



## Full wwPDB EM Validation Report ⓘ

Dec 11, 2022 – 11:13 am GMT

PDB ID : 6SH8  
EMDB ID : EMD-10196  
Title : Cryo-EM structure of the Type III-B Cmr-beta bound to cognate target RNA and AMPPnP, state 2, in the presence of ssDNA  
Authors : Sofos, N.; Montoya, G.; Stella, S.  
Deposited on : 2019-08-06  
Resolution : 3.14 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](mailto:validation@mail.wwpdb.org)

A user guide is available at

<https://www.wwpdb.org/validation/2017/EMValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

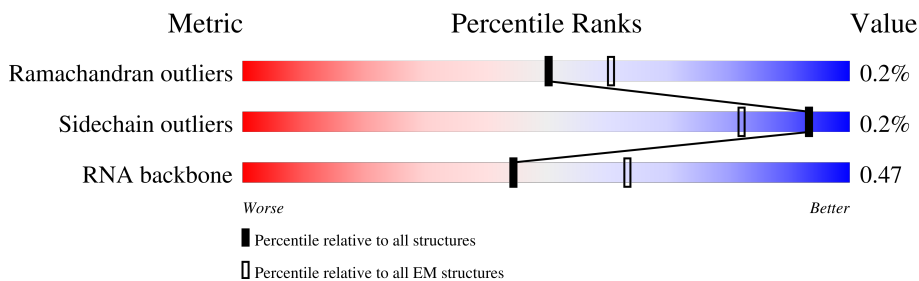
EMDB validation analysis : 0.0.1.dev43  
Mogul : 1.8.4, CSD as541be (2020)  
MolProbity : 4.02b-467  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
MapQ : 1.9.9  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.31.3

# 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 3.14 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.



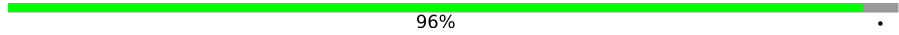
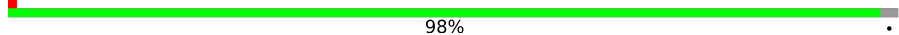
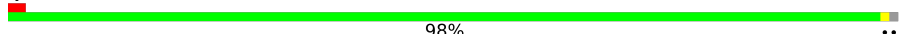
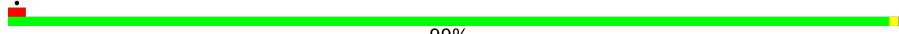


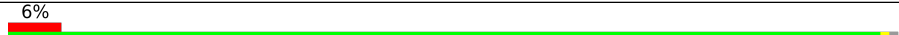
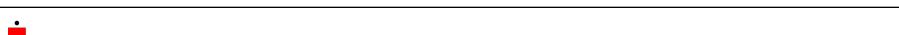
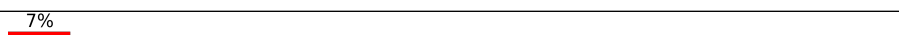
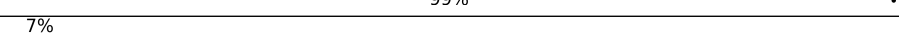
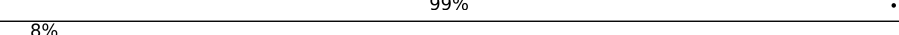
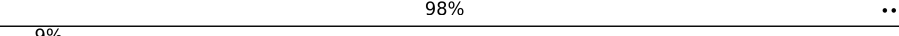
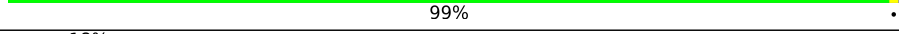
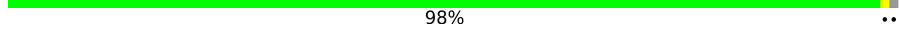
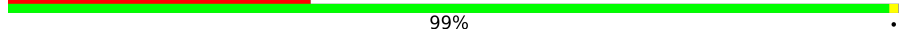
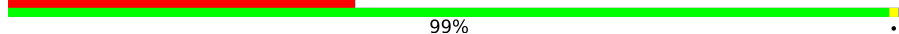

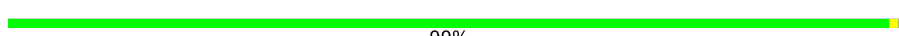





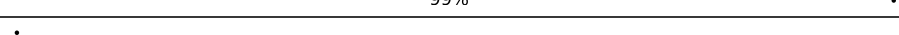
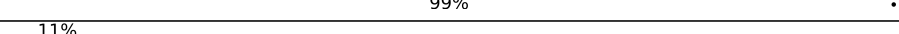
Metric	Whole archive (#Entries)	EM structures (#Entries)
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826
RNA backbone	4643	859

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

Mol	Chain	Length	Quality of chain
1	A	155	
1	B	155	
1	C	155	
2	D	286	
2	E	286	
2	F	286	
2	G	286	
3	H	313	

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Mol	Chain	Length	Quality of chain
4	I	296	 96%
5	J	476	 98%
6	K	1037	 98%
7	L	174	 99%
7	M	174	 99%
7	N	174	 99%
7	O	174	 6% 98%
7	P	174	 99%
7	Q	174	 7% 99%
7	R	174	 7% 99%
7	S	174	 8% 98%
7	T	174	 9% 99%
7	W	174	 18% 98%
7	X	174	 34% 99%
7	Y	174	 39% 99%
7	Z	174	 68% 99%
7	l	174	 99%
7	m	174	 99%
7	n	174	 99%
7	o	174	 98%
7	p	174	 7% 99%
7	q	174	 8% 99%
7	r	174	 99%
7	s	174	 11% 99%
7	t	174	 18% 99%

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Mol	Chain	Length	Quality of chain
7	w	174	<p>13% 99% ..</p>
7	x	174	<p>26% 99% ..</p>
7	y	174	<p>53% 99% ..</p>
7	z	174	<p>63% 99% .</p>
8	U	46	<p>48% 22% 30%</p>
9	V	51	<p>71% 24% 6%</p>

## 2 Entry composition i

There are 12 unique types of molecules in this entry. The entry contains 67477 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 CRISPR-associated protein, Cmr5 family.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	153	1253	817	205	230	1	0	0
1	B	151	1235	809	200	225	1	0	0
1	C	154	1261	823	206	231	1	0	0

- Molecule 2 is a protein called CRISPR-associated RAMP protein, Cmr4 family.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	D	285	2274	1478	369	425	2	0	0
2	E	285	2274	1478	369	425	2	0	0
2	F	285	2274	1478	369	425	2	0	0
2	G	283	2258	1467	367	422	2	0	0

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	31	ALA	ASP	engineered mutation	UNP F0NDX6
E	31	ALA	ASP	engineered mutation	UNP F0NDX6
F	31	ALA	ASP	engineered mutation	UNP F0NDX6
G	31	ALA	ASP	engineered mutation	UNP F0NDX6

- Molecule 3 is a protein called CRISPR-associated protein, Cmr3 family.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	H	312	2528	1630	418	473	7	0	0

- Molecule 4 is a protein called CRISPR-associated RAMP protein, Cmr6 family.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	I	284	2282	1470	381	427	4	0	0

There are 13 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
I	284	ALA	-	expression tag	UNP F0NDX3
I	285	ALA	-	expression tag	UNP F0NDX3
I	286	ALA	-	expression tag	UNP F0NDX3
I	287	HIS	-	expression tag	UNP F0NDX3
I	288	HIS	-	expression tag	UNP F0NDX3
I	289	HIS	-	expression tag	UNP F0NDX3
I	290	HIS	-	expression tag	UNP F0NDX3
I	291	HIS	-	expression tag	UNP F0NDX3
I	292	HIS	-	expression tag	UNP F0NDX3
I	293	HIS	-	expression tag	UNP F0NDX3
I	294	HIS	-	expression tag	UNP F0NDX3
I	295	HIS	-	expression tag	UNP F0NDX3
I	296	HIS	-	expression tag	UNP F0NDX3

- Molecule 5 is a protein called Cmr1,CRISPR-associated RAMP protein, Cmr1 family.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	J	467	3833	2481	622	717	13	0	0

- Molecule 6 is a protein called CRISPR-associated protein, Cmr2 family.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
6	K	1024	8418	5444	1394	1556	24	0	0

- Molecule 7 is a protein called CRISPR-associated protein CmrX.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
7	L	173	1378	880	227	269	2	0	0
7	M	173	1378	880	227	269	2	0	0
7	N	173	1378	880	227	269	2	0	0

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Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
7	O	173	1378	880	227	269	2	0	0
7	P	173	1378	880	227	269	2	0	0
7	Q	173	1378	880	227	269	2	0	0
7	R	173	1378	880	227	269	2	0	0
7	S	173	1378	880	227	269	2	0	0
7	T	173	1378	880	227	269	2	0	0
7	W	173	1378	880	227	269	2	0	0
7	X	173	1378	880	227	269	2	0	0
7	l	173	1378	880	227	269	2	0	0
7	m	173	1378	880	227	269	2	0	0
7	n	173	1378	880	227	269	2	0	0
7	o	173	1378	880	227	269	2	0	0
7	p	173	1378	880	227	269	2	0	0
7	q	173	1378	880	227	269	2	0	0
7	r	173	1378	880	227	269	2	0	0
7	s	173	1378	880	227	269	2	0	0
7	t	173	1378	880	227	269	2	0	0
7	w	173	1378	880	227	269	2	0	0
7	x	173	1378	880	227	269	2	0	0
7	Z	173	1378	880	227	269	2	0	0
7	z	173	1378	880	227	269	2	0	0

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Mol	Chain	Residues	Atoms					AltConf	Trace
7	Y	173	Total	C	N	O	S	0	0
			1378	880	227	269	2		
7	y	173	Total	C	N	O	S	0	0
			1378	880	227	269	2		

- Molecule 8 is a RNA chain called Cognate target RNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
8	U	32	Total	C	N	O	P	0	0
			668	301	110	227	30		

- Molecule 9 is a RNA chain called crRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
9	V	48	Total	C	N	O	P	0	0
			1025	461	192	325	47		

There are 2 discrepancies between the modelled and reference sequences:

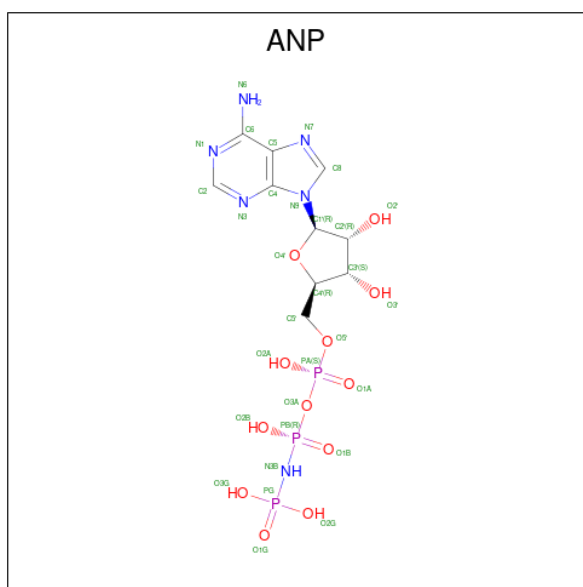
Chain	Residue	Modelled	Actual	Comment	Reference
V	1	A	C	conflict	GB 323473489
V	3	U	G	conflict	GB 323473489

- Molecule 10 is ZINC ION (three-letter code: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		AltConf
10	K	1	Total	Zn	0
			1	1	

- Molecule 11 is PHOSPHOAMINOPHOSPHONIC ACID-ADENYLATE ESTER (three-letter code: ANP) (formula: C<sub>10</sub>H<sub>17</sub>N<sub>6</sub>O<sub>12</sub>P<sub>3</sub>) (labeled as "Ligand of Interest" by depositor).





Mol	Chain	Residues	Atoms				AltConf	
			Total	C	N	O		P
11	K	1	62	20	12	24	6	0
11	K	1	62	20	12	24	6	0

- Molecule 12 is MANGANESE (II) ION (three-letter code: MN) (formula: Mn) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		AltConf
			Total	Mn	
12	K	3	3	3	0

### 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.

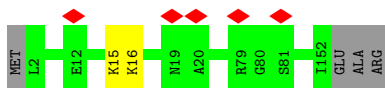
- Molecule 1: CRISPR-associated protein, Cmr5 family

Chain A:  99%



- Molecule 1: CRISPR-associated protein, Cmr5 family

Chain B:  96%



- Molecule 1: CRISPR-associated protein, Cmr5 family

Chain C:  99%



- Molecule 2: CRISPR-associated RAMP protein, Cmr4 family

Chain D:  100%



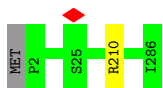
- Molecule 2: CRISPR-associated RAMP protein, Cmr4 family

Chain E:  99%



- Molecule 2: CRISPR-associated RAMP protein, Cmr4 family

Chain F:  99%



- Molecule 2: CRISPR-associated RAMP protein, Cmr4 family

Chain G:  98%



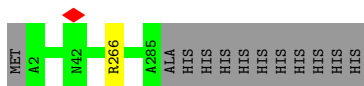
- Molecule 3: CRISPR-associated protein, Cmr3 family

Chain H:  99%



- Molecule 4: CRISPR-associated RAMP protein, Cmr6 family

Chain I:  96%



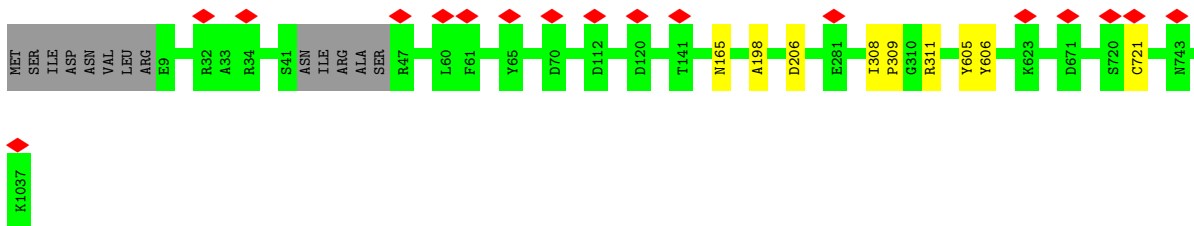
- Molecule 5: Cmr1, CRISPR-associated RAMP protein, Cmr1 family

Chain J:  98%



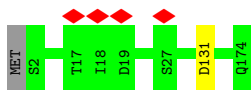
- Molecule 6: CRISPR-associated protein, Cmr2 family

Chain K:  98%

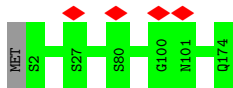


- Molecule 7: CRISPR-associated protein CmrX

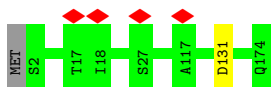
Chain L:  99%



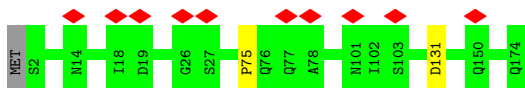
- Molecule 7: CRISPR-associated protein CmrX



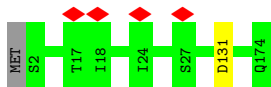
- Molecule 7: CRISPR-associated protein CmrX



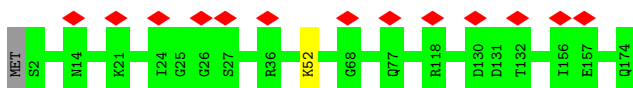
- Molecule 7: CRISPR-associated protein CmrX



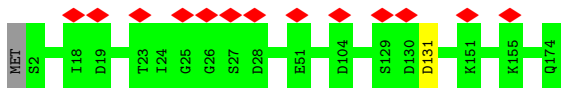
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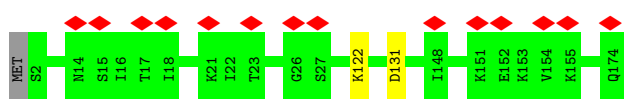
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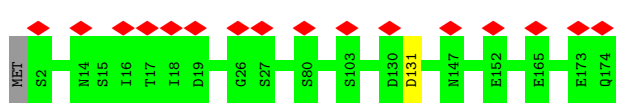
- Molecule 7: CRISPR-associated protein CmrX



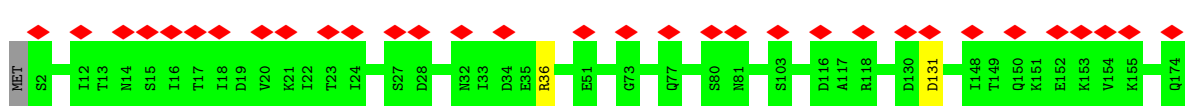
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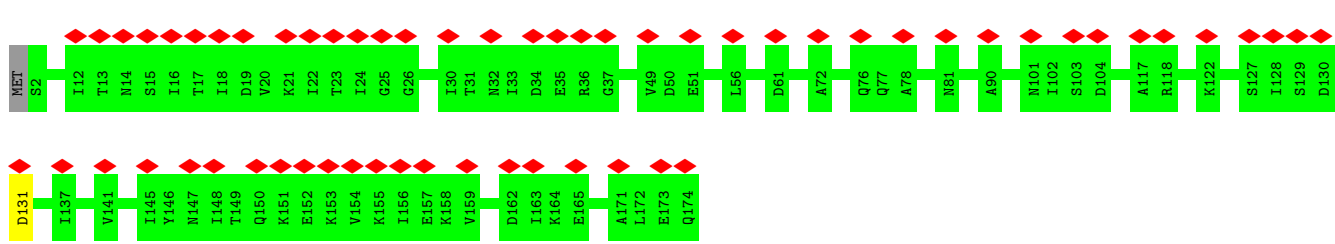
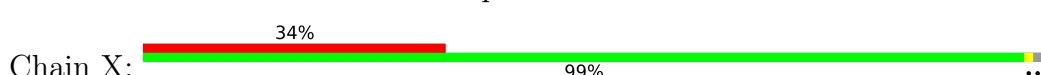
• Molecule 7: CRISPR-associated protein CmrX



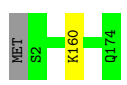
• Molecule 7: CRISPR-associated protein CmrX



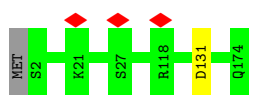
• Molecule 7: CRISPR-associated protein CmrX



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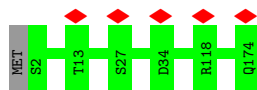


• Molecule 7: CRISPR-associated protein CmrX

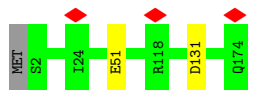


• Molecule 7: CRISPR-associated protein CmrX

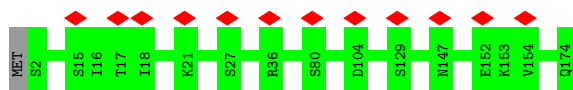




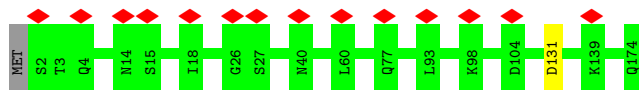
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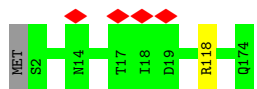
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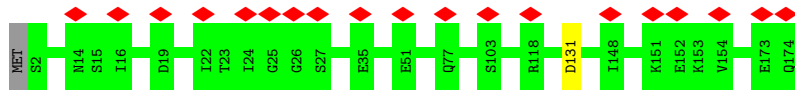
- Molecule 7: CRISPR-associated protein CmrX



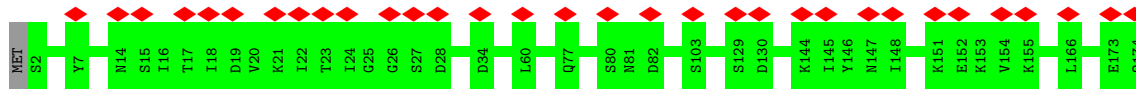
- Molecule 7: CRISPR-associated protein CmrX



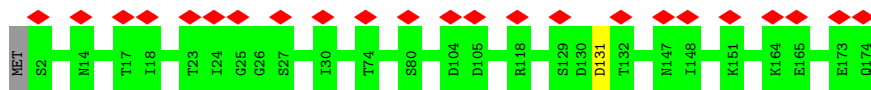
- Molecule 7: CRISPR-associated protein CmrX



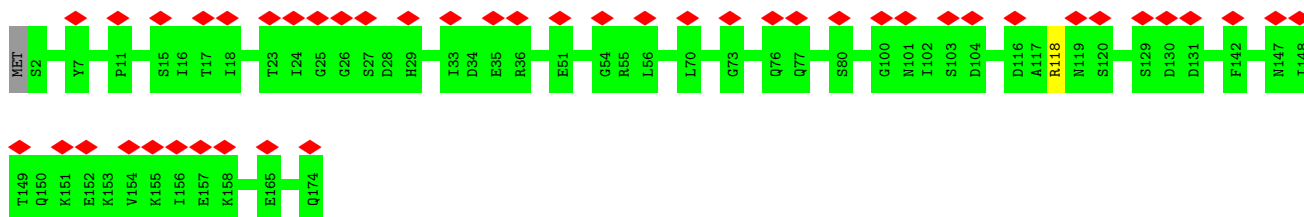
- Molecule 7: CRISPR-associated protein CmrX



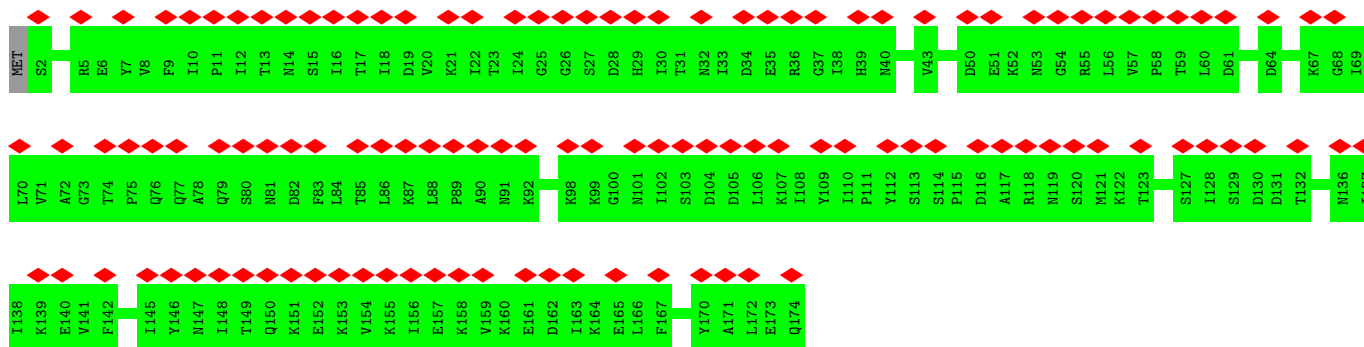
- Molecule 7: CRISPR-associated protein CmrX



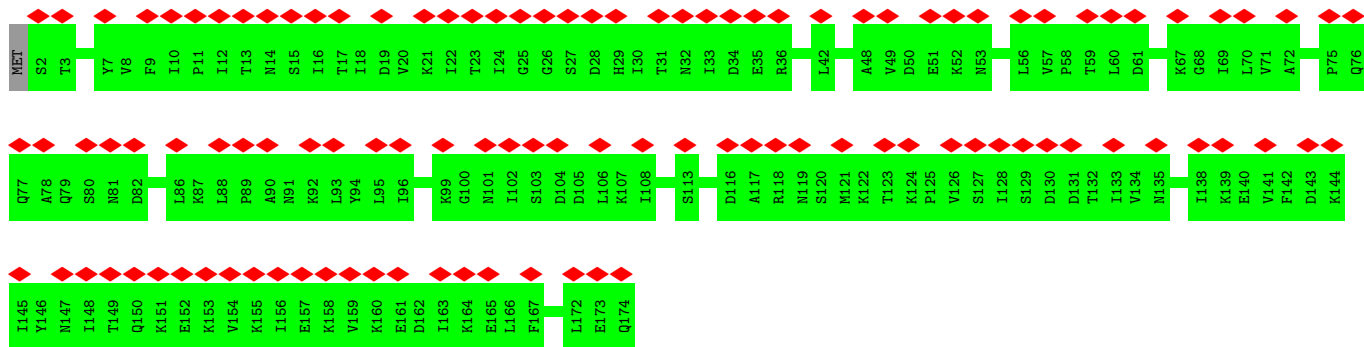
• Molecule 7: CRISPR-associated protein CmrX



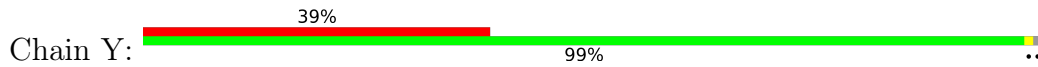
• Molecule 7: CRISPR-associated protein CmrX

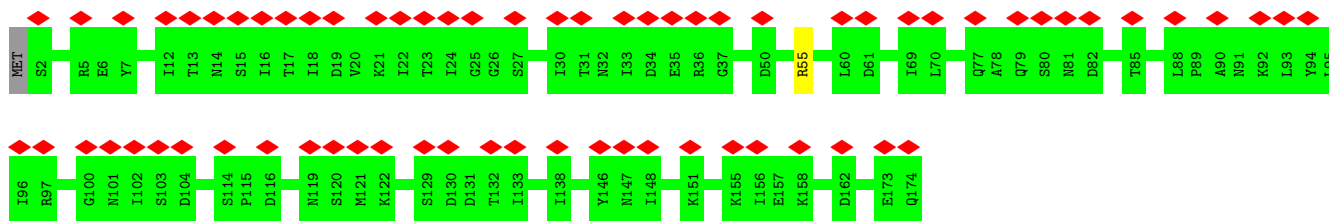


• Molecule 7: CRISPR-associated protein CmrX

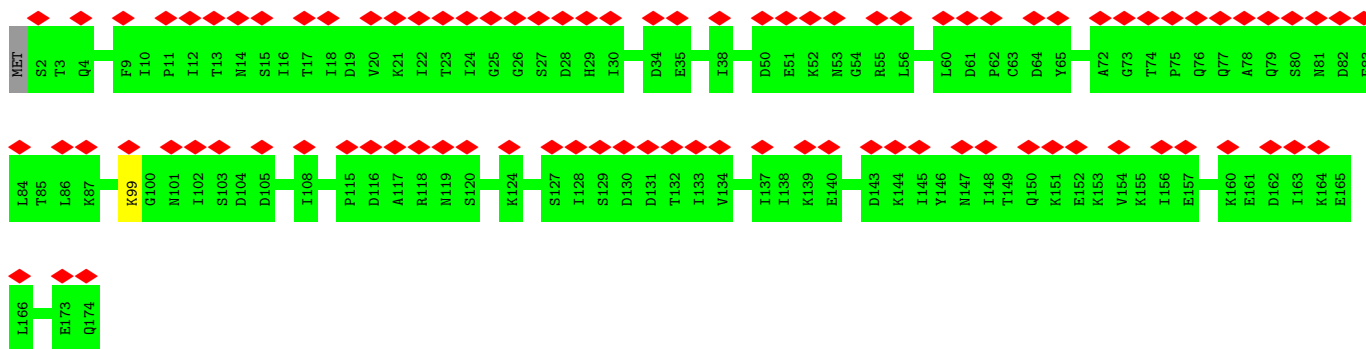


• Molecule 7: CRISPR-associated protein CmrX

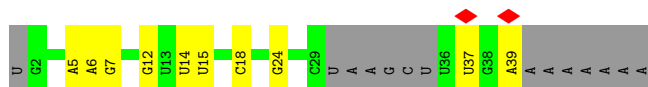




• Molecule 7: CRISPR-associated protein CmrX



• Molecule 8: Cognate target RNA



• Molecule 9: crRNA





## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	50409	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ( $e^-/\text{\AA}^2$ )	41	Depositor
Minimum defocus (nm)	1700	Depositor
Maximum defocus (nm)	2600	Depositor
Magnification	96000	Depositor
Image detector	FEI FALCON III (4k x 4k)	Depositor
Maximum map value	23.571	Depositor
Minimum map value	-13.126	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.610	Depositor
Recommended contour level	1.8	Depositor
Map size (Å)	416.0, 416.0, 416.0	wwPDB
Map dimensions	500, 500, 500	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.832, 0.832, 0.832	Depositor

## 5 Model quality

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: MN, ANP, ZN

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	0.43	0/1275	0.45	0/1716
1	B	0.39	0/1257	0.51	0/1694
1	C	0.46	0/1283	0.47	0/1727
2	D	0.51	0/2318	0.49	0/3134
2	E	0.49	0/2318	0.50	0/3134
2	F	0.49	0/2318	0.50	0/3134
2	G	0.47	0/2302	0.50	0/3113
3	H	0.38	0/2574	0.48	0/3469
4	I	0.47	0/2325	0.48	0/3138
5	J	0.38	0/3899	0.47	0/5242
6	K	0.39	2/8590 (0.0%)	0.51	3/11599 (0.0%)
7	L	0.36	0/1400	0.51	0/1895
7	M	0.36	0/1400	0.52	0/1895
7	N	0.30	0/1400	0.50	0/1895
7	O	0.31	0/1400	0.49	0/1895
7	P	0.32	0/1400	0.50	0/1895
7	Q	0.29	0/1400	0.49	0/1895
7	R	0.28	0/1400	0.48	0/1895
7	S	0.31	0/1400	0.49	0/1895
7	T	0.27	0/1400	0.48	0/1895
7	W	0.27	0/1400	0.49	0/1895
7	X	0.27	0/1400	0.50	0/1895
7	Y	0.27	0/1400	0.50	0/1895
7	Z	0.26	0/1400	0.49	0/1895
7	l	0.36	0/1400	0.48	0/1895
7	m	0.37	0/1400	0.50	0/1895
7	n	0.29	0/1400	0.47	0/1895
7	o	0.33	0/1400	0.50	0/1895
7	p	0.31	0/1400	0.49	0/1895
7	q	0.28	0/1400	0.50	0/1895
7	r	0.29	0/1400	0.49	0/1895
7	s	0.30	0/1400	0.48	0/1895

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z  >5	RMSZ	# Z  >5
7	t	0.27	0/1400	0.48	0/1895
7	w	0.27	0/1400	0.50	0/1895
7	x	0.27	0/1400	0.51	0/1895
7	y	0.26	0/1400	0.50	0/1895
7	z	0.27	0/1400	0.50	0/1895
8	U	0.69	0/743	0.82	0/1153
9	V	0.97	0/1149	0.87	6/1789 (0.3%)
All	All	0.39	2/68751 (0.0%)	0.51	9/93312 (0.0%)

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

Mol	Chain	#Chirality outliers	#Planarity outliers
1	B	0	2
6	K	0	2
7	O	0	1
All	All	0	5

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	K	309	PRO	N-CA	12.67	1.68	1.47
6	K	308	ILE	C-N	5.60	1.44	1.34

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	K	165	ASN	C-N-CA	12.07	151.88	121.70
6	K	309	PRO	CA-N-CD	-7.65	100.79	111.50
9	V	39	A	O4'-C1'-N9	6.00	113.00	108.20
6	K	309	PRO	N-CA-C	-5.96	96.59	112.10
9	V	38	C	C2-N1-C1'	5.93	125.32	118.80
9	V	38	C	N1-C2-O2	5.53	122.22	118.90
9	V	38	C	N3-C2-O2	-5.30	118.19	121.90
9	V	21	A	O4'-C1'-N9	5.27	112.42	108.20
9	V	38	C	C6-N1-C2	-5.14	118.25	120.30

There are no chirality outliers.

All (5) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	15	LYS	Peptide
1	B	16	LYS	Peptide
6	K	198	ALA	Peptide
6	K	605	TYR	Peptide
7	O	75	PRO	Peptide

## 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	
1	A	151/155 (97%)	147 (97%)	4 (3%)	0	100	100
1	B	149/155 (96%)	126 (85%)	23 (15%)	0	100	100
1	C	152/155 (98%)	142 (93%)	10 (7%)	0	100	100
2	D	283/286 (99%)	263 (93%)	20 (7%)	0	100	100
2	E	283/286 (99%)	259 (92%)	24 (8%)	0	100	100
2	F	283/286 (99%)	261 (92%)	22 (8%)	0	100	100
2	G	281/286 (98%)	247 (88%)	33 (12%)	1 (0%)	34	67
3	H	310/313 (99%)	280 (90%)	30 (10%)	0	100	100
4	I	282/296 (95%)	265 (94%)	17 (6%)	0	100	100
5	J	463/476 (97%)	422 (91%)	40 (9%)	1 (0%)	47	78
6	K	1020/1037 (98%)	919 (90%)	99 (10%)	2 (0%)	47	78
7	L	171/174 (98%)	139 (81%)	31 (18%)	1 (1%)	25	59
7	M	171/174 (98%)	143 (84%)	28 (16%)	0	100	100
7	N	171/174 (98%)	138 (81%)	32 (19%)	1 (1%)	25	59
7	O	171/174 (98%)	143 (84%)	27 (16%)	1 (1%)	25	59

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
7	P	171/174 (98%)	144 (84%)	26 (15%)	1 (1%)	25	59
7	Q	171/174 (98%)	136 (80%)	35 (20%)	0	100	100
7	R	171/174 (98%)	139 (81%)	31 (18%)	1 (1%)	25	59
7	S	171/174 (98%)	150 (88%)	20 (12%)	1 (1%)	25	59
7	T	171/174 (98%)	143 (84%)	27 (16%)	1 (1%)	25	59
7	W	171/174 (98%)	147 (86%)	23 (14%)	1 (1%)	25	59
7	X	171/174 (98%)	144 (84%)	26 (15%)	1 (1%)	25	59
7	Y	171/174 (98%)	141 (82%)	30 (18%)	0	100	100
7	Z	171/174 (98%)	144 (84%)	27 (16%)	0	100	100
7	l	171/174 (98%)	146 (85%)	25 (15%)	0	100	100
7	m	171/174 (98%)	142 (83%)	28 (16%)	1 (1%)	25	59
7	n	171/174 (98%)	149 (87%)	22 (13%)	0	100	100
7	o	171/174 (98%)	144 (84%)	25 (15%)	2 (1%)	13	42
7	p	171/174 (98%)	142 (83%)	29 (17%)	0	100	100
7	q	171/174 (98%)	139 (81%)	31 (18%)	1 (1%)	25	59
7	r	171/174 (98%)	142 (83%)	29 (17%)	0	100	100
7	s	171/174 (98%)	146 (85%)	24 (14%)	1 (1%)	25	59
7	t	171/174 (98%)	143 (84%)	28 (16%)	0	100	100
7	w	171/174 (98%)	153 (90%)	17 (10%)	1 (1%)	25	59
7	x	171/174 (98%)	146 (85%)	25 (15%)	0	100	100
7	y	171/174 (98%)	146 (85%)	25 (15%)	0	100	100
7	z	171/174 (98%)	152 (89%)	19 (11%)	0	100	100
All	All	8103/8255 (98%)	7072 (87%)	1012 (12%)	19 (0%)	50	78

All (19) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
5	J	440	ASN
6	K	311	ARG
6	K	606	TYR
7	T	131	ASP
7	X	131	ASP
7	m	131	ASP
7	o	51	GLU

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Mol	Chain	Res	Type
7	o	131	ASP
2	G	4	TYR
7	S	131	ASP
7	q	131	ASP
7	w	131	ASP
7	L	131	ASP
7	N	131	ASP
7	O	131	ASP
7	P	131	ASP
7	R	131	ASP
7	W	131	ASP
7	s	131	ASP

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

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	134/136 (98%)	134 (100%)	0	100	100
1	B	133/136 (98%)	133 (100%)	0	100	100
1	C	135/136 (99%)	135 (100%)	0	100	100
2	D	252/253 (100%)	252 (100%)	0	100	100
2	E	252/253 (100%)	251 (100%)	1 (0%)	91	96
2	F	252/253 (100%)	251 (100%)	1 (0%)	91	96
2	G	250/253 (99%)	249 (100%)	1 (0%)	91	96
3	H	279/280 (100%)	276 (99%)	3 (1%)	73	88
4	I	255/266 (96%)	254 (100%)	1 (0%)	91	96
5	J	438/445 (98%)	438 (100%)	0	100	100
6	K	937/949 (99%)	935 (100%)	2 (0%)	93	97
7	L	159/160 (99%)	159 (100%)	0	100	100
7	M	159/160 (99%)	159 (100%)	0	100	100
7	N	159/160 (99%)	159 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
7	O	159/160 (99%)	159 (100%)	0	100	100
7	P	159/160 (99%)	159 (100%)	0	100	100
7	Q	159/160 (99%)	158 (99%)	1 (1%)	86	94
7	R	159/160 (99%)	159 (100%)	0	100	100
7	S	159/160 (99%)	158 (99%)	1 (1%)	86	94
7	T	159/160 (99%)	159 (100%)	0	100	100
7	W	159/160 (99%)	158 (99%)	1 (1%)	86	94
7	X	159/160 (99%)	159 (100%)	0	100	100
7	Y	159/160 (99%)	158 (99%)	1 (1%)	86	94
7	Z	159/160 (99%)	159 (100%)	0	100	100
7	l	159/160 (99%)	158 (99%)	1 (1%)	86	94
7	m	159/160 (99%)	159 (100%)	0	100	100
7	n	159/160 (99%)	159 (100%)	0	100	100
7	o	159/160 (99%)	159 (100%)	0	100	100
7	p	159/160 (99%)	159 (100%)	0	100	100
7	q	159/160 (99%)	159 (100%)	0	100	100
7	r	159/160 (99%)	158 (99%)	1 (1%)	86	94
7	s	159/160 (99%)	159 (100%)	0	100	100
7	t	159/160 (99%)	159 (100%)	0	100	100
7	w	159/160 (99%)	159 (100%)	0	100	100
7	x	159/160 (99%)	158 (99%)	1 (1%)	86	94
7	y	159/160 (99%)	158 (99%)	1 (1%)	86	94
7	z	159/160 (99%)	159 (100%)	0	100	100
All	All	7451/7520 (99%)	7434 (100%)	17 (0%)	93	97

All (17) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	E	210	ARG
2	F	210	ARG
2	G	256	CYS
3	H	147	ARG
3	H	205	ASP
3	H	271	ARG

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Mol	Chain	Res	Type
4	I	266	ARG
6	K	206	ASP
6	K	721	CYS
7	Q	52	LYS
7	S	122	LYS
7	W	36	ARG
7	l	160	LYS
7	r	118	ARG
7	x	118	ARG
7	Y	55	ARG
7	y	99	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (111) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	75	ASN
2	D	166	ASN
2	E	19	HIS
2	E	77	ASN
2	E	141	ASN
2	E	166	ASN
2	F	17	HIS
2	F	77	ASN
2	F	141	ASN
2	F	153	ASN
2	F	178	ASN
2	G	13	HIS
2	G	130	GLN
2	G	203	ASN
2	G	260	ASN
3	H	187	ASN
3	H	253	ASN
4	I	44	GLN
4	I	56	HIS
4	I	210	HIS
4	I	227	HIS
5	J	51	ASN
5	J	277	ASN
5	J	285	ASN
5	J	321	ASN
5	J	327	ASN
5	J	393	ASN

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
5	J	443	ASN
6	K	110	GLN
6	K	172	ASN
6	K	299	ASN
6	K	382	GLN
6	K	602	ASN
6	K	635	HIS
6	K	743	ASN
6	K	771	HIS
6	K	845	ASN
6	K	846	ASN
6	K	1024	ASN
7	L	79	GLN
7	M	77	GLN
7	N	39	HIS
7	N	40	ASN
7	O	4	GLN
7	P	40	ASN
7	Q	14	ASN
7	R	40	ASN
7	R	76	GLN
7	R	77	GLN
7	R	79	GLN
7	R	135	ASN
7	R	174	GLN
7	S	4	GLN
7	S	40	ASN
7	S	79	GLN
7	S	136	ASN
7	T	32	ASN
7	T	79	GLN
7	T	150	GLN
7	W	39	HIS
7	W	40	ASN
7	W	77	GLN
7	W	136	ASN
7	W	174	GLN
7	X	119	ASN
7	l	147	ASN
7	m	40	ASN
7	m	76	GLN
7	n	53	ASN

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
7	n	174	GLN
7	p	79	GLN
7	p	135	ASN
7	p	147	ASN
7	q	136	ASN
7	q	174	GLN
7	r	29	HIS
7	r	40	ASN
7	r	79	GLN
7	s	39	HIS
7	s	101	ASN
7	s	147	ASN
7	s	174	GLN
7	t	4	GLN
7	t	29	HIS
7	t	40	ASN
7	t	53	ASN
7	t	174	GLN
7	w	14	ASN
7	w	53	ASN
7	w	135	ASN
7	x	77	GLN
7	x	79	GLN
7	x	147	ASN
7	x	174	GLN
7	Z	4	GLN
7	Z	14	ASN
7	Z	29	HIS
7	Z	91	ASN
7	z	39	HIS
7	z	76	GLN
7	z	77	GLN
7	z	135	ASN
7	z	174	GLN
7	Y	29	HIS
7	Y	76	GLN
7	Y	77	GLN
7	Y	79	GLN
7	Y	147	ASN
7	y	76	GLN
7	y	77	GLN
7	y	135	ASN

### 5.3.3 RNA [i](#)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
8	U	30/46 (65%)	9 (30%)	1 (3%)
9	V	47/51 (92%)	9 (19%)	0
All	All	77/97 (79%)	18 (23%)	1 (1%)

All (18) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
8	U	6	A
8	U	7	G
8	U	12	G
8	U	14	U
8	U	15	U
8	U	18	C
8	U	24	G
8	U	37	U
8	U	39	A
9	V	2	U
9	V	3	U
9	V	9	U
9	V	14	A
9	V	16	C
9	V	19	A
9	V	33	G
9	V	34	A
9	V	35	A

All (1) RNA pucker outliers are listed below:

Mol	Chain	Res	Type
8	U	5	A

## 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 monosaccharides in this entry.

## 5.6 Ligand geometry

Of 6 ligands modelled in this entry, 4 are monoatomic - leaving 2 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
11	ANP	K	1103	12	29,33,33	1.31	5 (17%)	31,52,52	1.43	6 (19%)
11	ANP	K	1102	12	29,33,33	1.35	5 (17%)	31,52,52	1.34	4 (12%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
11	ANP	K	1103	12	-	3/14/38/38	0/3/3/3
11	ANP	K	1102	12	-	3/14/38/38	0/3/3/3

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
11	K	1102	ANP	PG-O2G	-3.15	1.48	1.56
11	K	1102	ANP	PG-O3G	-3.00	1.48	1.56
11	K	1103	ANP	PG-O2G	-2.99	1.48	1.56
11	K	1103	ANP	PG-O3G	-2.89	1.49	1.56
11	K	1102	ANP	PB-O3A	-2.85	1.55	1.59
11	K	1103	ANP	PB-O2B	-2.71	1.49	1.56
11	K	1102	ANP	PB-O2B	-2.54	1.49	1.56
11	K	1102	ANP	PB-O1B	2.22	1.49	1.46
11	K	1103	ANP	PG-O1G	2.18	1.49	1.46
11	K	1103	ANP	PB-O1B	2.11	1.49	1.46

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
11	K	1103	ANP	O2B-PB-O1B	3.95	118.20	109.92

*Continued on next page...*

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
11	K	1102	ANP	O2B-PB-O1B	3.86	118.01	109.92
11	K	1102	ANP	PB-O3A-PA	-3.33	120.91	132.62
11	K	1102	ANP	O3G-PG-O1G	-3.12	105.61	113.45
11	K	1103	ANP	O2G-PG-O1G	-2.58	106.98	113.45
11	K	1103	ANP	O1B-PB-N3B	-2.47	108.14	111.77
11	K	1102	ANP	C5-C6-N6	2.41	124.01	120.35
11	K	1103	ANP	C3'-C2'-C1'	-2.35	97.44	100.98
11	K	1103	ANP	PB-O3A-PA	-2.31	124.46	132.62
11	K	1103	ANP	C5-C6-N6	2.24	123.75	120.35

There are no chirality outliers.

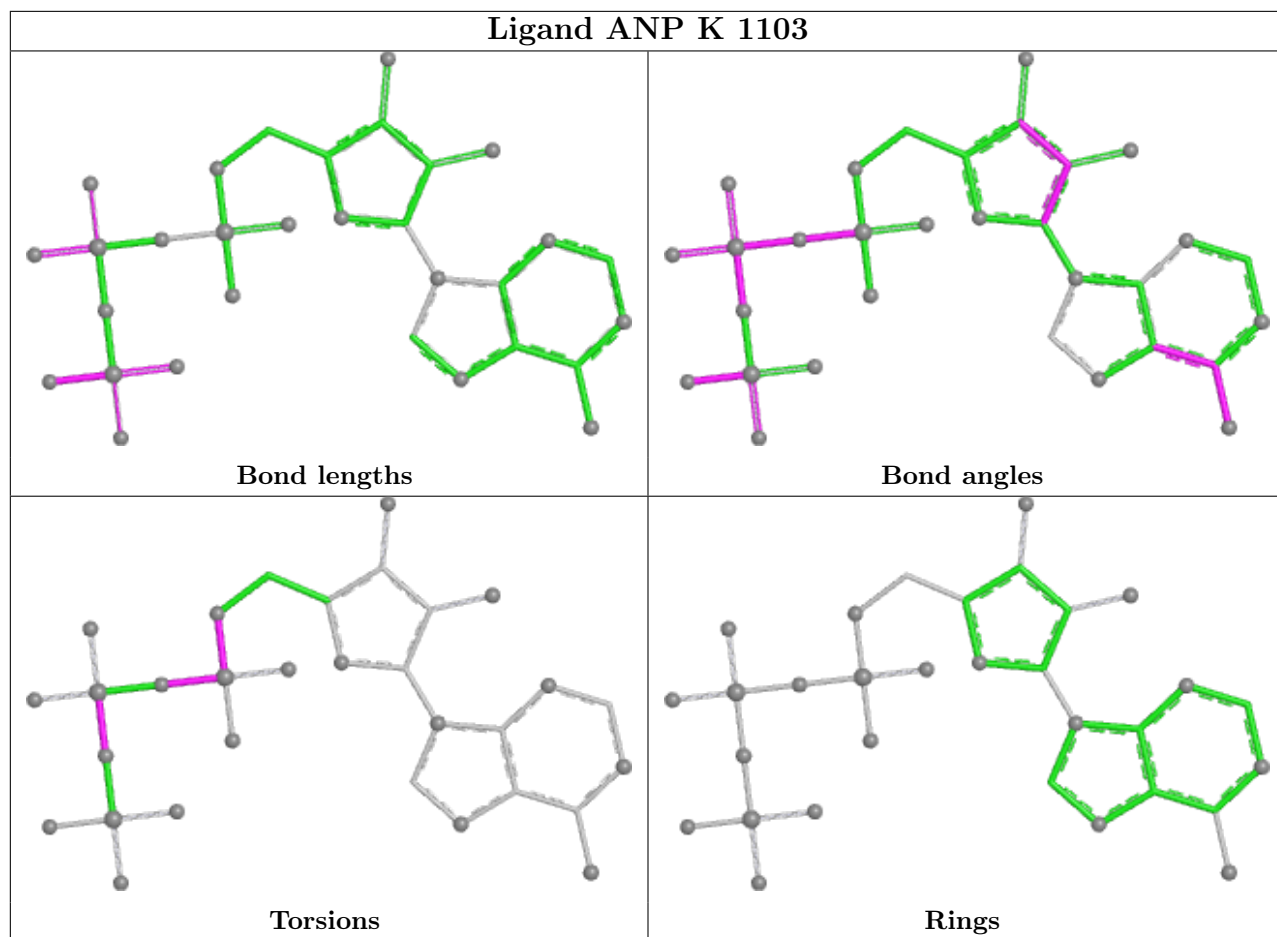
All (6) torsion outliers are listed below:

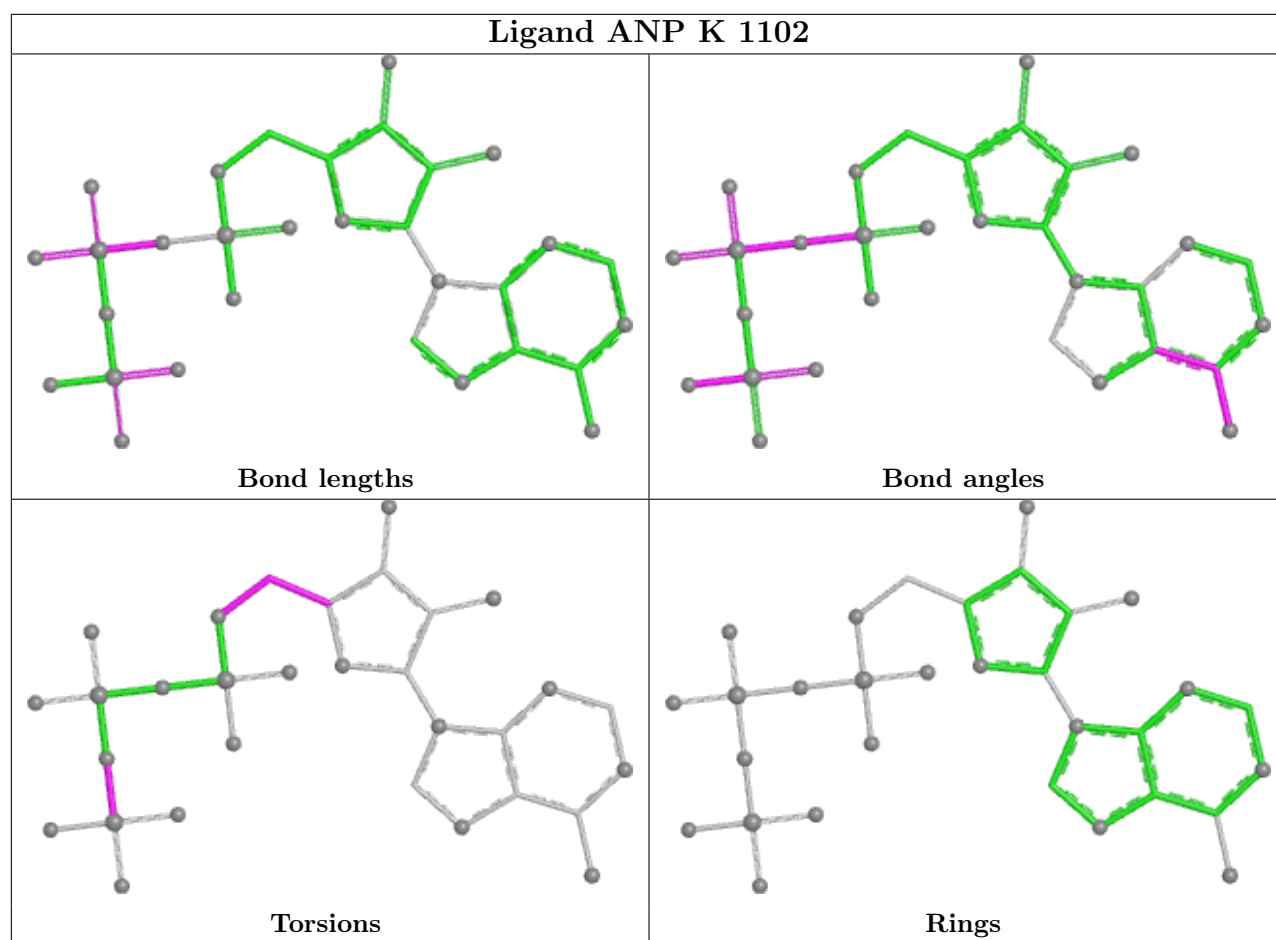
Mol	Chain	Res	Type	Atoms
11	K	1102	ANP	PB-N3B-PG-O1G
11	K	1102	ANP	C4'-C5'-O5'-PA
11	K	1103	ANP	PG-N3B-PB-O3A
11	K	1102	ANP	O4'-C4'-C5'-O5'
11	K	1103	ANP	PB-O3A-PA-O2A
11	K	1103	ANP	C5'-O5'-PA-O1A

There are no ring outliers.

No monomer is involved in short contacts.

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.





## 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.

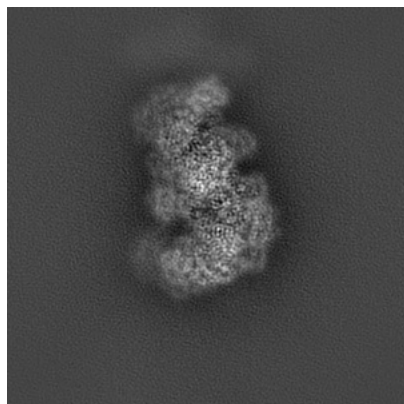
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-10196. These allow visual inspection of the internal detail of the map and identification of artifacts.

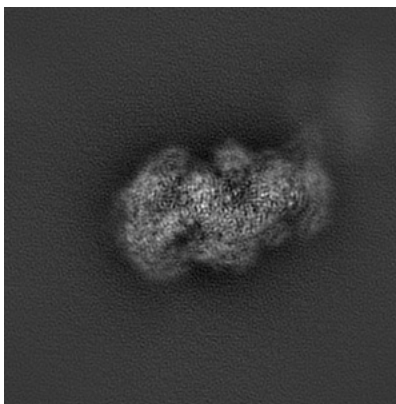
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

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

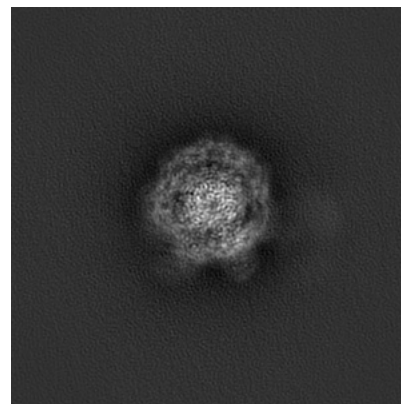
#### 6.1.1 Primary map



X

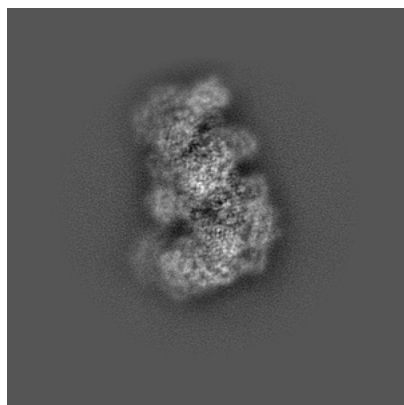


Y

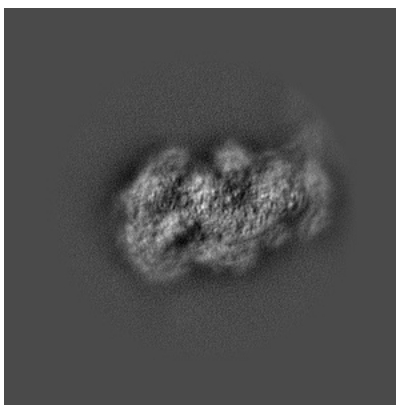


Z

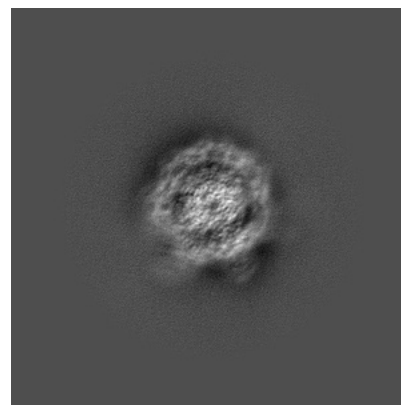
#### 6.1.2 Raw map



X



Y



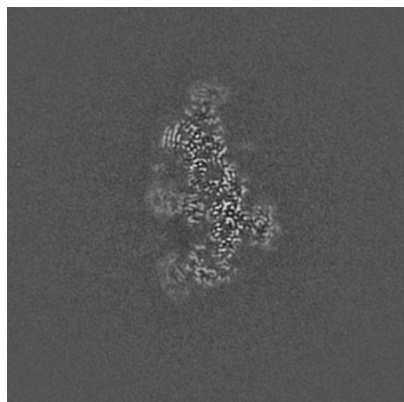
Z

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

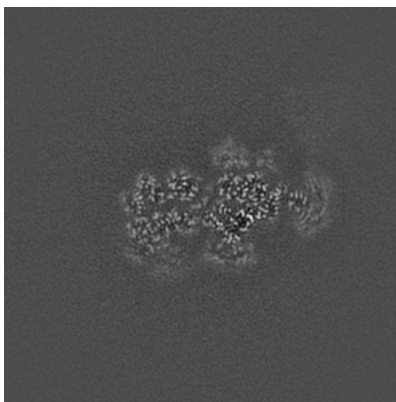


## 6.2 Central slices [i](#)

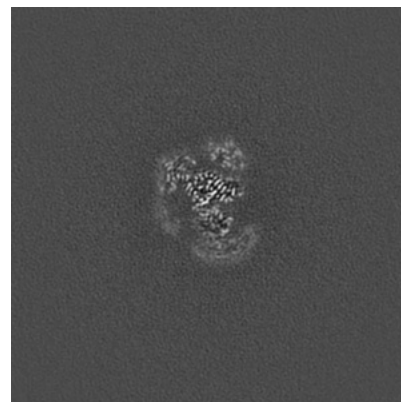
### 6.2.1 Primary map



X Index: 250

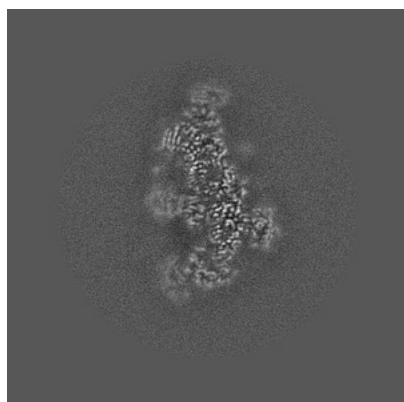


Y Index: 250

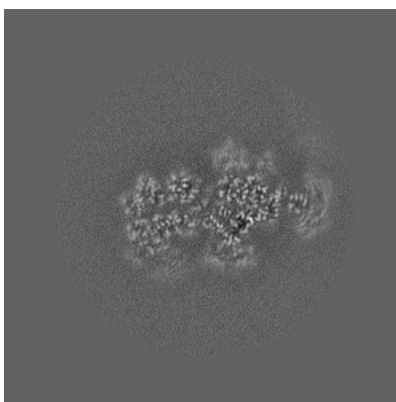


Z Index: 250

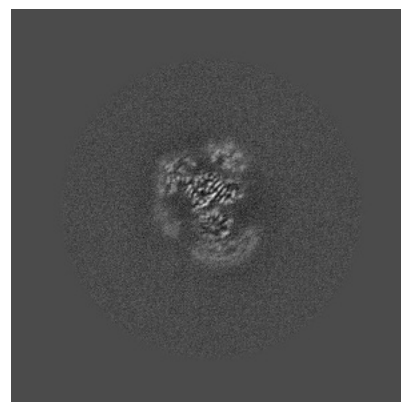
### 6.2.2 Raw map



X Index: 250



Y Index: 250

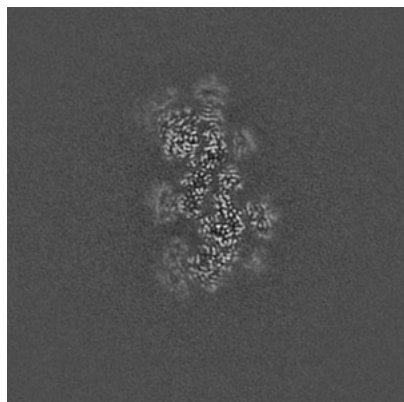


Z Index: 250

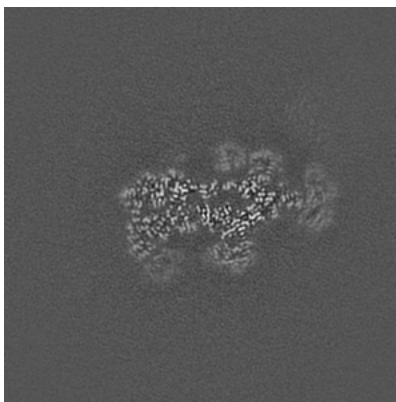
The images above show central slices of the map in three orthogonal directions.

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

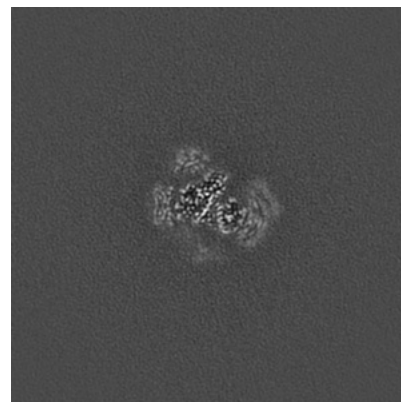
### 6.3.1 Primary map



X Index: 265

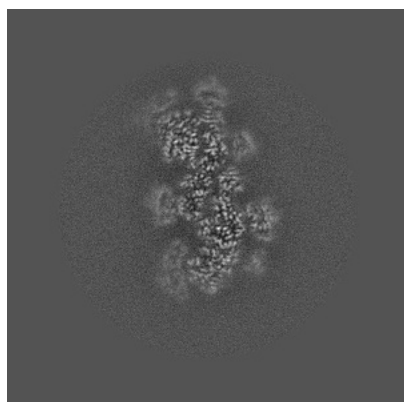


Y Index: 258

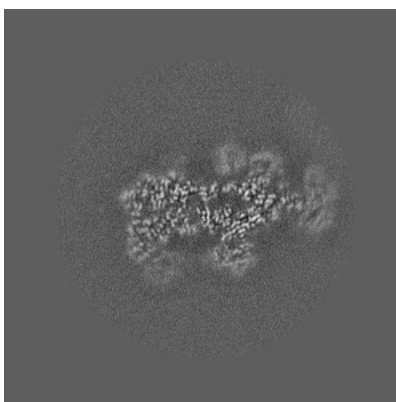


Z Index: 281

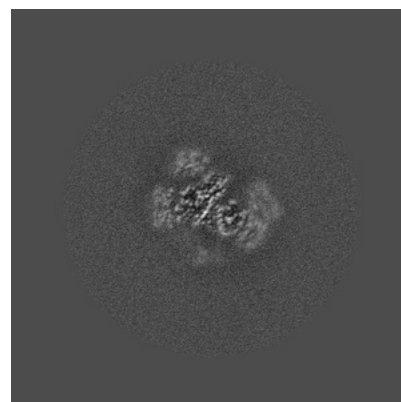
### 6.3.2 Raw map



X Index: 265



Y Index: 258

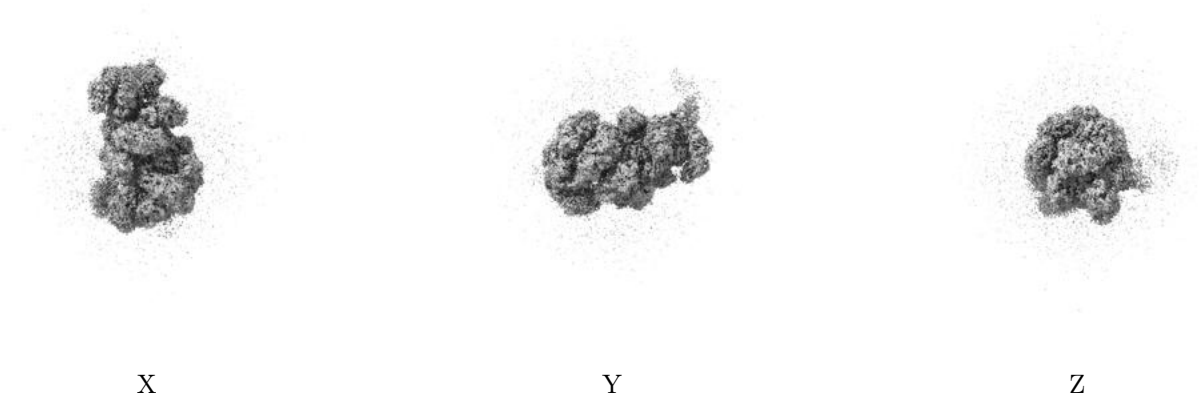


Z Index: 281

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

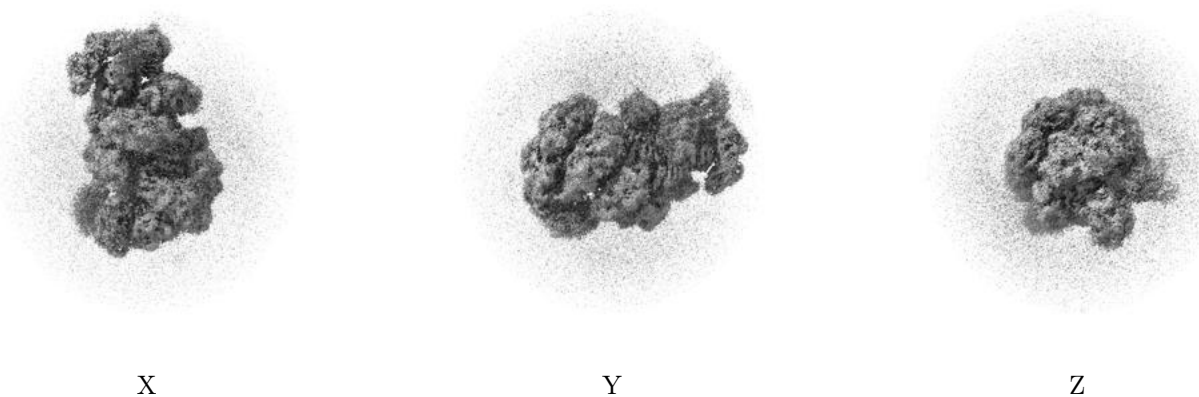
## 6.4 Orthogonal surface views [i](#)

### 6.4.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 1.8. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

### 6.4.2 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.

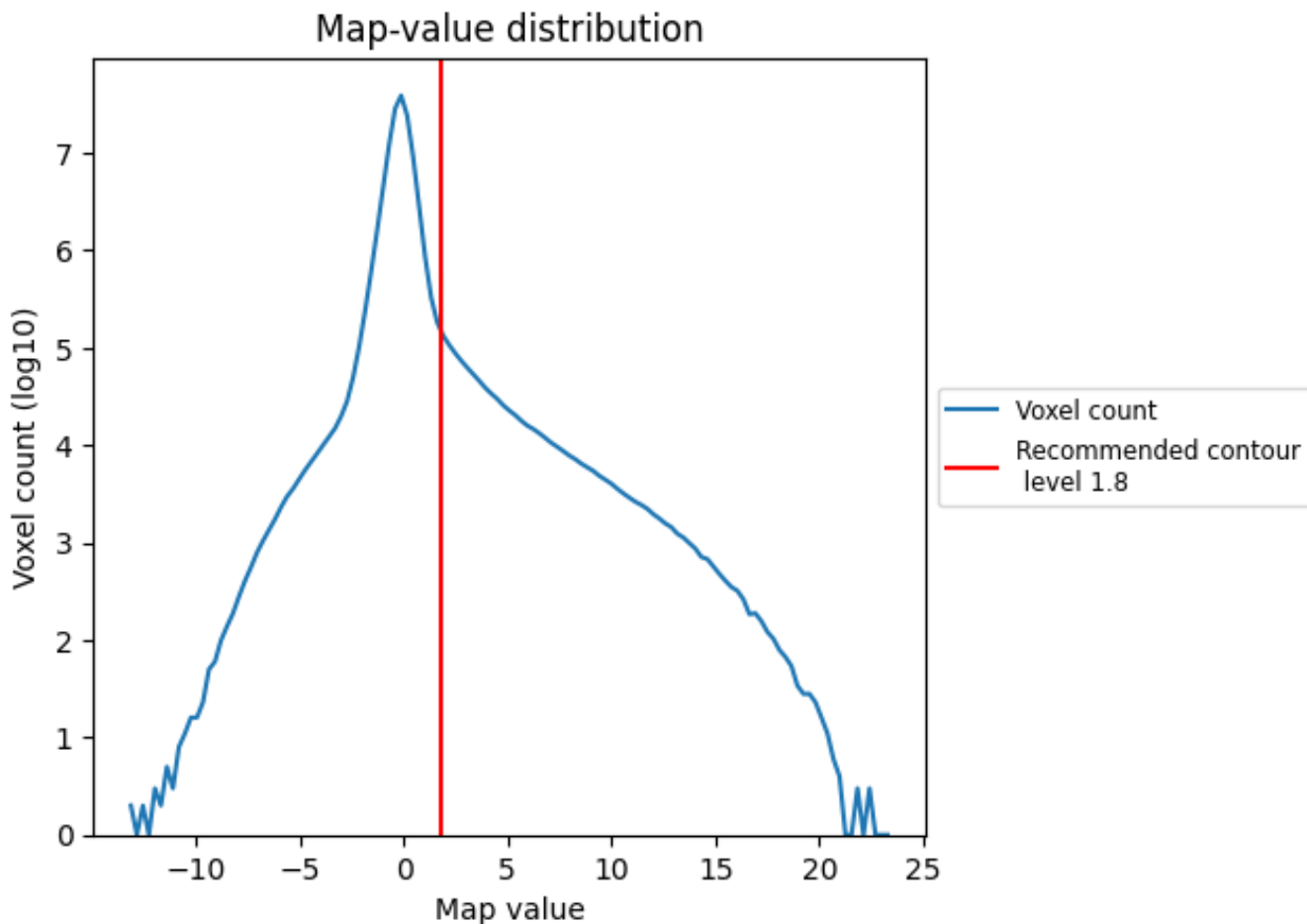
## 6.5 Mask visualisation [i](#)

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

## 7 Map analysis [i](#)

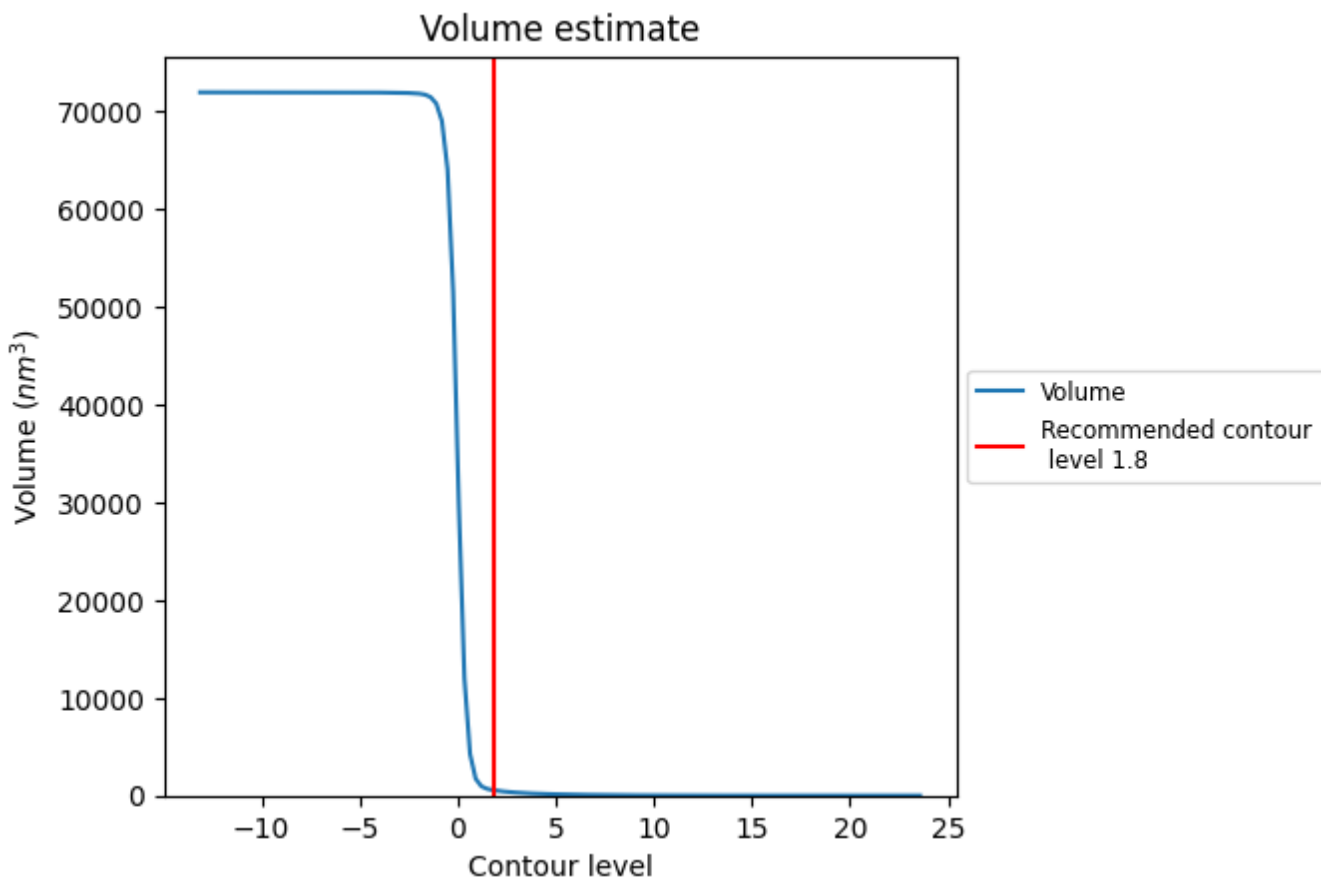
This section contains the results of statistical analysis of the map.

### 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.

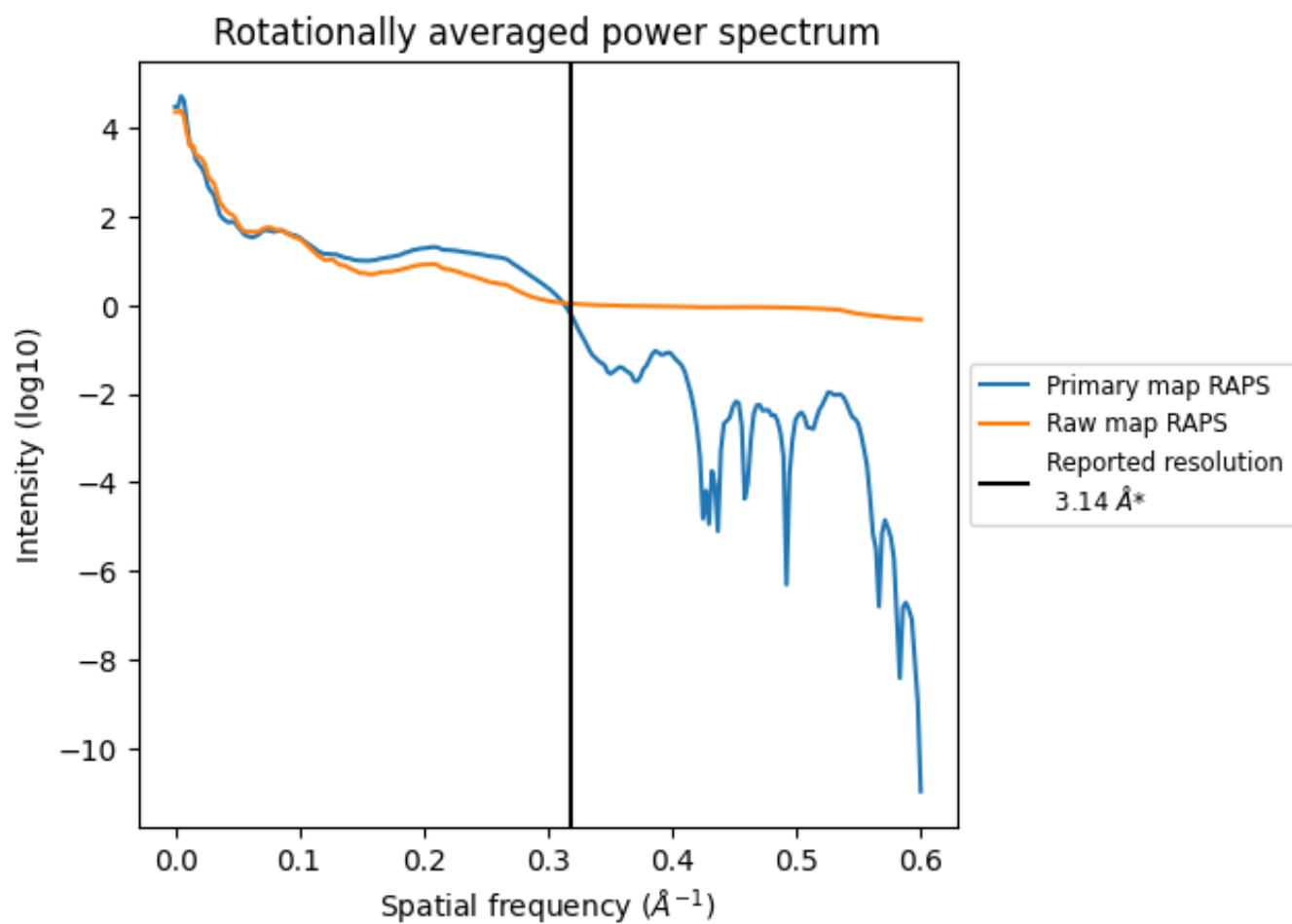
## 7.2 Volume estimate [i](#)



The volume at the recommended contour level is 560 nm<sup>3</sup>; this corresponds to an approximate mass of 506 kDa.

The volume estimate graph shows how the enclosed volume varies with the contour level. The recommended contour level is shown as a vertical line and the intersection between the line and the curve gives the volume of the enclosed surface at the given level.

### 7.3 Rotationally averaged power spectrum [i](#)

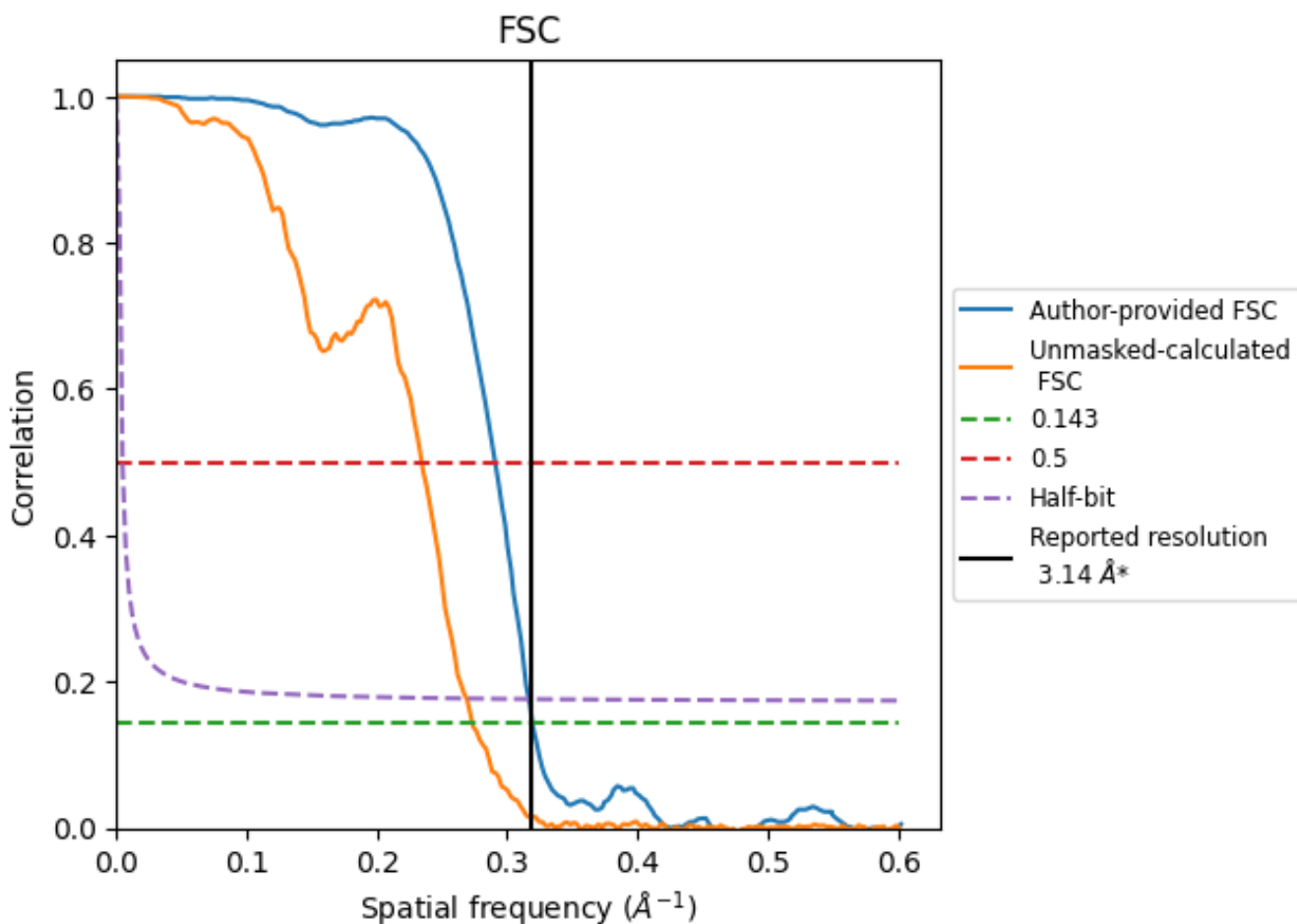


\*Reported resolution corresponds to spatial frequency of 0.318 Å<sup>-1</sup>

## 8 Fourier-Shell correlation [i](#)

Fourier-Shell Correlation (FSC) is the most commonly used method to estimate the resolution of single-particle and subtomogram-averaged maps. The shape of the curve depends on the imposed symmetry, mask and whether or not the two 3D reconstructions used were processed from a common reference. The reported resolution is shown as a black line. A curve is displayed for the half-bit criterion in addition to lines showing the 0.143 gold standard cut-off and 0.5 cut-off.

### 8.1 FSC [i](#)



\*Reported resolution corresponds to spatial frequency of 0.318 Å<sup>-1</sup>

## 8.2 Resolution estimates [i](#)

Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.14	-	-
Author-provided FSC curve	3.13	3.44	3.16
Unmasked-calculated*	3.66	4.27	3.72

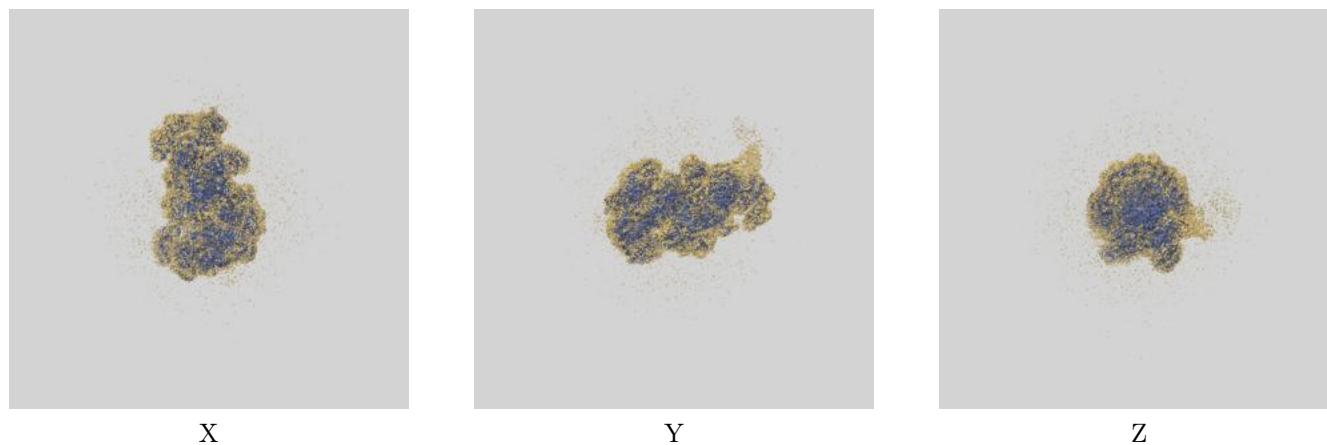
\*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 3.66 differs from the reported value 3.14 by more than 10 %



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

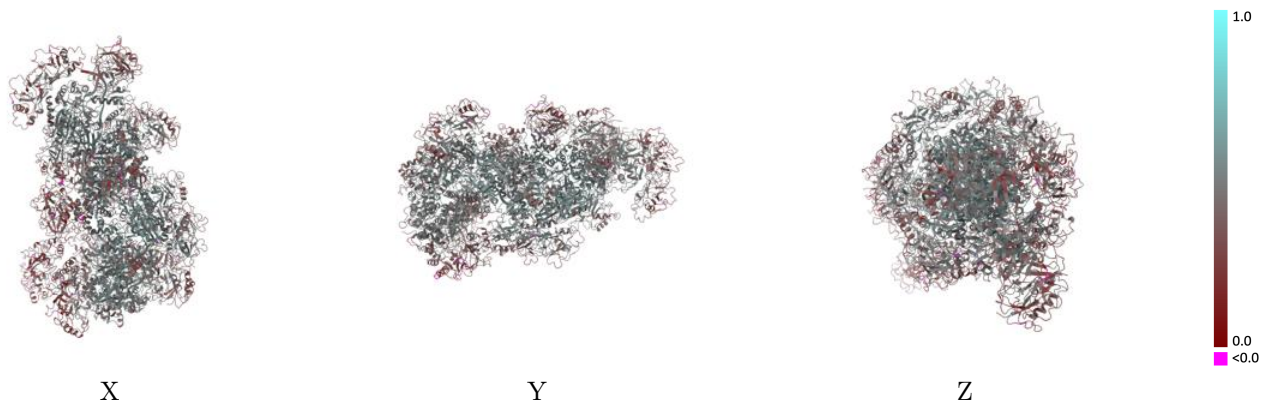
This section contains information regarding the fit between EMDB map EMD-10196 and PDB model 6SH8. Per-residue inclusion information can be found in section 3 on page 10.

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



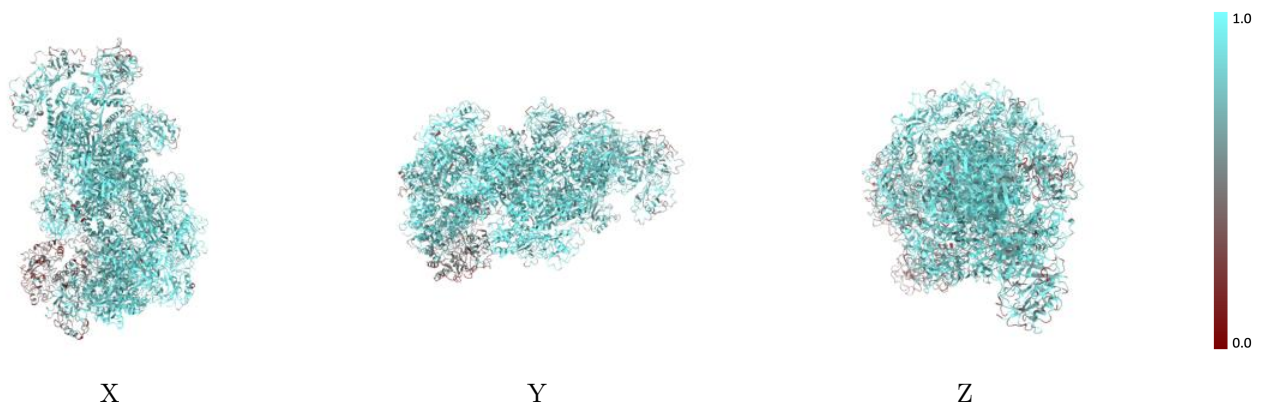
The images above show the 3D surface view of the map at the recommended contour level 1.8 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



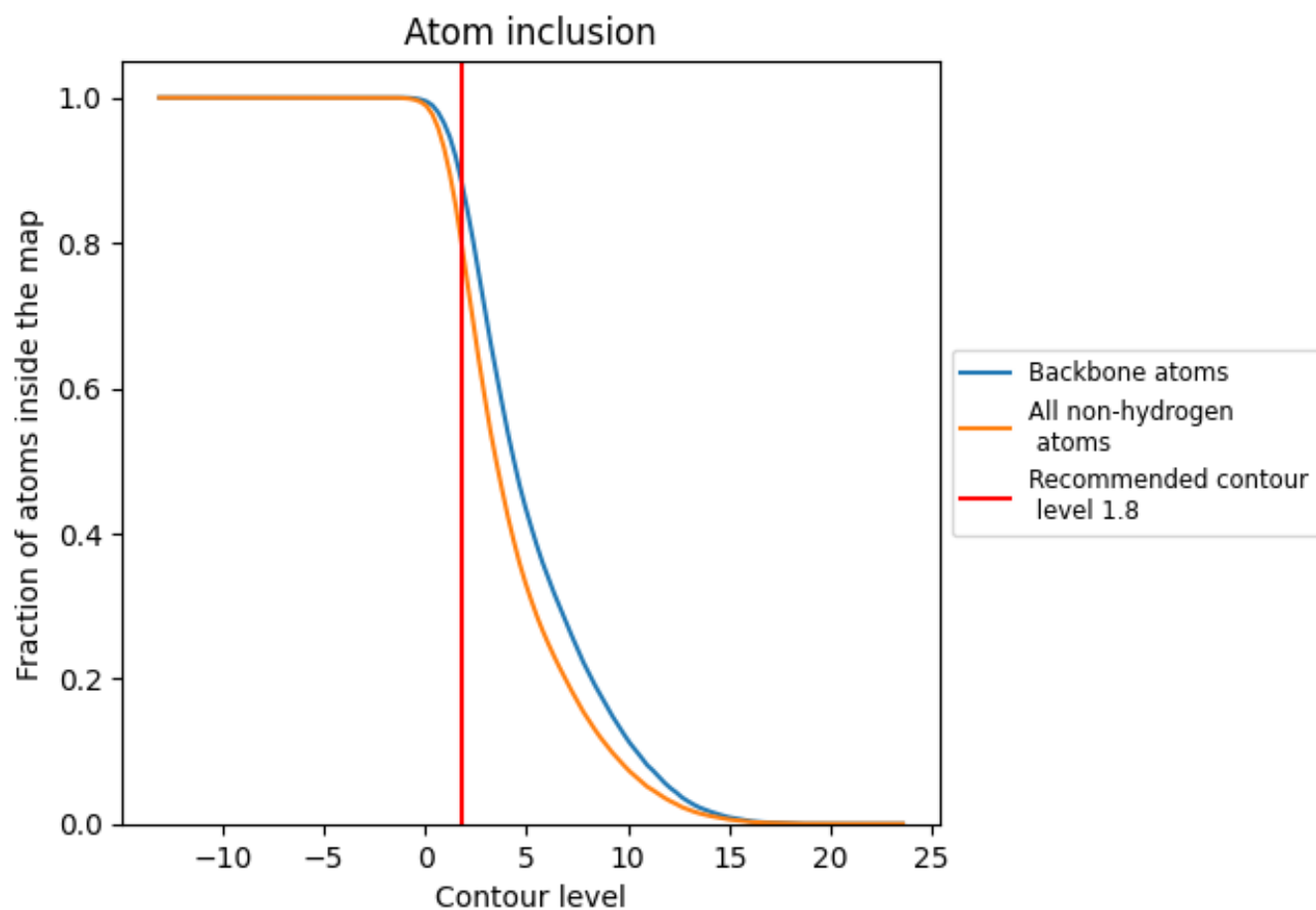
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions at which atoms can be resolved. Low Q-score values may therefore be expected for many entries.

## 9.3 Atom inclusion mapped to coordinate model [i](#)



The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (1.8).







































































## 9.4 Atom inclusion [i](#)



At the recommended contour level, 88% of all backbone atoms, 80% 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 (1.8) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.7972	 0.4370
A	 0.9051	 0.5160
B	 0.8474	 0.4510
C	 0.9130	 0.5290
D	 0.9185	 0.5360
E	 0.9095	 0.5380
F	 0.9185	 0.5390
G	 0.9098	 0.5210
H	 0.9117	 0.5060
I	 0.9107	 0.5320
J	 0.8818	 0.4950
K	 0.8639	 0.4780
L	 0.8720	 0.4410
M	 0.8882	 0.4430
N	 0.8396	 0.3980
O	 0.8344	 0.4170
P	 0.7954	 0.4320
Q	 0.7579	 0.3300
R	 0.7969	 0.3310
S	 0.7704	 0.3990
T	 0.7219	 0.3640
U	 0.8817	 0.5050
V	 0.9756	 0.5490
W	 0.6527	 0.3640
X	 0.5327	 0.3400
Y	 0.4702	 0.3260
Z	 0.3105	 0.2720
l	 0.8882	 0.4490
m	 0.8977	 0.4560
n	 0.8300	 0.3810
o	 0.8543	 0.4360
p	 0.7910	 0.4300
q	 0.7969	 0.3210
r	 0.8330	 0.3680
s	 0.7219	 0.4180



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Chain	Atom inclusion	Q-score
t	 0.6380	 0.3490
w	 0.6917	 0.3750
x	 0.5843	 0.3520
y	 0.3863	 0.2920
z	 0.3444	 0.2740