



Full wwPDB EM Validation Report ⓘ

Apr 14, 2025 – 04:53 PM EDT

PDB ID : 9MUD / pdb_00009mud
EMDB ID : EMD-48629
Title : Cryo-EM structure of CRISPR-associated cA4 bound Cat1 Pentagonal filament assembly
Authors : Majumder, P.; Patel, D.J.
Deposited on : 2025-01-13
Resolution : 3.40 Å(reported)

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

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

A user guide is available at

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

The types of validation reports are described at

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

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

EMDB validation analysis : 0.0.1.dev117
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) : 2.42

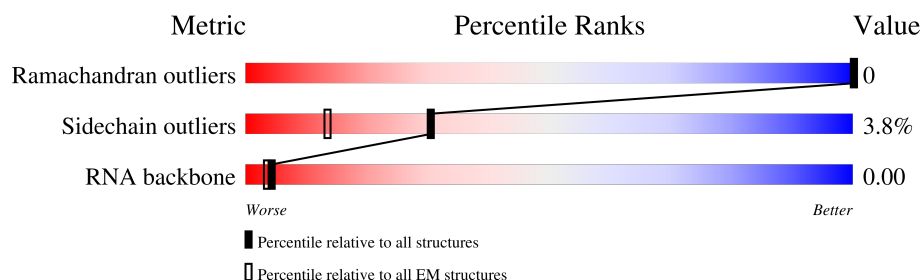
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.40 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.



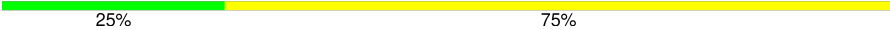
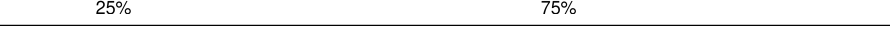
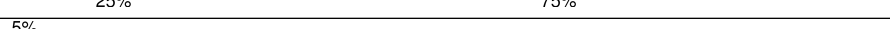
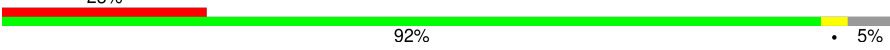
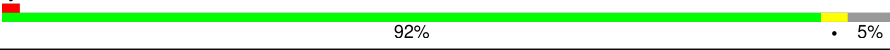
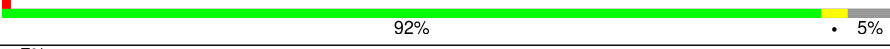
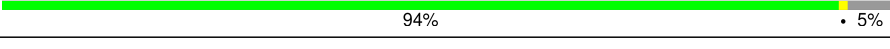
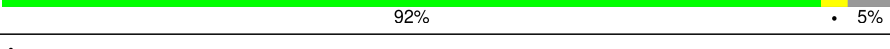
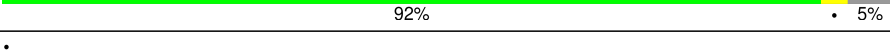
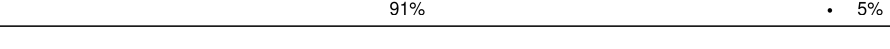
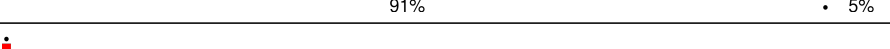
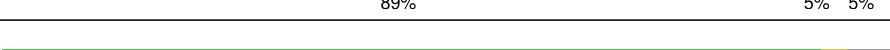
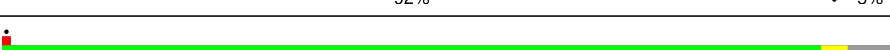
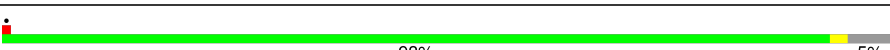
Metric	Whole archive (#Entries)	EM structures (#Entries)
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415
RNA backbone	6643	2191

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the EM map (all-atom inclusion $< 40\%$). The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	a	4	
1	b	4	
1	c	4	
1	d	4	
1	e	4	
1	f	4	
1	g	4	
1	h	4	

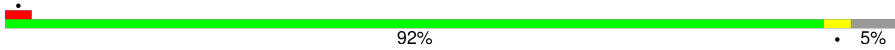
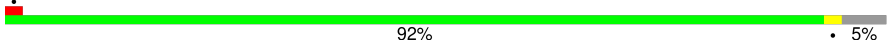
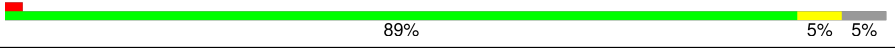
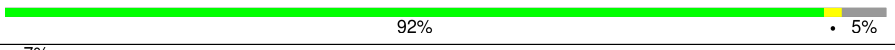
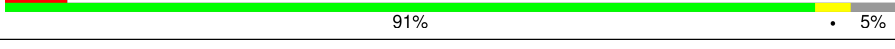
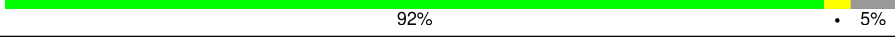
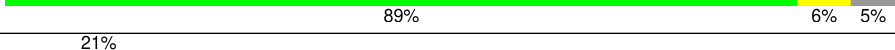
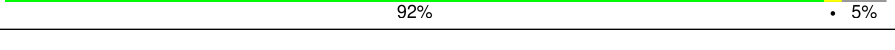
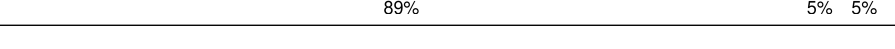
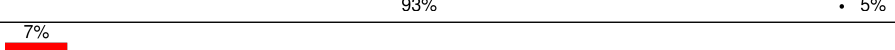
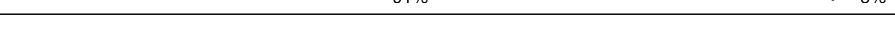
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Mol	Chain	Length	Quality of chain
1	i	4	
1	j	4	
1	k	4	
1	l	4	
1	m	4	
1	n	4	
1	o	4	
2	A	263	
2	B	263	
2	C	263	
2	D	263	
2	E	263	
2	F	263	
2	G	263	
2	H	263	
2	I	263	
2	J	263	
2	K	263	
2	L	263	
2	M	263	
2	N	263	
2	O	263	
2	P	263	
2	Q	263	
2	R	263	

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Mol	Chain	Length	Quality of chain
2	S	263	 92% 5% 5%
2	T	263	 92% 5% 5%
2	U	263	 89% 5% 5%
2	V	263	 92% 5% 5%
2	W	263	 7% 91% 5% 5%
2	X	263	 92% 5% 5%
2	Y	263	 89% 6% 5%
2	Z	263	 21% 92% 5% 5%
2	p	263	 89% 5% 5%
2	q	263	 93% 5% 5%
2	r	263	 7% 91% 5% 5%
2	s	263	 26% 91% 5% 5%

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 61980 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 RNA chain called RNA (5'-R(P*AP*AP*AP*A)-3').

Mol	Chain	Residues	Atoms					AltConf	Trace
1	a	4	Total	C	N	O	P	0	0
			88	40	20	24	4		
1	b	4	Total	C	N	O	P	0	0
			88	40	20	24	4		
1	d	4	Total	C	N	O	P	0	0
			88	40	20	24	4		
1	e	4	Total	C	N	O	P	0	0
			88	40	20	24	4		
1	f	4	Total	C	N	O	P	0	0
			88	40	20	24	4		
1	g	4	Total	C	N	O	P	0	0
			88	40	20	24	4		
1	h	4	Total	C	N	O	P	0	0
			88	40	20	24	4		
1	i	4	Total	C	N	O	P	0	0
			88	40	20	24	4		
1	j	4	Total	C	N	O	P	0	0
			88	40	20	24	4		
1	k	4	Total	C	N	O	P	0	0
			88	40	20	24	4		
1	l	4	Total	C	N	O	P	0	0
			88	40	20	24	4		
1	m	4	Total	C	N	O	P	0	0
			88	40	20	24	4		
1	n	4	Total	C	N	O	P	0	0
			88	40	20	24	4		
1	o	4	Total	C	N	O	P	0	0
			88	40	20	24	4		
1	c	4	Total	C	N	O	P	0	0
			88	40	20	24	4		

- Molecule 2 is a protein called Cat1 (CRISPR associated TIR 1) pentagonal filament.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	K	249	Total 2022	C 1316	N 340	O 361	S 5	0	0
2	L	249	Total 2022	C 1316	N 340	O 361	S 5	0	0
2	U	249	Total 2022	C 1316	N 340	O 361	S 5	0	0
2	V	249	Total 2022	C 1316	N 340	O 361	S 5	0	0
2	p	249	Total 2022	C 1316	N 340	O 361	S 5	0	0
2	q	249	Total 2022	C 1316	N 340	O 361	S 5	0	0
2	I	249	Total 2022	C 1316	N 340	O 361	S 5	0	0
2	J	249	Total 2022	C 1316	N 340	O 361	S 5	0	0
2	S	249	Total 2022	C 1316	N 340	O 361	S 5	0	0
2	T	249	Total 2022	C 1316	N 340	O 361	S 5	0	0
2	G	249	Total 2022	C 1316	N 340	O 361	S 5	0	0
2	H	249	Total 2022	C 1316	N 340	O 361	S 5	0	0
2	Q	249	Total 2022	C 1316	N 340	O 361	S 5	0	0
2	R	249	Total 2022	C 1316	N 340	O 361	S 5	0	0
2	E	249	Total 2022	C 1316	N 340	O 361	S 5	0	0
2	F	249	Total 2022	C 1316	N 340	O 361	S 5	0	0
2	O	249	Total 2022	C 1316	N 340	O 361	S 5	0	0
2	P	249	Total 2022	C 1316	N 340	O 361	S 5	0	0
2	C	249	Total 2022	C 1316	N 340	O 361	S 5	0	0
2	D	249	Total 2022	C 1316	N 340	O 361	S 5	0	0
2	M	249	Total 2022	C 1316	N 340	O 361	S 5	0	0
2	N	249	Total 2022	C 1316	N 340	O 361	S 5	0	0

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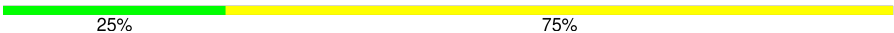
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Mol	Chain	Residues	Atoms					AltConf	Trace
2	W	249	Total	C	N	O	S	0	0
			2022	1316	340	361	5		
2	X	249	Total	C	N	O	S	0	0
			2022	1316	340	361	5		
2	A	249	Total	C	N	O	S	0	0
			2022	1316	340	361	5		
2	B	249	Total	C	N	O	S	0	0
			2022	1316	340	361	5		
2	Y	249	Total	C	N	O	S	0	0
			2022	1316	340	361	5		
2	Z	249	Total	C	N	O	S	0	0
			2022	1316	340	361	5		
2	r	249	Total	C	N	O	S	0	0
			2022	1316	340	361	5		
2	s	249	Total	C	N	O	S	0	0
			2022	1316	340	361	5		

3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion in map density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red diamond above a residue indicates a poor fit to the EM map for this residue (all-atom inclusion < 40%). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

- Molecule 1: RNA (5'-R(P*AP*AP*AP*A)-3')

Chain a: 

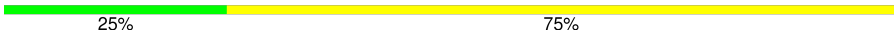


- Molecule 1: RNA (5'-R(P*AP*AP*AP*A)-3')

Chain b: 

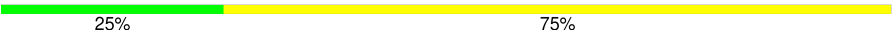


- Molecule 1: RNA (5'-R(P*AP*AP*AP*A)-3')

Chain d: 



- Molecule 1: RNA (5'-R(P*AP*AP*AP*A)-3')

Chain e: 



- Molecule 1: RNA (5'-R(P*AP*AP*AP*A)-3')

Chain f: 



- Molecule 1: RNA (5'-R(P*AP*AP*AP*A)-3')

Chain g: 



- Molecule 1: RNA (5'-R(P*AP*AP*AP*A)-3')

Chain h:  25% 75%



- Molecule 1: RNA (5'-R(P*AP*AP*AP*A)-3')

Chain i:  25% 75%

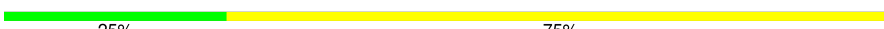


- Molecule 1: RNA (5'-R(P*AP*AP*AP*A)-3')

Chain j:  25% 75%



- Molecule 1: RNA (5'-R(P*AP*AP*AP*A)-3')

Chain k:  25% 75%



- Molecule 1: RNA (5'-R(P*AP*AP*AP*A)-3')

Chain l:  25% 75%



- Molecule 1: RNA (5'-R(P*AP*AP*AP*A)-3')

Chain m:  25% 75%



- Molecule 1: RNA (5'-R(P*AP*AP*AP*A)-3')

Chain n:  25% 75%

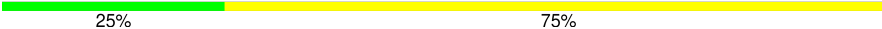


- Molecule 1: RNA (5'-R(P*AP*AP*AP*A)-3')

Chain o:  25% 75%



- Molecule 1: RNA (5'-R(P*AP*AP*AP*A)-3')

Chain c: 



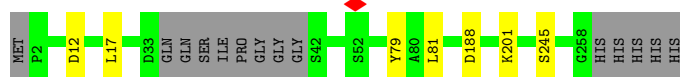
- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament

Chain K: 



- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament

Chain L: 

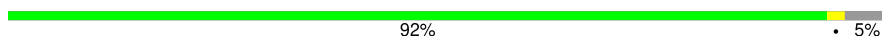


- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament

Chain U: 



- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament

Chain V: 

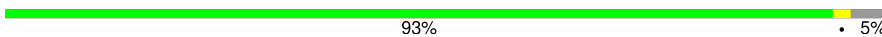


- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament

Chain p: 



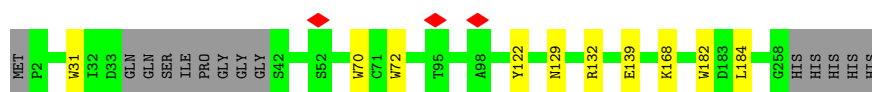
- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament

Chain q: 



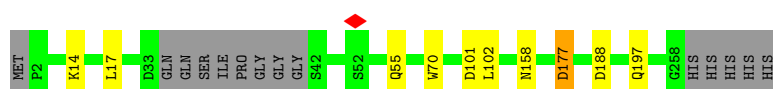
- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament

Chain I:  91% 5%



- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament

Chain J:  91% 5%

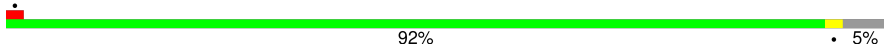


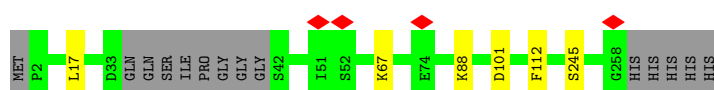
- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament

Chain S:  92% 5%

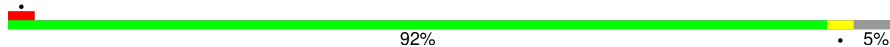


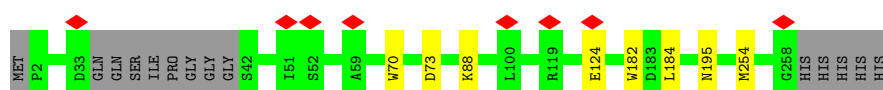
- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament

Chain T:  92% 5%

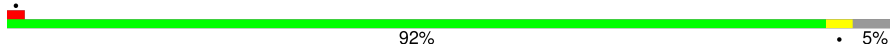


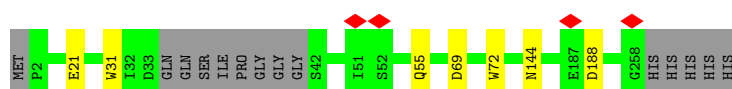
- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament

Chain G:  92% 5%



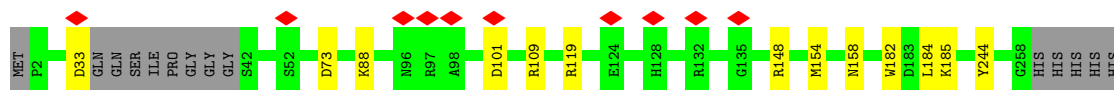
- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament

Chain H:  92% 5%



- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament

Chain Q:  90% 5% 5%



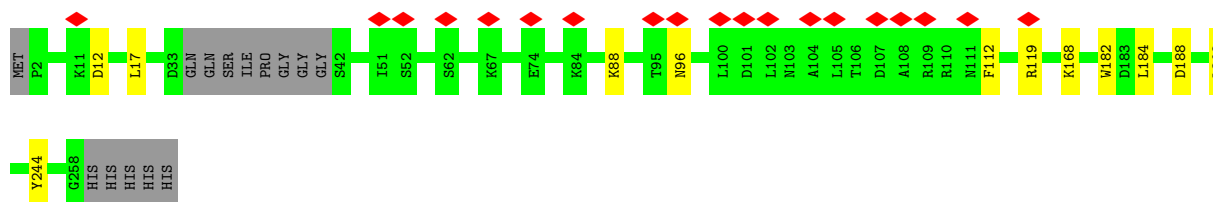
- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament

Chain R: 90% 5%



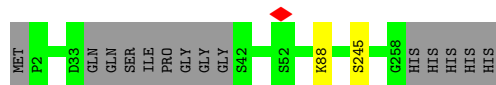
- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament

Chain E: 7% 90% 5% 5%



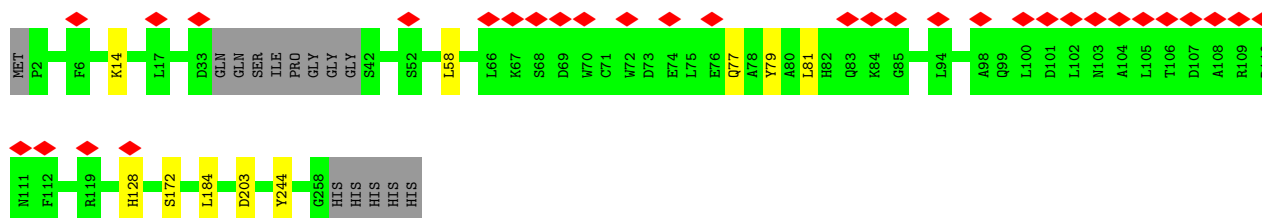
- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament

Chain F: 94% 5%



- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament

Chain O: 12% 91% 5%

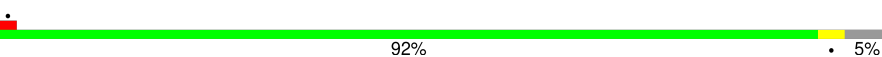


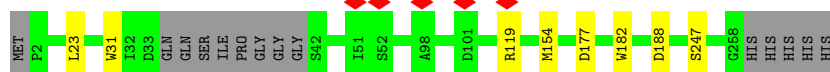
- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament

Chain P: 93% 5%

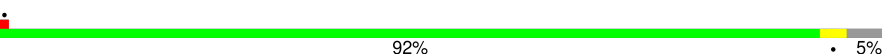


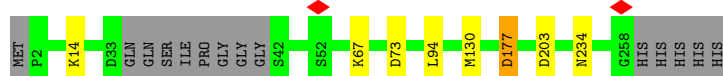
- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament

Chain C:  92% • 5%

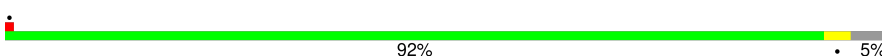


- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament

Chain D:  92% • 5%



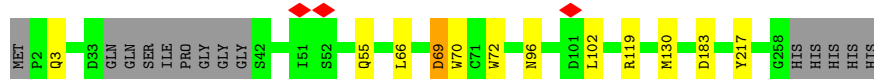
- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament

Chain M:  92% • 5%

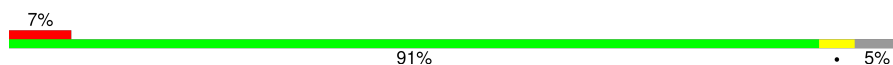


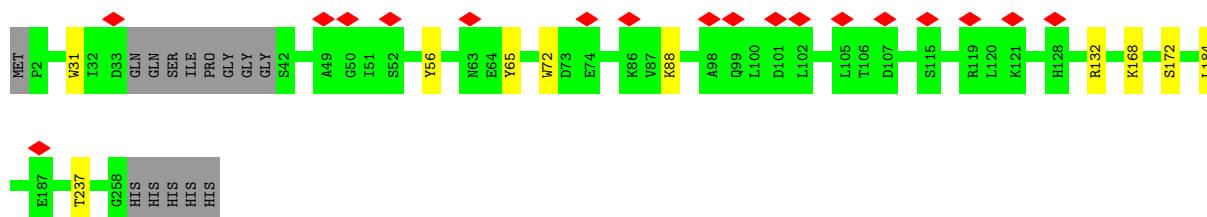
- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament

Chain N:  90% • 5%

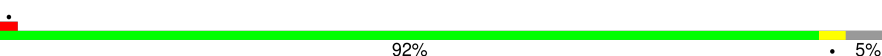


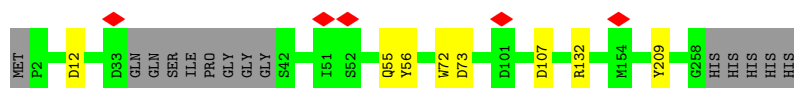
- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament

Chain W:  91% • 5%

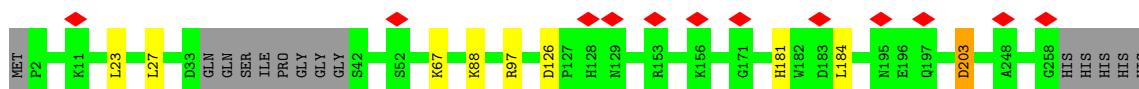
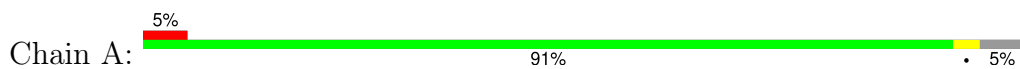


- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament

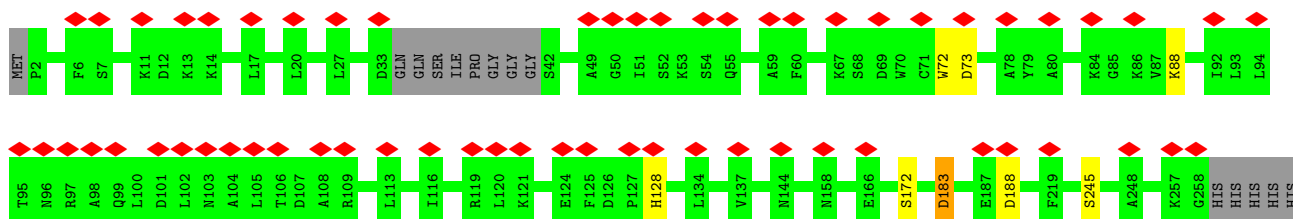
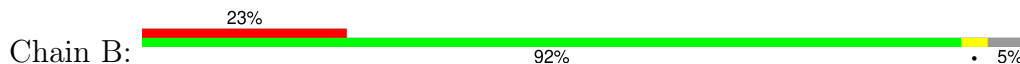
Chain X:  92% • 5%



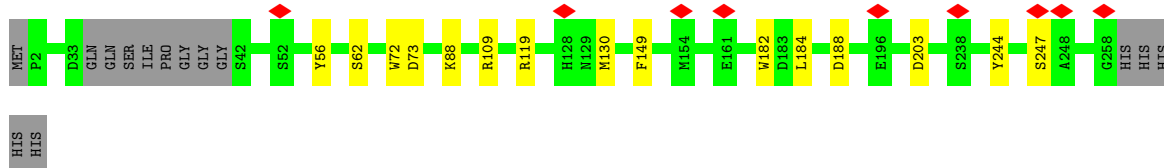
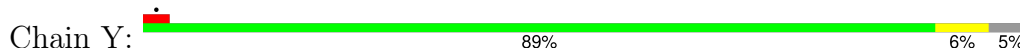
- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament



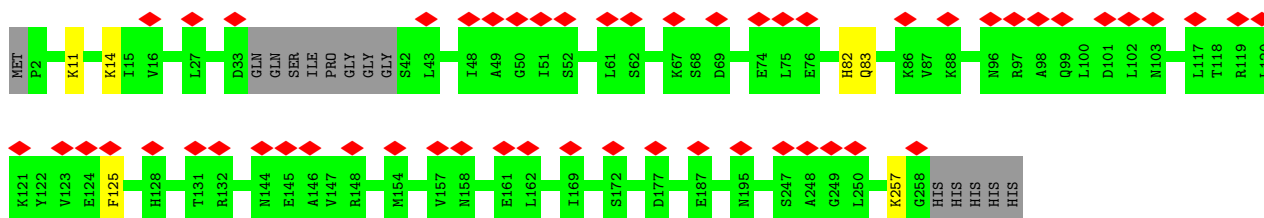
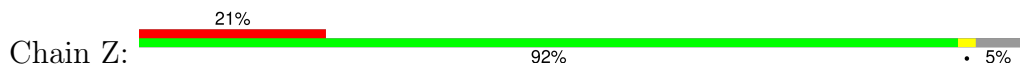
- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament



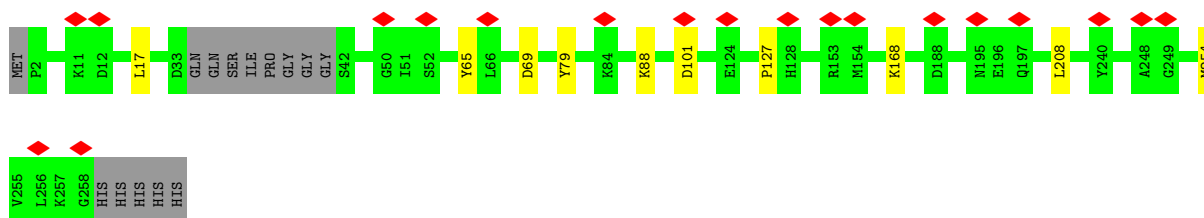
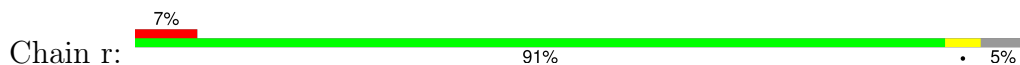
- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament



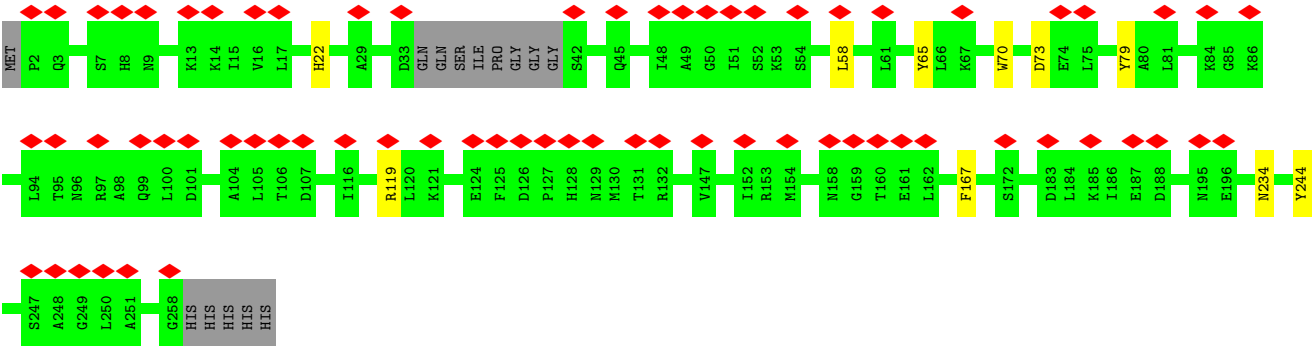
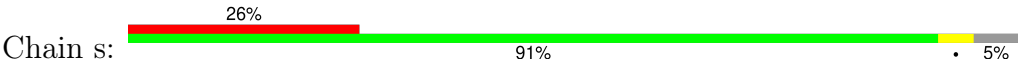
- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament



- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament



- Molecule 2: Cat1 (CRISPR associated TIR 1) pentagonal filament



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	12721	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	45.03	Depositor
Minimum defocus (nm)	800	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	Not provided	
Image detector	FEI FALCON IV (4k x 4k)	Depositor
Maximum map value	0.637	Depositor
Minimum map value	-0.356	Depositor
Average map value	0.007	Depositor
Map value standard deviation	0.044	Depositor
Recommended contour level	0.13	Depositor
Map size ($\text{\AA}$)	373.76, 373.76, 373.76	wwPDB
Map dimensions	512, 512, 512	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing ($\text{\AA}$)	0.73, 0.73, 0.73	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	0.16	0/99	0.61	0/152
1	b	0.29	0/99	0.64	0/152
1	c	0.23	0/99	0.62	0/152
1	d	0.27	0/99	0.61	0/152
1	e	0.31	0/99	0.63	0/152
1	f	0.31	0/99	0.61	0/152
1	g	0.26	0/99	0.63	0/152
1	h	0.24	0/99	0.61	0/152
1	i	0.26	0/99	0.64	0/152
1	j	0.31	0/99	0.63	0/152
1	k	0.34	0/99	0.65	0/152
1	l	0.25	0/99	0.58	0/152
1	m	0.20	0/99	0.61	0/152
1	n	0.16	0/99	0.58	0/152
1	o	0.31	0/99	0.60	0/152
2	A	0.27	0/2074	0.54	2/2815 (0.1%)
2	B	0.26	0/2074	0.50	1/2815 (0.0%)
2	C	0.26	0/2074	0.53	2/2815 (0.1%)
2	D	0.28	0/2074	0.53	1/2815 (0.0%)
2	E	0.27	0/2074	0.53	1/2815 (0.0%)
2	F	0.26	0/2074	0.49	0/2815
2	G	0.27	0/2074	0.53	1/2815 (0.0%)
2	H	0.27	0/2074	0.50	0/2815
2	I	0.27	0/2074	0.54	1/2815 (0.0%)
2	J	0.27	0/2074	0.50	1/2815 (0.0%)
2	K	0.27	0/2074	0.53	1/2815 (0.0%)
2	L	0.28	0/2074	0.51	0/2815
2	M	0.27	0/2074	0.49	0/2815
2	N	0.27	0/2074	0.52	2/2815 (0.1%)
2	O	0.26	0/2074	0.54	1/2815 (0.0%)
2	P	0.26	0/2074	0.50	0/2815
2	Q	0.27	0/2074	0.51	1/2815 (0.0%)
2	R	0.27	0/2074	0.52	0/2815
2	S	0.27	0/2074	0.54	1/2815 (0.0%)

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
2	T	0.26	0/2074	0.51	0/2815
2	U	0.28	0/2074	0.54	2/2815 (0.1%)
2	V	0.27	0/2074	0.53	1/2815 (0.0%)
2	W	0.27	0/2074	0.52	1/2815 (0.0%)
2	X	0.28	0/2074	0.54	0/2815
2	Y	0.27	0/2074	0.55	1/2815 (0.0%)
2	Z	0.26	0/2074	0.49	0/2815
2	p	0.28	0/2074	0.54	1/2815 (0.0%)
2	q	0.27	0/2074	0.50	0/2815
2	r	0.28	0/2074	0.57	1/2815 (0.0%)
2	s	0.25	0/2074	0.48	0/2815
All	All	0.27	0/63705	0.52	23/86730 (0.0%)

There are no bond length outliers.

All (23) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	U	184	LEU	CA-CB-CG	7.85	133.35	115.30
2	Y	184	LEU	CA-CB-CG	7.60	132.78	115.30
2	p	184	LEU	CA-CB-CG	7.15	131.75	115.30
2	Q	184	LEU	CA-CB-CG	6.80	130.94	115.30
2	r	127	PRO	CA-N-CD	-6.76	102.04	111.50
2	G	184	LEU	CA-CB-CG	6.74	130.80	115.30
2	A	184	LEU	CA-CB-CG	6.69	130.68	115.30
2	W	184	LEU	CA-CB-CG	6.67	130.64	115.30
2	U	203	ASP	CB-CG-OD1	6.57	124.22	118.30
2	K	184	LEU	CA-CB-CG	6.38	129.97	115.30
2	I	184	LEU	CA-CB-CG	6.35	129.91	115.30
2	E	184	LEU	CA-CB-CG	6.32	129.84	115.30
2	A	203	ASP	CB-CG-OD1	5.66	123.39	118.30
2	O	184	LEU	CA-CB-CG	5.65	128.30	115.30
2	B	183	ASP	CB-CG-OD2	5.46	123.22	118.30
2	C	188	ASP	CB-CG-OD1	5.44	123.20	118.30
2	V	107	ASP	CB-CG-OD1	5.37	123.14	118.30
2	N	69	ASP	CB-CG-OD1	5.28	123.05	118.30
2	C	177	ASP	CB-CG-OD1	5.27	123.04	118.30
2	S	203	ASP	CB-CG-OD2	5.22	123.00	118.30
2	J	177	ASP	CB-CG-OD2	5.13	122.92	118.30
2	N	183	ASP	CB-CG-OD2	5.13	122.92	118.30
2	D	177	ASP	CB-CG-OD2	5.13	122.92	118.30

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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

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	
2	A	245/263 (93%)	231 (94%)	14 (6%)	0	100	100
2	B	245/263 (93%)	235 (96%)	10 (4%)	0	100	100
2	C	245/263 (93%)	235 (96%)	10 (4%)	0	100	100
2	D	245/263 (93%)	236 (96%)	9 (4%)	0	100	100
2	E	245/263 (93%)	232 (95%)	13 (5%)	0	100	100
2	F	245/263 (93%)	236 (96%)	9 (4%)	0	100	100
2	G	245/263 (93%)	236 (96%)	9 (4%)	0	100	100
2	H	245/263 (93%)	238 (97%)	7 (3%)	0	100	100
2	I	245/263 (93%)	234 (96%)	11 (4%)	0	100	100
2	J	245/263 (93%)	238 (97%)	7 (3%)	0	100	100
2	K	245/263 (93%)	234 (96%)	11 (4%)	0	100	100
2	L	245/263 (93%)	234 (96%)	11 (4%)	0	100	100
2	M	245/263 (93%)	236 (96%)	9 (4%)	0	100	100
2	N	245/263 (93%)	236 (96%)	9 (4%)	0	100	100
2	O	245/263 (93%)	234 (96%)	11 (4%)	0	100	100
2	P	245/263 (93%)	236 (96%)	9 (4%)	0	100	100
2	Q	245/263 (93%)	237 (97%)	8 (3%)	0	100	100
2	R	245/263 (93%)	237 (97%)	8 (3%)	0	100	100
2	S	245/263 (93%)	234 (96%)	11 (4%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	T	245/263 (93%)	236 (96%)	9 (4%)	0	100	100
2	U	245/263 (93%)	232 (95%)	13 (5%)	0	100	100
2	V	245/263 (93%)	237 (97%)	8 (3%)	0	100	100
2	W	245/263 (93%)	233 (95%)	12 (5%)	0	100	100
2	X	245/263 (93%)	232 (95%)	13 (5%)	0	100	100
2	Y	245/263 (93%)	237 (97%)	8 (3%)	0	100	100
2	Z	245/263 (93%)	235 (96%)	10 (4%)	0	100	100
2	p	245/263 (93%)	234 (96%)	11 (4%)	0	100	100
2	q	245/263 (93%)	237 (97%)	8 (3%)	0	100	100
2	r	245/263 (93%)	230 (94%)	15 (6%)	0	100	100
2	s	245/263 (93%)	239 (98%)	6 (2%)	0	100	100
All	All	7350/7890 (93%)	7051 (96%)	299 (4%)	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	
2	A	222/233 (95%)	214 (96%)	8 (4%)	30	56
2	B	222/233 (95%)	214 (96%)	8 (4%)	30	56
2	C	222/233 (95%)	216 (97%)	6 (3%)	40	63
2	D	222/233 (95%)	214 (96%)	8 (4%)	30	56
2	E	222/233 (95%)	211 (95%)	11 (5%)	20	46
2	F	222/233 (95%)	220 (99%)	2 (1%)	75	86
2	G	222/233 (95%)	215 (97%)	7 (3%)	34	59
2	H	222/233 (95%)	215 (97%)	7 (3%)	34	59
2	I	222/233 (95%)	213 (96%)	9 (4%)	26	51
2	J	222/233 (95%)	212 (96%)	10 (4%)	23	50

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	K	222/233 (95%)	209 (94%)	13 (6%)	16	41
2	L	222/233 (95%)	215 (97%)	7 (3%)	34	59
2	M	222/233 (95%)	215 (97%)	7 (3%)	34	59
2	N	222/233 (95%)	211 (95%)	11 (5%)	20	46
2	O	222/233 (95%)	213 (96%)	9 (4%)	26	51
2	P	222/233 (95%)	217 (98%)	5 (2%)	45	67
2	Q	222/233 (95%)	210 (95%)	12 (5%)	18	44
2	R	222/233 (95%)	211 (95%)	11 (5%)	20	46
2	S	222/233 (95%)	216 (97%)	6 (3%)	40	63
2	T	222/233 (95%)	216 (97%)	6 (3%)	40	63
2	U	222/233 (95%)	210 (95%)	12 (5%)	18	44
2	V	222/233 (95%)	216 (97%)	6 (3%)	40	63
2	W	222/233 (95%)	213 (96%)	9 (4%)	26	51
2	X	222/233 (95%)	214 (96%)	8 (4%)	30	56
2	Y	222/233 (95%)	208 (94%)	14 (6%)	15	40
2	Z	222/233 (95%)	216 (97%)	6 (3%)	40	63
2	p	222/233 (95%)	209 (94%)	13 (6%)	16	41
2	q	222/233 (95%)	217 (98%)	5 (2%)	45	67
2	r	222/233 (95%)	213 (96%)	9 (4%)	26	51
2	s	222/233 (95%)	212 (96%)	10 (4%)	23	50
All	All	6660/6990 (95%)	6405 (96%)	255 (4%)	30	54

All (255) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	K	8	HIS
2	K	11	LYS
2	K	12	ASP
2	K	21	GLU
2	K	33	ASP
2	K	72	TRP
2	K	73	ASP
2	K	96	ASN
2	K	128	HIS
2	K	130	MET

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Mol	Chain	Res	Type
2	K	143	GLN
2	K	172	SER
2	K	257	LYS
2	L	12	ASP
2	L	17	LEU
2	L	79	TYR
2	L	81	LEU
2	L	188	ASP
2	L	201	LYS
2	L	245	SER
2	U	11	LYS
2	U	24	ARG
2	U	69	ASP
2	U	73	ASP
2	U	81	LEU
2	U	88	LYS
2	U	122	TYR
2	U	130	MET
2	U	132	ARG
2	U	172	SER
2	U	182	TRP
2	U	244	TYR
2	V	60	PHE
2	V	63	ASN
2	V	81	LEU
2	V	88	LYS
2	V	107	ASP
2	V	119	ARG
2	p	56	TYR
2	p	60	PHE
2	p	73	ASP
2	p	81	LEU
2	p	86	LYS
2	p	88	LYS
2	p	95	THR
2	p	148	ARG
2	p	158	ASN
2	p	182	TRP
2	p	188	ASP
2	p	211	PRO
2	p	244	TYR
2	q	73	ASP

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Mol	Chain	Res	Type
2	q	81	LEU
2	q	88	LYS
2	q	154	MET
2	q	245	SER
2	I	31	TRP
2	I	70	TRP
2	I	72	TRP
2	I	122	TYR
2	I	129	ASN
2	I	132	ARG
2	I	139	GLU
2	I	168	LYS
2	I	182	TRP
2	J	14	LYS
2	J	17	LEU
2	J	55	GLN
2	J	70	TRP
2	J	101	ASP
2	J	102	LEU
2	J	158	ASN
2	J	177	ASP
2	J	188	ASP
2	J	197	GLN
2	S	66	LEU
2	S	73	ASP
2	S	88	LYS
2	S	132	ARG
2	S	182	TRP
2	S	188	ASP
2	T	17	LEU
2	T	67	LYS
2	T	88	LYS
2	T	101	ASP
2	T	112	PHE
2	T	245	SER
2	G	70	TRP
2	G	73	ASP
2	G	88	LYS
2	G	124	GLU
2	G	182	TRP
2	G	195	ASN
2	G	254	MET

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Mol	Chain	Res	Type
2	H	21	GLU
2	H	31	TRP
2	H	55	GLN
2	H	69	ASP
2	H	72	TRP
2	H	144	ASN
2	H	188	ASP
2	Q	33	ASP
2	Q	73	ASP
2	Q	88	LYS
2	Q	101	ASP
2	Q	109	ARG
2	Q	119	ARG
2	Q	148	ARG
2	Q	154	MET
2	Q	158	ASN
2	Q	182	TRP
2	Q	185	LYS
2	Q	244	TYR
2	R	26	SER
2	R	33	ASP
2	R	56	TYR
2	R	70	TRP
2	R	72	TRP
2	R	73	ASP
2	R	81	LEU
2	R	96	ASN
2	R	128	HIS
2	R	130	MET
2	R	209	TYR
2	E	12	ASP
2	E	17	LEU
2	E	88	LYS
2	E	96	ASN
2	E	112	PHE
2	E	119	ARG
2	E	168	LYS
2	E	182	TRP
2	E	188	ASP
2	E	208	LEU
2	E	244	TYR
2	F	88	LYS

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Mol	Chain	Res	Type
2	F	245	SER
2	O	14	LYS
2	O	58	LEU
2	O	77	GLN
2	O	79	TYR
2	O	81	LEU
2	O	128	HIS
2	O	172	SER
2	O	203	ASP
2	O	244	TYR
2	P	58	LEU
2	P	88	LYS
2	P	128	HIS
2	P	154	MET
2	P	182	TRP
2	C	23	LEU
2	C	31	TRP
2	C	119	ARG
2	C	154	MET
2	C	182	TRP
2	C	247	SER
2	D	14	LYS
2	D	67	LYS
2	D	73	ASP
2	D	94	LEU
2	D	130	MET
2	D	177	ASP
2	D	203	ASP
2	D	234	ASN
2	M	73	ASP
2	M	122	TYR
2	M	154	MET
2	M	158	ASN
2	M	172	SER
2	M	182	TRP
2	M	244	TYR
2	N	3	GLN
2	N	55	GLN
2	N	66	LEU
2	N	69	ASP
2	N	70	TRP
2	N	72	TRP

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Mol	Chain	Res	Type
2	N	96	ASN
2	N	102	LEU
2	N	119	ARG
2	N	130	MET
2	N	217	TYR
2	W	31	TRP
2	W	56	TYR
2	W	65	TYR
2	W	72	TRP
2	W	88	LYS
2	W	132	ARG
2	W	168	LYS
2	W	172	SER
2	W	237	THR
2	X	12	ASP
2	X	55	GLN
2	X	56	TYR
2	X	72	TRP
2	X	73	ASP
2	X	107	ASP
2	X	132	ARG
2	X	209	TYR
2	A	23	LEU
2	A	27	LEU
2	A	67	LYS
2	A	88	LYS
2	A	97	ARG
2	A	126	ASP
2	A	181	HIS
2	A	203	ASP
2	B	72	TRP
2	B	73	ASP
2	B	88	LYS
2	B	128	HIS
2	B	172	SER
2	B	183	ASP
2	B	188	ASP
2	B	245	SER
2	Y	56	TYR
2	Y	62	SER
2	Y	72	TRP
2	Y	73	ASP

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Mol	Chain	Res	Type
2	Y	88	LYS
2	Y	109	ARG
2	Y	119	ARG
2	Y	130	MET
2	Y	149	PHE
2	Y	182	TRP
2	Y	188	ASP
2	Y	203	ASP
2	Y	244	TYR
2	Y	247	SER
2	Z	11	LYS
2	Z	14	LYS
2	Z	82	HIS
2	Z	83	GLN
2	Z	125	PHE
2	Z	257	LYS
2	r	17	LEU
2	r	65	TYR
2	r	69	ASP
2	r	79	TYR
2	r	88	LYS
2	r	101	ASP
2	r	168	LYS
2	r	208	LEU
2	r	254	MET
2	s	22	HIS
2	s	58	LEU
2	s	65	TYR
2	s	70	TRP
2	s	73	ASP
2	s	79	TYR
2	s	119	ARG
2	s	167	PHE
2	s	234	ASN
2	s	244	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
2	p	8	HIS
2	S	63	ASN
2	S	129	ASN

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
2	O	55	GLN
2	P	55	GLN
2	C	55	GLN
2	M	144	ASN
2	B	128	HIS
2	r	3	GLN
2	s	3	GLN
2	s	96	ASN
2	s	99	GLN

5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
1	a	3/4 (75%)	3 (100%)	0
1	b	3/4 (75%)	3 (100%)	0
1	c	3/4 (75%)	3 (100%)	0
1	d	3/4 (75%)	3 (100%)	0
1	e	3/4 (75%)	3 (100%)	0
1	f	3/4 (75%)	3 (100%)	0
1	g	3/4 (75%)	3 (100%)	0
1	h	3/4 (75%)	3 (100%)	0
1	i	3/4 (75%)	3 (100%)	0
1	j	3/4 (75%)	3 (100%)	0
1	k	3/4 (75%)	3 (100%)	0
1	l	3/4 (75%)	3 (100%)	0
1	m	3/4 (75%)	3 (100%)	0
1	n	3/4 (75%)	3 (100%)	0
1	o	3/4 (75%)	3 (100%)	0
All	All	45/60 (75%)	45 (100%)	0

All (45) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
1	a	1	A
1	a	2	A
1	a	3	A
1	b	1	A
1	b	2	A
1	b	3	A
1	d	1	A
1	d	2	A

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	d	3	A
1	e	1	A
1	e	2	A
1	e	3	A
1	f	1	A
1	f	2	A
1	f	3	A
1	g	1	A
1	g	2	A
1	g	3	A
1	h	1	A
1	h	2	A
1	h	3	A
1	i	1	A
1	i	2	A
1	i	3	A
1	j	1	A
1	j	2	A
1	j	3	A
1	k	1	A
1	k	2	A
1	k	3	A
1	l	1	A
1	l	2	A
1	l	3	A
1	m	1	A
1	m	2	A
1	m	3	A
1	n	1	A
1	n	2	A
1	n	3	A
1	o	1	A
1	o	2	A
1	o	3	A
1	c	5	A
1	c	6	A
1	c	7	A

There are no RNA pucker outliers to report.

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.

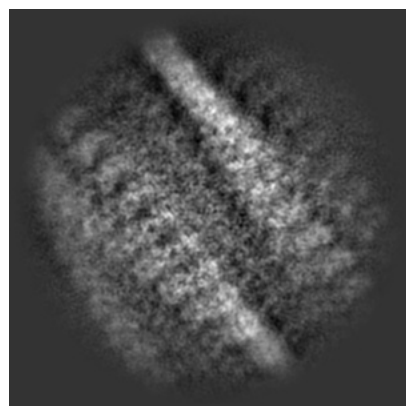
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-48629. These allow visual inspection of the internal detail of the map and identification of artifacts.

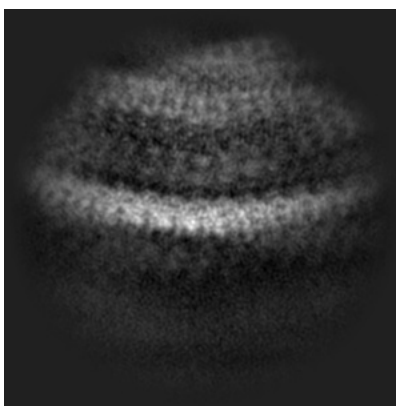
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

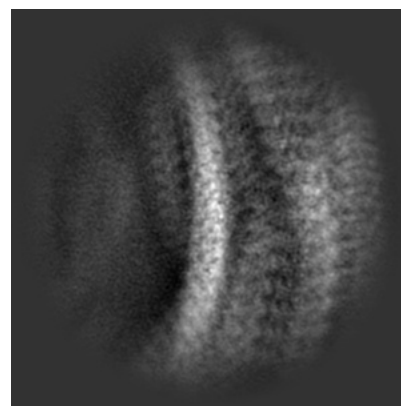
6.1.1 Primary map



X

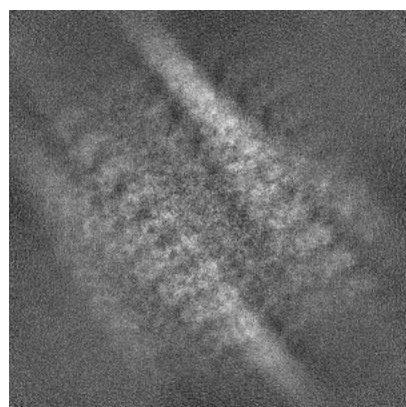


Y

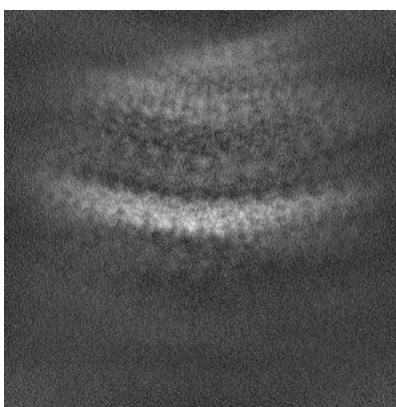


Z

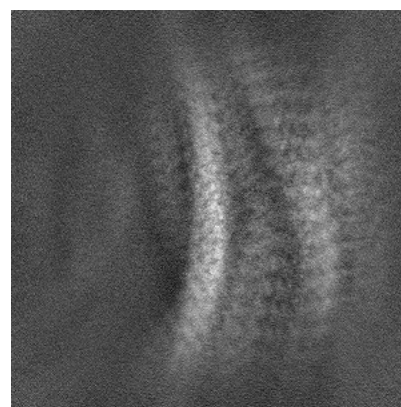
6.1.2 Raw map



X



Y

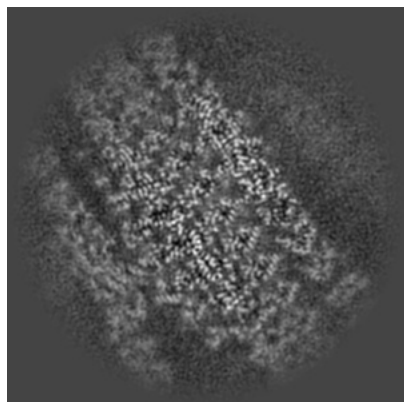


Z

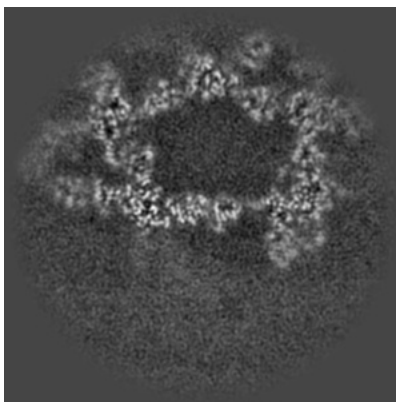
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

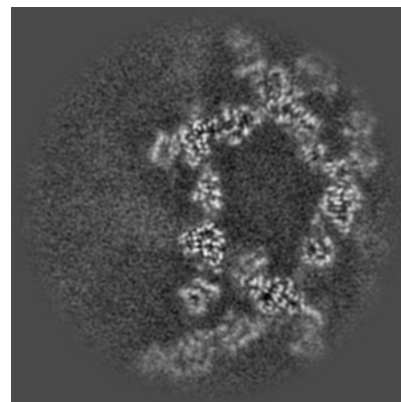
6.2.1 Primary map



X Index: 256

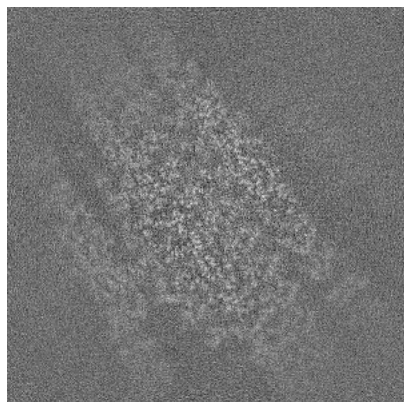


Y Index: 256

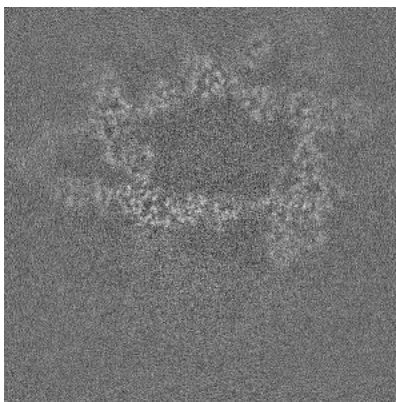


Z Index: 256

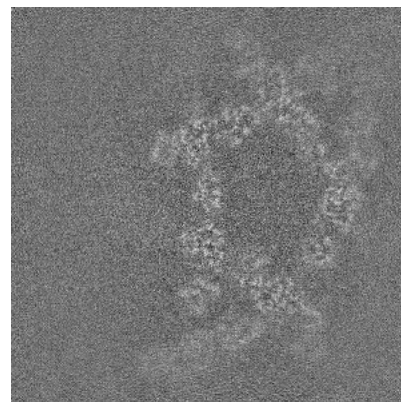
6.2.2 Raw map



X Index: 256



Y Index: 256

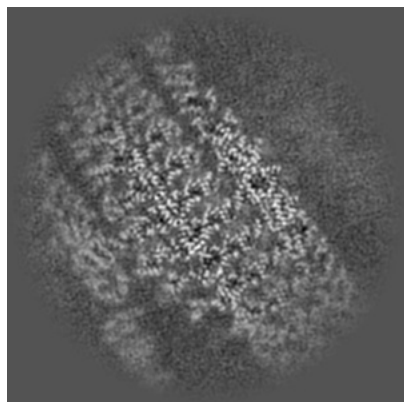


Z Index: 256

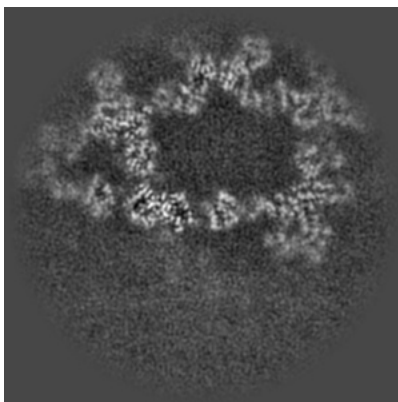
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

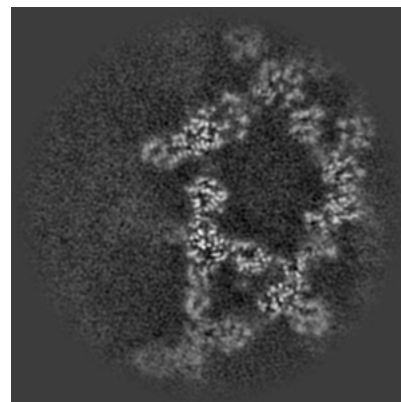
6.3.1 Primary map



X Index: 248

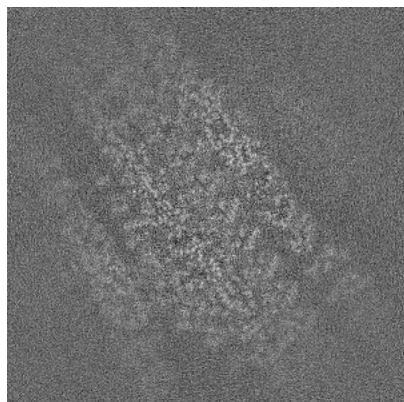


Y Index: 246

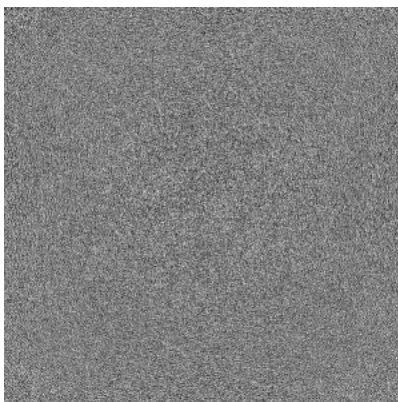


Z Index: 242

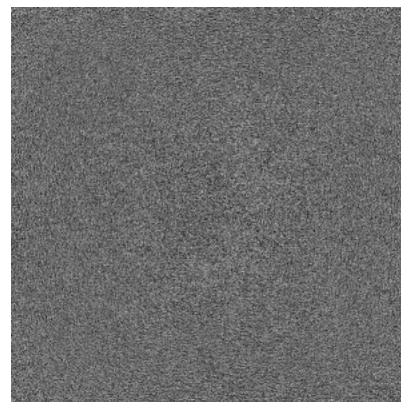
6.3.2 Raw map



X Index: 259



Y Index: 0

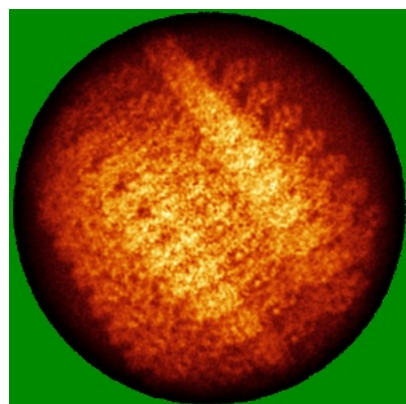


Z Index: 0

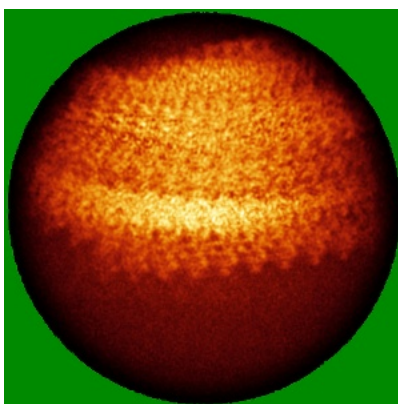
The images above show the largest variance slices of the map in three orthogonal directions.

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

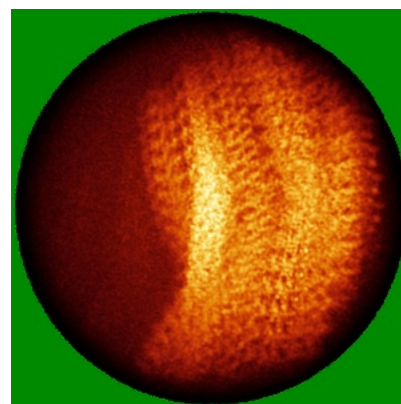
6.4.1 Primary map



X

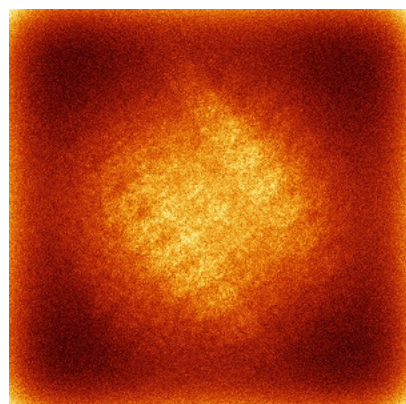


Y

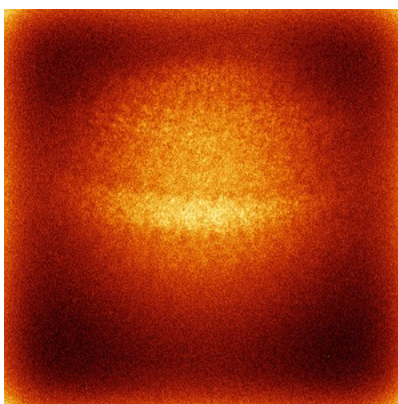


Z

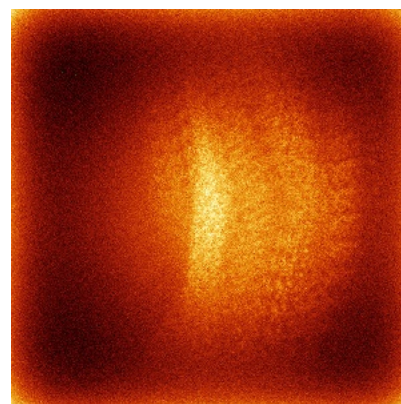
6.4.2 Raw map



X



Y

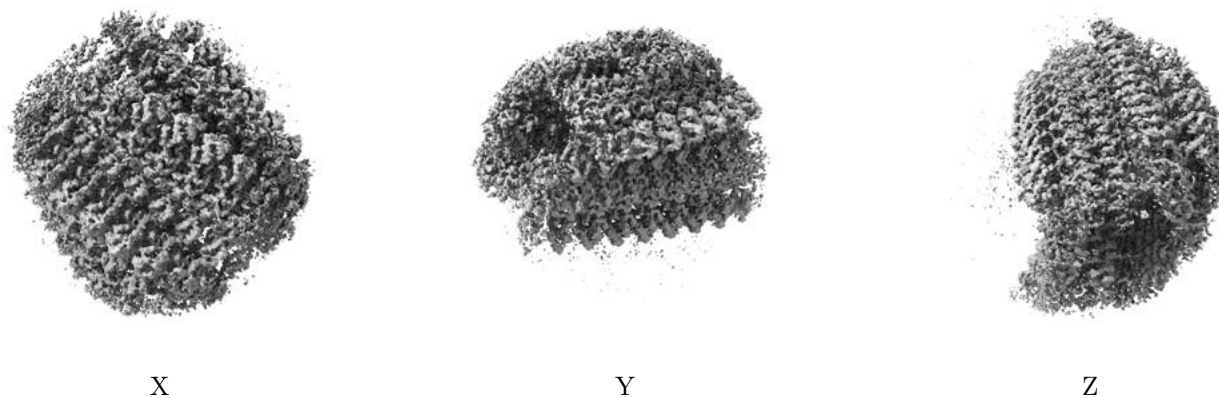


Z

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.

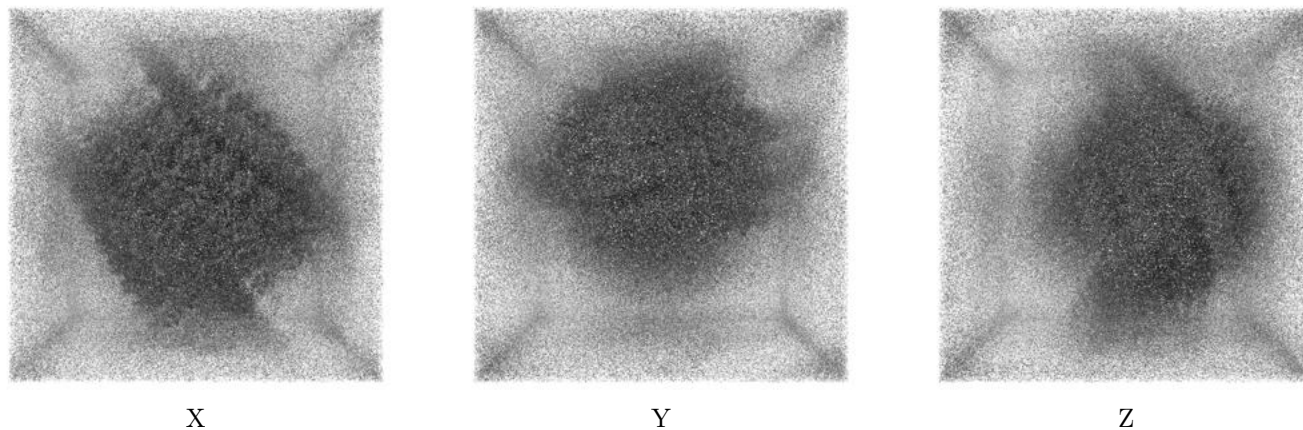
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.13. 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.

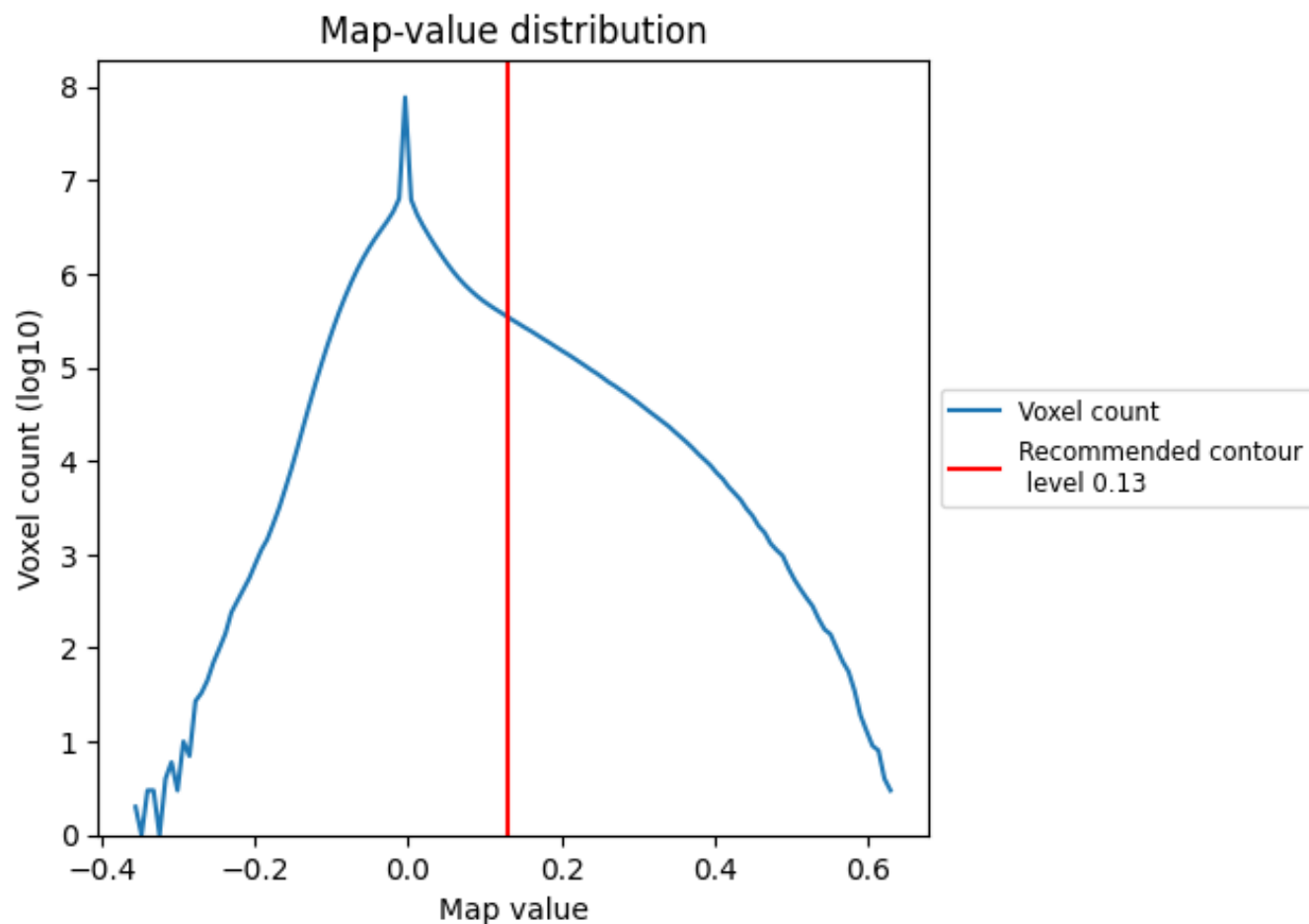
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

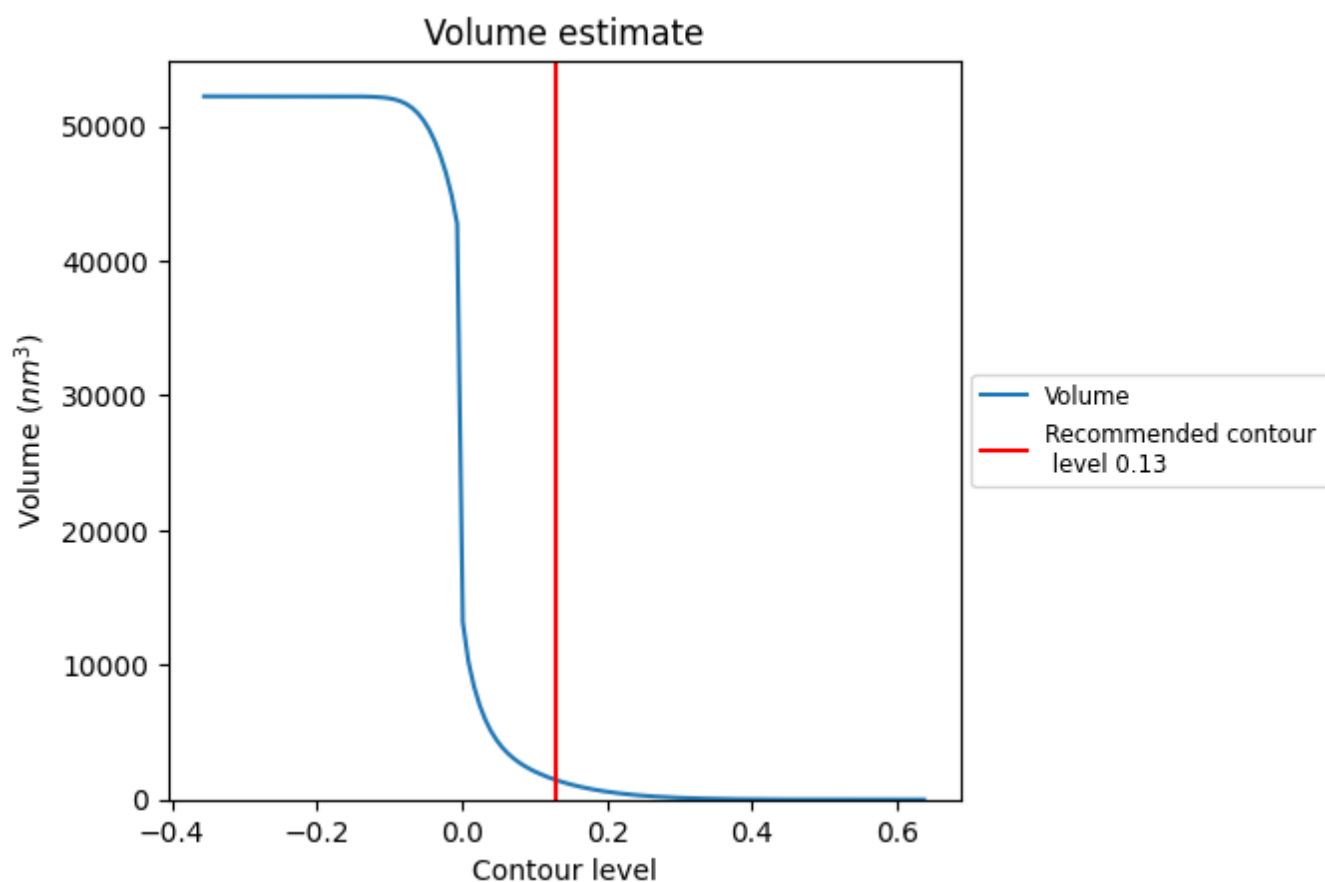
This section contains the results of statistical analysis of the map.

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.

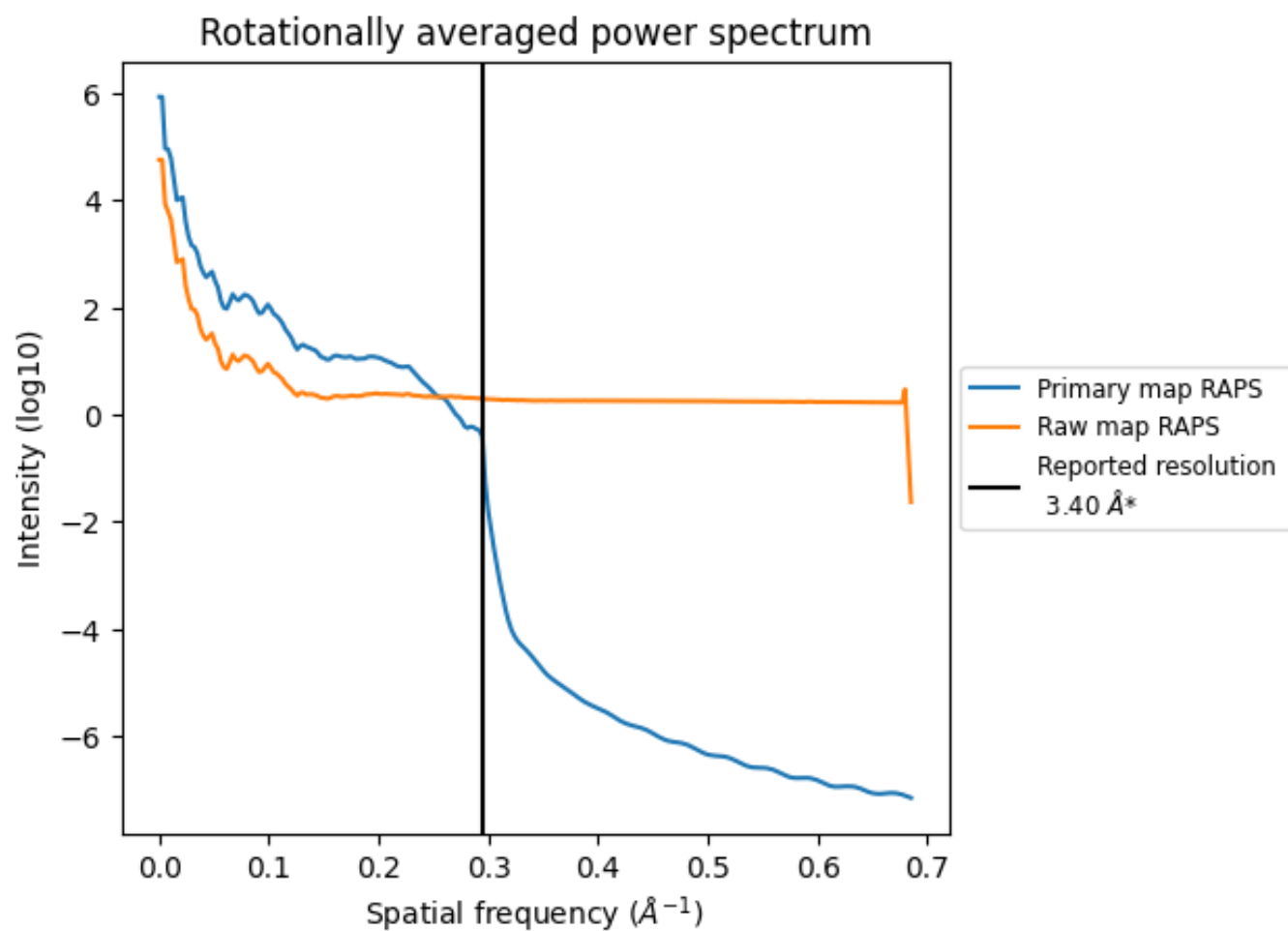
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 1442 nm³; this corresponds to an approximate mass of 1303 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 ⓘ

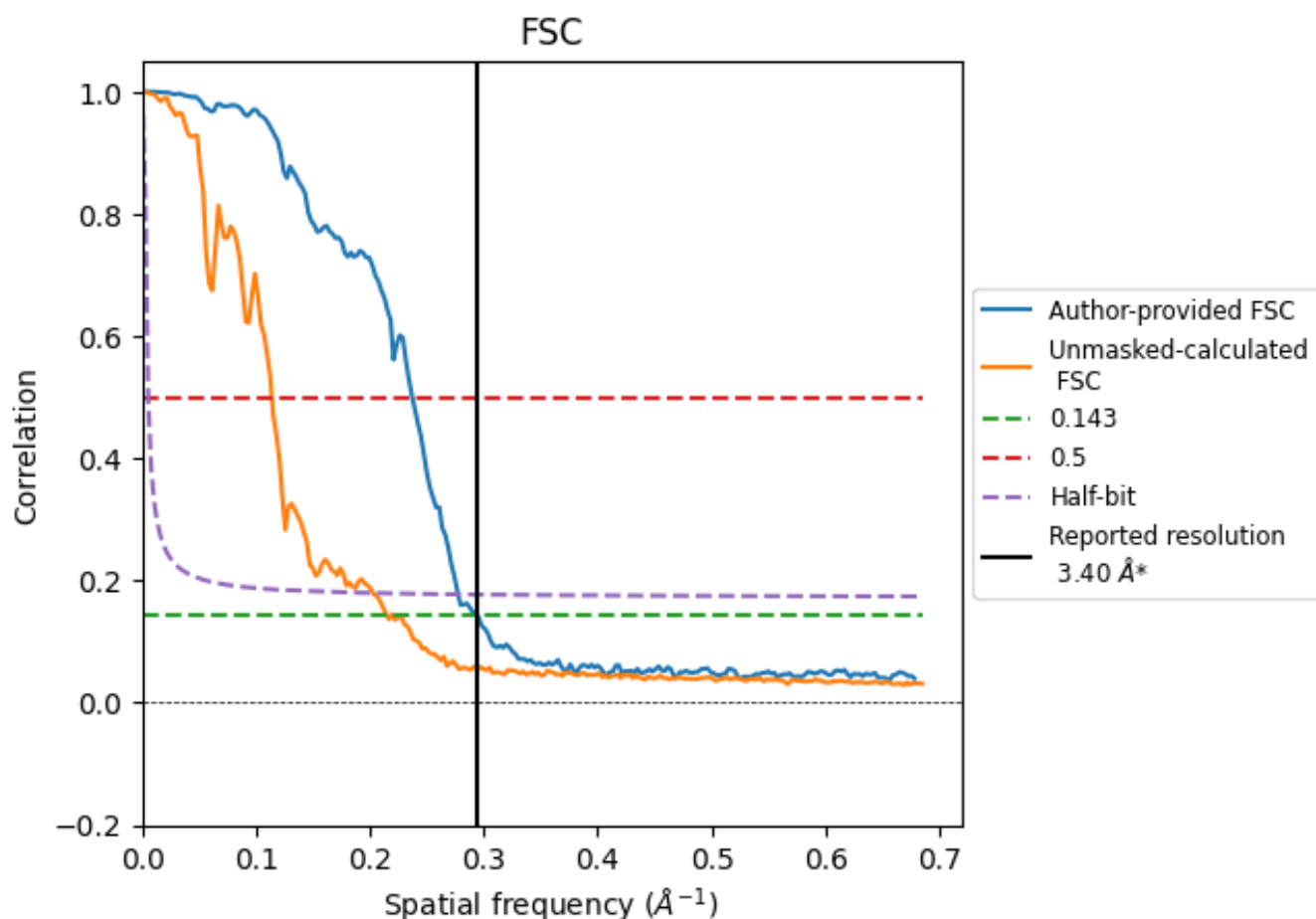


*Reported resolution corresponds to spatial frequency of 0.294 Å⁻¹

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 $0.294 \text{ \AA}^{-1}$

8.2 Resolution estimates [i](#)

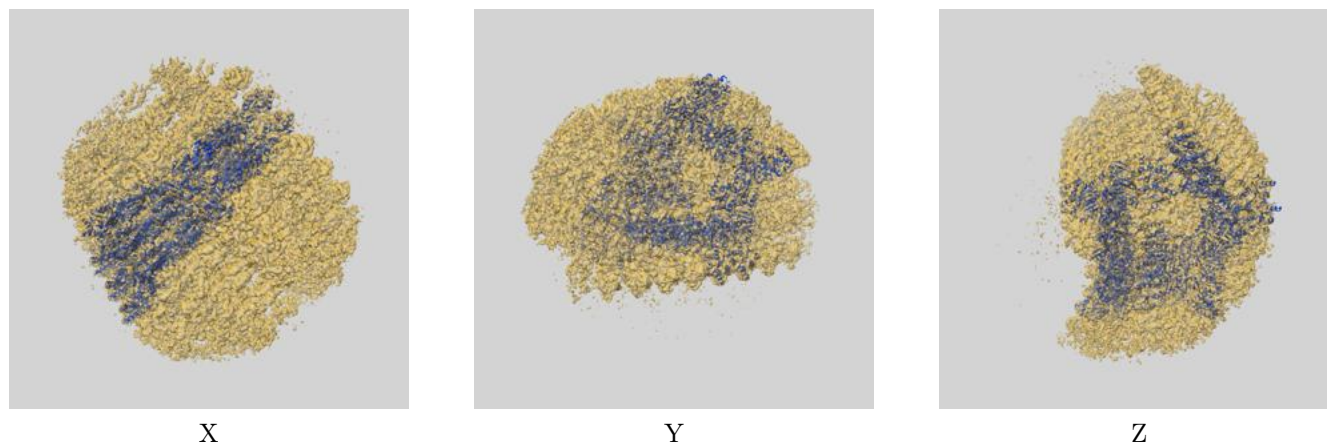
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.40	-	-
Author-provided FSC curve	3.40	4.22	3.60
Unmasked-calculated*	4.66	8.79	4.93

*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 4.66 differs from the reported value 3.4 by more than 10 %

9 Map-model fit [i](#)

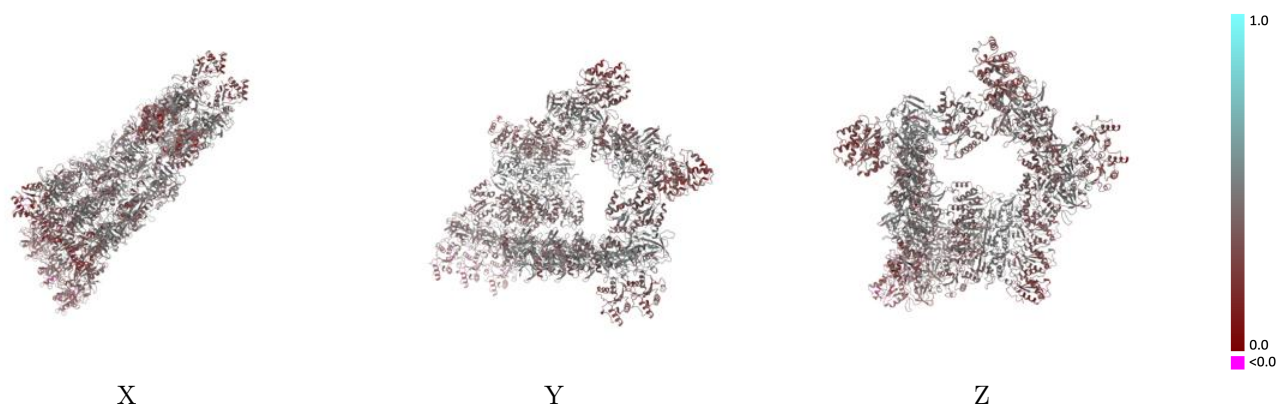
This section contains information regarding the fit between EMDB map EMD-48629 and PDB model 9MUD. Per-residue inclusion information can be found in section [3](#) on page [8](#).

9.1 Map-model overlay [i](#)



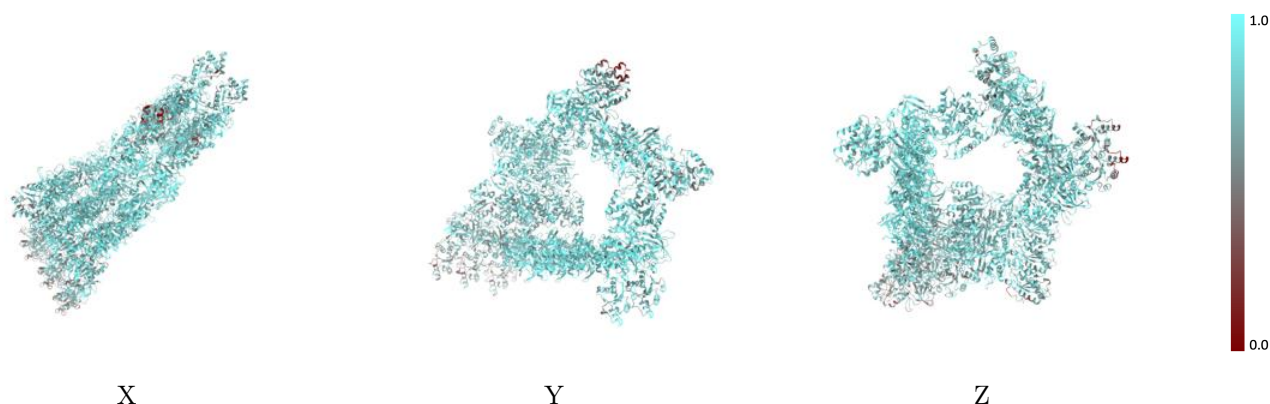
The images above show the 3D surface view of the map at the recommended contour level 0.13 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



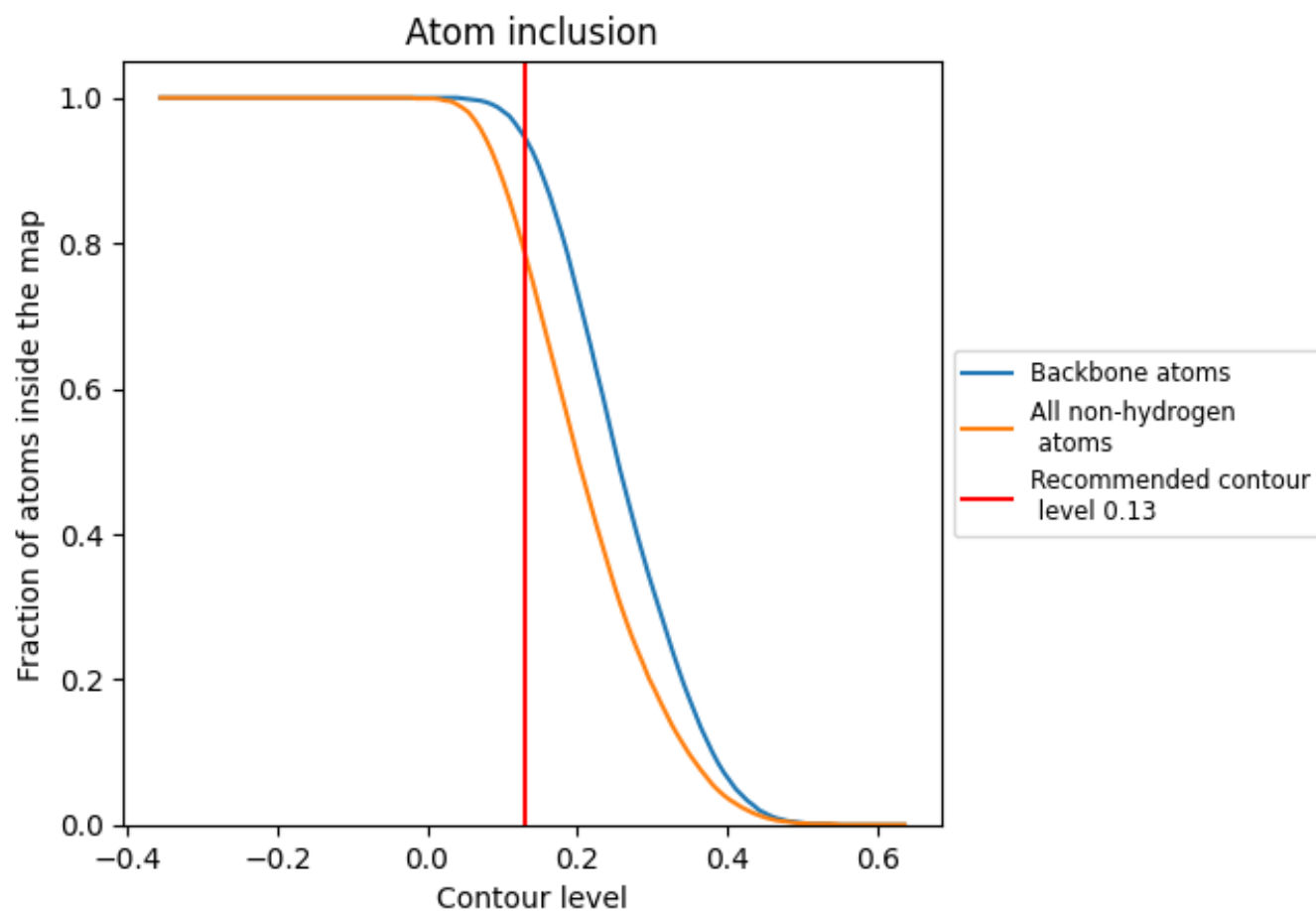
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.13).

9.4 Atom inclusion [i](#)



At the recommended contour level, 95% of all backbone atoms, 79% 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 (0.13) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.7880	 0.3870
A	 0.7250	 0.3650
B	 0.5970	 0.2810
C	 0.8260	 0.3680
D	 0.8400	 0.4310
E	 0.7480	 0.3800
F	 0.8430	 0.4110
G	 0.7610	 0.3730
H	 0.8120	 0.4180
I	 0.8230	 0.3780
J	 0.8710	 0.4400
K	 0.8350	 0.4250
L	 0.8920	 0.4450
M	 0.8370	 0.3700
N	 0.8310	 0.4260
O	 0.6900	 0.3660
P	 0.8420	 0.4150
Q	 0.7450	 0.3590
R	 0.7740	 0.4000
S	 0.7890	 0.3650
T	 0.8430	 0.4250
U	 0.8010	 0.3970
V	 0.8490	 0.4290
W	 0.7520	 0.3400
X	 0.8170	 0.4140
Y	 0.7380	 0.3710
Z	 0.6200	 0.2870
a	 0.9770	 0.3850
b	 0.9890	 0.4860
c	 0.9890	 0.4600
d	 0.9890	 0.4770
e	 0.9890	 0.4880
f	 1.0000	 0.4890
g	 0.9770	 0.4770
h	 0.9770	 0.4450



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Chain	Atom inclusion	Q-score
i	 0.9660	 0.4540
j	 0.9660	 0.4870
k	 0.9890	 0.4820
l	 0.9890	 0.4610
m	 0.9770	 0.3930
n	 0.9550	 0.3730
o	 1.0000	 0.4920
p	 0.8520	 0.4250
q	 0.8860	 0.4420
r	 0.7050	 0.3550
s	 0.5760	 0.2650