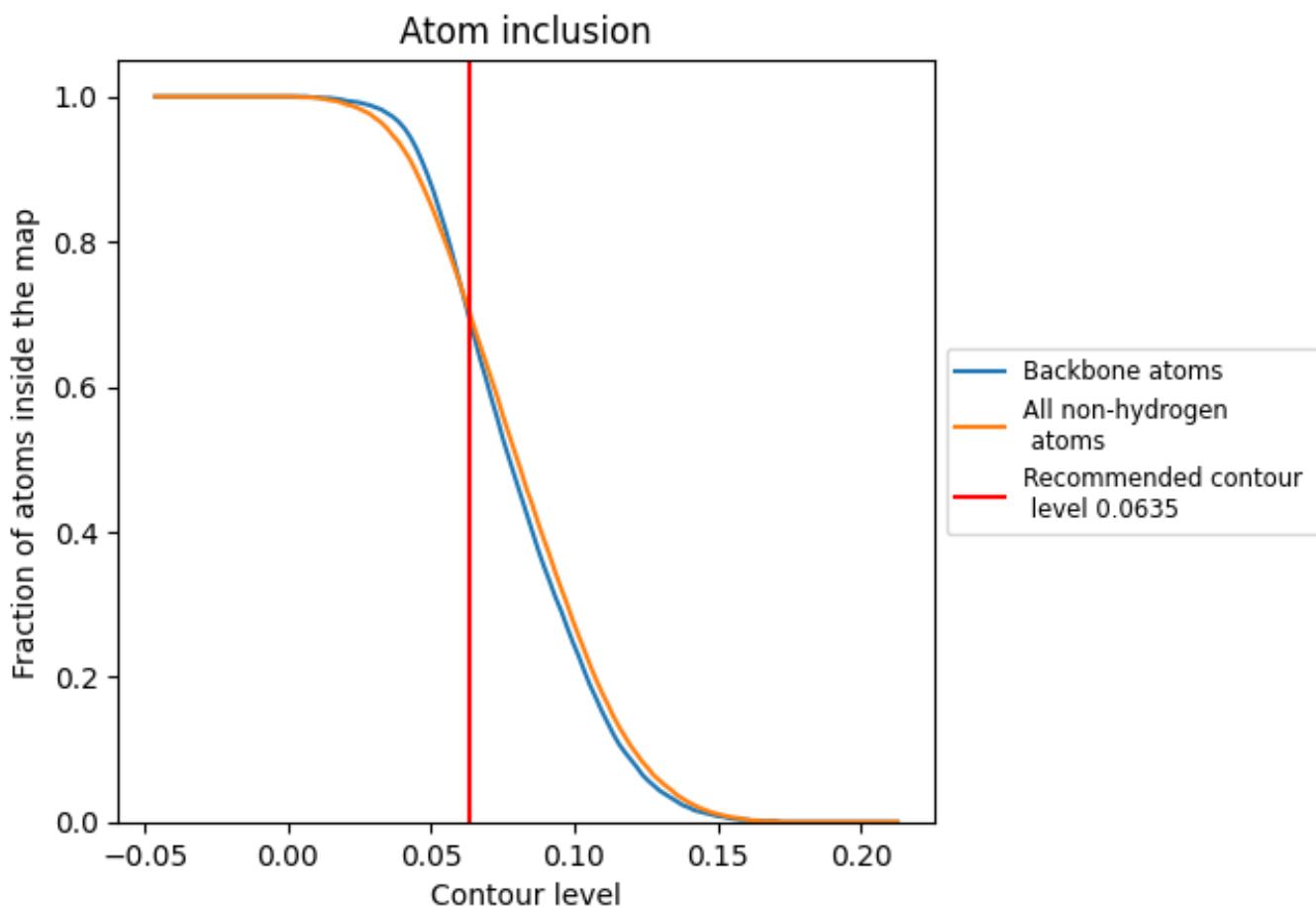
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.0635).

9.4 Atom inclusion ⓘ

At the recommended contour level, 69% of all backbone atoms, 70% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary ⓘ

The table lists the average atom inclusion at the recommended contour level (0.0635) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.7010	0.1380
A	0.7800	0.1280
B	0.7280	0.1450
C	0.6700	0.1630
D	0.6900	0.1540
E	0.7450	0.1330
F	0.7000	0.1530
G	0.6580	0.1640
H	0.6850	0.1600
I	0.7260	0.1360
J	0.7150	0.1340
K	0.7620	0.1340
L	0.7090	0.1380
M	0.6470	0.1550
N	0.6790	0.1560
O	0.7940	0.1430
P	0.7150	0.1410
Q	0.6830	0.1620
R	0.6870	0.1460
a	0.7090	0.1210
b	0.6710	0.1300
c	0.6310	0.1540
d	0.6210	0.1400
e	0.6980	0.1210
f	0.6920	0.1360
g	0.6110	0.1540
h	0.6030	0.1390
u	0.2790	0.0440

1.0

0.0
<0.0