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

wwPDB EM Validation Summary Report (i)

Oct 28, 2024 – 08:00 pm GMT

PDB ID	:	8BP8
EMDB ID	:	EMD-16146
Title	:	SPA of Trypsin untreated Rotavirus TLP spike
Authors	:	Shah, P.N.M.; Stuart, D.I.
Deposited on	:	2022-11-16
Resolution	:	2.70 Å(reported)

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

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/EMValidationReportHelp
with specific help available everywhere you see the (i) 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 (i)) were used in the production of this report:

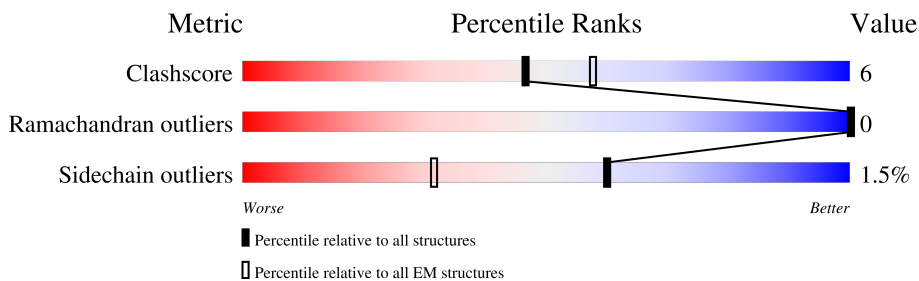|		
EMDB validation analysis	:	0.0.1.dev113
MolProbity	:	4.02b-467
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ	:	1.9.13
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.39

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 2.70 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.

Metric	Percentile Ranks	Value
Clashscore		6
Ramachandran outliers		0
Sidechain outliers		1.5%

Worse *Better*

■ Percentile relative to all structures

▯ Percentile relative to all EM structures
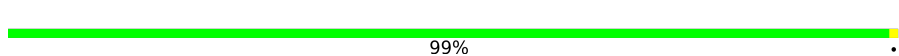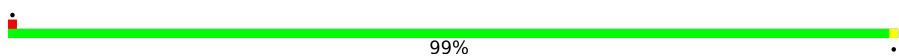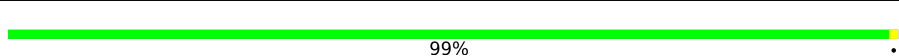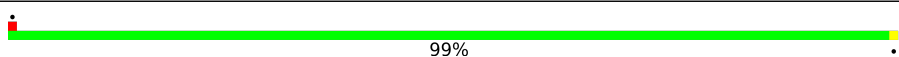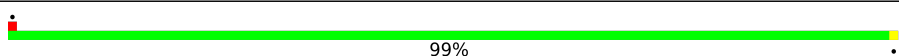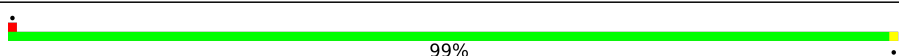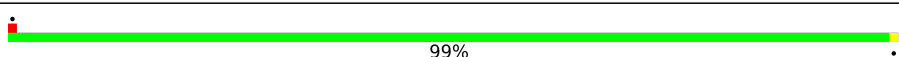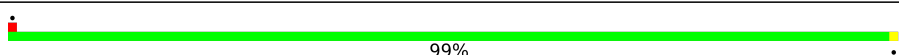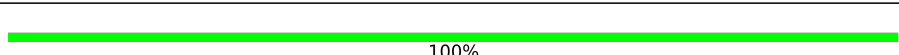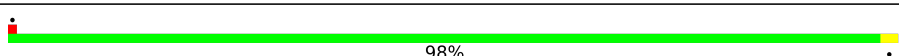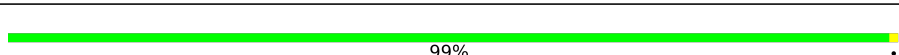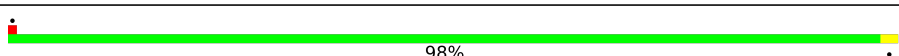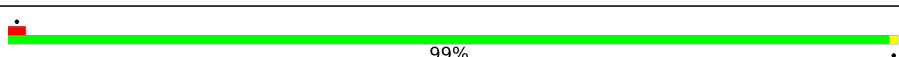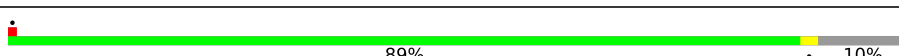
Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415

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

Mol	Chain	Length	Quality of chain
1	A	776	56% / 70% 23% · 6%
1	B	776	56% / 68% 27% · ·
1	C	776	33% / 73% 15% · 11%
2	D	326	· / 70% 10% · 20%
2	E	326	· / 66% 8% 25%
2	F	326	· / 70% 11% 18%
2	G	326	· / 71% 11% 18%
2	H	326	64% 10% 26%

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Mol	Chain	Length	Quality of chain
2	I	326	71% 10% 19%
2	J	326	72% 8% 19%
2	K	326	68% 11% 21%
2	L	326	69% 12% 19%
2	M	326	72% 10% 18%
2	N	326	69% 12% 19%
2	O	326	73% 8% 19%
2	P	326	66% 9% 26%
3	d	397	99%
3	e	397	99%
3	f	397	99%
3	g	397	99%
3	h	397	99%
3	i	397	99%
3	j	397	99%
3	k	397	99%
3	l	397	100%
3	m	397	98%
3	n	397	99%
3	o	397	98%
3	p	397	99%
4	q	882	86% 13%
4	r	882	89% 10%

2   Entry composition ⓘ

There are 6 unique types of molecules in this entry. The entry contains 193677 atoms, of which 96046 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 Outer capsid protein VP4.

Mol	Chain	Residues	Atoms						AltConf	Trace
1	A	726	Total	C	H	N	O	S	0	0
			11303	3616	5589	952	1127	19		
1	B	744	Total	C	H	N	O	S	0	0
			11596	3703	5737	977	1159	20		
1	C	692	Total	C	H	N	O	S	0	0
			10813	3466	5343	910	1074	20		

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	185	THR	ARG	conflict	UNP A0A1Q2TSK9
A	323	MET	VAL	conflict	UNP A0A1Q2TSK9
A	737	SER	THR	conflict	UNP A0A1Q2TSK9
A	738	ARG	LYS	conflict	UNP A0A1Q2TSK9
B	185	THR	ARG	conflict	UNP A0A1Q2TSK9
B	323	MET	VAL	conflict	UNP A0A1Q2TSK9
B	737	SER	THR	conflict	UNP A0A1Q2TSK9
B	738	ARG	LYS	conflict	UNP A0A1Q2TSK9
C	185	THR	ARG	conflict	UNP A0A1Q2TSK9
C	323	MET	VAL	conflict	UNP A0A1Q2TSK9
C	737	SER	THR	conflict	UNP A0A1Q2TSK9
C	738	ARG	LYS	conflict	UNP A0A1Q2TSK9

- Molecule 2 is a protein called Outer capsid glycoprotein VP7.

Mol	Chain	Residues	Atoms						AltConf	Trace
2	D	262	Total	C	H	N	O	S	0	0
			4111	1324	2035	329	407	16		
2	E	244	Total	C	H	N	O	S	0	0
			3820	1227	1892	304	381	16		
2	F	267	Total	C	H	N	O	S	0	0
			4185	1348	2067	337	417	16		
2	G	268	Total	C	H	N	O	S	0	0
			4203	1354	2078	338	417	16		

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Mol	Chain	Residues	Atoms						AltConf	Trace
2	H	242	Total	C	H	N	O	S	0	0
			3787	1217	1874	302	378	16		
2	I	264	Total	C	H	N	O	S	0	0
			4144	1333	2048	334	413	16		
2	J	265	Total	C	H	N	O	S	0	0
			4153	1336	2053	335	413	16		
2	K	256	Total	C	H	N	O	S	0	0
			4021	1293	1991	323	398	16		
2	L	265	Total	C	H	N	O	S	0	0
			4154	1336	2053	335	414	16		
2	M	267	Total	C	H	N	O	S	0	0
			4185	1348	2067	337	417	16		
2	N	263	Total	C	H	N	O	S	0	0
			4131	1329	2044	333	409	16		
2	O	265	Total	C	H	N	O	S	0	0
			4154	1336	2053	335	414	16		
2	P	242	Total	C	H	N	O	S	0	0
			3787	1217	1874	302	378	16		

- Molecule 3 is a protein called Intermediate capsid protein VP6.

Mol	Chain	Residues	Atoms						AltConf	Trace
3	d	397	Total	C	H	N	O	S	0	0
			6276	2007	3113	550	592	14		
3	e	397	Total	C	H	N	O	S	0	0
			6276	2007	3113	550	592	14		
3	f	397	Total	C	H	N	O	S	0	0
			6277	2007	3114	550	592	14		
3	g	397	Total	C	H	N	O	S	0	0
			6276	2007	3113	550	592	14		
3	h	397	Total	C	H	N	O	S	0	0
			6277	2007	3114	550	592	14		
3	i	397	Total	C	H	N	O	S	0	0
			6277	2007	3114	550	592	14		
3	j	397	Total	C	H	N	O	S	0	0
			6276	2007	3113	550	592	14		
3	k	397	Total	C	H	N	O	S	0	0
			6276	2007	3113	550	592	14		
3	l	397	Total	C	H	N	O	S	0	0
			6276	2007	3113	550	592	14		
3	m	397	Total	C	H	N	O	S	0	0
			6276	2007	3113	550	592	14		

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Mol	Chain	Residues	Atoms							AltConf	Trace
3	n	397	Total 6276	C 2007	H 3113	N 550	O 592	S 14		0	0
3	o	397	Total 6276	C 2007	H 3113	N 550	O 592	S 14		0	0
3	p	397	Total 6277	C 2007	H 3114	N 550	O 592	S 14		0	0

- Molecule 4 is a protein called Inner capsid protein VP2.

Mol	Chain	Residues	Atoms							AltConf	Trace
4	q	769	Total 12520	C 3978	H 6273	N 1072	O 1161	S 36		0	0
4	r	795	Total 12974	C 4122	H 6502	N 1108	O 1206	S 36		0	0

There are 76 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
q	118	ALA	LYS	conflict	UNP A2T3R1
q	129	ARG	LYS	conflict	UNP A2T3R1
q	131	LYS	LEU	conflict	UNP A2T3R1
q	135	ILE	ARG	conflict	UNP A2T3R1
q	140	LYS	ARG	conflict	UNP A2T3R1
q	142	ARG	LEU	conflict	UNP A2T3R1
q	146	ILE	TRP	conflict	UNP A2T3R1
q	152	LYS	ARG	conflict	UNP A2T3R1
q	175	THR	MET	conflict	UNP A2T3R1
q	206	SER	ALA	conflict	UNP A2T3R1
q	222	ALA	ARG	conflict	UNP A2T3R1
q	250	TYR	HIS	conflict	UNP A2T3R1
q	414	VAL	ILE	conflict	UNP A2T3R1
q	432	VAL	ILE	conflict	UNP A2T3R1
q	436	ILE	VAL	conflict	UNP A2T3R1
q	438	VAL	PRO	conflict	UNP A2T3R1
q	477	ASN	TYR	conflict	UNP A2T3R1
q	479	TYR	GLN	conflict	UNP A2T3R1
q	503	ILE	VAL	conflict	UNP A2T3R1
q	551	ALA	SER	conflict	UNP A2T3R1
q	553	SER	ASN	conflict	UNP A2T3R1
q	561	VAL	ILE	conflict	UNP A2T3R1
q	640	ALA	SER	conflict	UNP A2T3R1
q	650	HIS	GLN	conflict	UNP A2T3R1

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Chain	Residue	Modelled	Actual	Comment	Reference
q	656	VAL	ARG	conflict	UNP A2T3R1
q	657	ALA	VAL	conflict	UNP A2T3R1
q	676	VAL	ILE	conflict	UNP A2T3R1
q	686	LEU	ALA	conflict	UNP A2T3R1
q	688	ALA	ASN	conflict	UNP A2T3R1
q	690	ASP	GLU	conflict	UNP A2T3R1
q	741	THR	SER	conflict	UNP A2T3R1
q	743	SER	ASP	conflict	UNP A2T3R1
q	766	VAL	ILE	conflict	UNP A2T3R1
q	777	ILE	LYS	conflict	UNP A2T3R1
q	818	VAL	ILE	conflict	UNP A2T3R1
q	820	ILE	THR	conflict	UNP A2T3R1
q	831	VAL	GLN	conflict	UNP A2T3R1
q	837	ASN	ALA	conflict	UNP A2T3R1
r	118	ALA	LYS	conflict	UNP A2T3R1
r	129	ARG	LYS	conflict	UNP A2T3R1
r	131	LYS	LEU	conflict	UNP A2T3R1
r	135	ILE	ARG	conflict	UNP A2T3R1
r	140	LYS	ARG	conflict	UNP A2T3R1
r	142	ARG	LEU	conflict	UNP A2T3R1
r	146	ILE	TRP	conflict	UNP A2T3R1
r	152	LYS	ARG	conflict	UNP A2T3R1
r	175	THR	MET	conflict	UNP A2T3R1
r	206	SER	ALA	conflict	UNP A2T3R1
r	222	ALA	ARG	conflict	UNP A2T3R1
r	250	TYR	HIS	conflict	UNP A2T3R1
r	414	VAL	ILE	conflict	UNP A2T3R1
r	432	VAL	ILE	conflict	UNP A2T3R1
r	436	ILE	VAL	conflict	UNP A2T3R1
r	438	VAL	PRO	conflict	UNP A2T3R1
r	477	ASN	TYR	conflict	UNP A2T3R1
r	479	TYR	GLN	conflict	UNP A2T3R1
r	503	ILE	VAL	conflict	UNP A2T3R1
r	551	ALA	SER	conflict	UNP A2T3R1
r	553	SER	ASN	conflict	UNP A2T3R1
r	561	VAL	ILE	conflict	UNP A2T3R1
r	640	ALA	SER	conflict	UNP A2T3R1
r	650	HIS	GLN	conflict	UNP A2T3R1
r	656	VAL	ARG	conflict	UNP A2T3R1
r	657	ALA	VAL	conflict	UNP A2T3R1
r	676	VAL	ILE	conflict	UNP A2T3R1
r	686	LEU	ALA	conflict	UNP A2T3R1

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Chain	Residue	Modelled	Actual	Comment	Reference
r	688	ALA	ASN	conflict	UNP A2T3R1
r	690	ASP	GLU	conflict	UNP A2T3R1
r	741	THR	SER	conflict	UNP A2T3R1
r	743	SER	ASP	conflict	UNP A2T3R1
r	766	VAL	ILE	conflict	UNP A2T3R1
r	777	ILE	LYS	conflict	UNP A2T3R1
r	818	VAL	ILE	conflict	UNP A2T3R1
r	820	ILE	THR	conflict	UNP A2T3R1
r	831	VAL	GLN	conflict	UNP A2T3R1
r	837	ASN	ALA	conflict	UNP A2T3R1

- Molecule 5 is CALCIUM ION (three-letter code: CA) (formula: Ca) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		AltConf
5	D	3	Total 3	Ca 3	0
5	E	3	Total 3	Ca 3	0
5	F	3	Total 3	Ca 3	0
5	G	3	Total 3	Ca 3	0
5	H	3	Total 3	Ca 3	0
5	I	3	Total 3	Ca 3	0
5	J	3	Total 3	Ca 3	0
5	K	3	Total 3	Ca 3	0
5	L	3	Total 3	Ca 3	0
5	M	3	Total 3	Ca 3	0
5	N	3	Total 3	Ca 3	0
5	O	3	Total 3	Ca 3	0
5	P	3	Total 3	Ca 3	0

- Molecule 6 is ZINC ION (three-letter code: ZN) (formula: Zn) (labeled as "Ligand of Inter-

est" by depositor).

Mol	Chain	Residues	Atoms		AltConf
6	e	1	Total 1	Zn 1	0
6	g	1	Total 1	Zn 1	0
6	j	1	Total 1	Zn 1	0
6	m	1	Total 1	Zn 1	0
6	p	1	Total 1	Zn 1	0

3 Residue-property plots ⓘ

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

• Molecule 1: Outer capsid protein VP4

Chain A:

R674 N678 D687 G688 D696 D704 V705 Q706 K707 D710 L711 V712 T713 D714 S715 K725 T726 R738 D748 P749 R766 R775 L776

• Molecule 1: Outer capsid protein VP4

Chain B:

56%

68% 27%

M1 I5 Y6 L10 T15 V16 D17 D20 S27 T28 K29 S30 Q31 I35 N49 W50 G51 P52 G53 E54 I55 N56 D57 S58 T59 T60 V61 G62 P63 L64 L65 D66 G67 P68 Y69 Q70 P71 T72 T73 F74 N75 P76 P77 V78 D79 Y80 W81 M82 L83 L84 A85 P86 T87

T88 P89 G90 V91 I92 V93 E94 G95 T96 N97 N98 T99 D100 R101 W102 L103 A104 T105 I106 L107 I108 E109 P110 N111 V112 Q113 S114 E115 N116 R117 T118 Y119 T120 I121 F122 G123 I124 Q125 E126 Q127 L128 T129 V130 S131 N132 T133 S134 Q135 D136 Q137 W138 K139 F140 I141 D142 V143 V144 K145 T146 T147

A148 N149 G150 S151 I152 G153 Q154 Y155 G156 P157 L158 L159 S160 S161 P162 K163 L164 Y165 A166 V167 M168 K169 H170 N171 E172 K173 L174 Y175 T176 Y177 E178 G179 Q180 T181 P182 N183 A184 T185 T186 A187 H188 Y189 S190 T191 T192 N193 Y194 D195 S196 V197 N198 M199 T200 A201 F202 C203 D204 F205 Y206 I207

I208 P209 R210 S211 E212 E213 S214 K215 C216 T217 E218 Y219 I220 N221 N222 G223 L224 PRO PRO ILE GLN ASN THR ARG ASN VAL VAL PRO LEU SER LEU THR ALA ARG ASP VAL ILE HIS TYR ARG ALA GLN A250 N251 E252 D253 I254 V255 I256 S257 E264 M265 Q266 Y267 N268 R269 D270 I271 T272

I273 R274 F275 K276 F277 A278 N279 T280 I281 I282 K283 S284 G285 G286 L287 G288 Y289 K290 W291 S292 E293 I294 S295 F296 K297 P298 A299 N300 Y301 Q302 Y303 T304 Y305 T306 R307 D308 G309 E310 E311 V312 T313 A314 H315 T316 T317 C318 S319 V320 N321 G322 M323 N324 D325 F326 S327 F328 N329 G330 G331 Y332

L333 P334 T335 D336 F337 V338 V339 S340 K341 F342 E343 V344 I345 K346 E347 N348 S349 Y350 V351 Y352 I353 D354 Y355 W356 D357 D358 S359 Q360 A361 F362 R363 N364 V365 V366 Y367 V368 R369 S370 L371 A372 A373 N374 L375 N376 S377 V378 M379 C380 T381 G382 G383 S384 Y385 N386 F387 S388 L389 P390 V391 G392

Q393 W394 P395 V396 L397 T398 G399 G400 A401 V402 S403 L404 H405 S406 A407 G408 V409 T410 L411 S412 T413 Q414 F415 T416 D417 F418 L421 N422 S423 L424 R425 F426 R427 F428 R429 L430 A431 V432 E433 E434 P435 H436 F437 K438 L439 T440 R441 T442 R443 L444 D445 R446 L447 Y448 G449 L450 P451 A452 A453

D464 P455 N456 N457 G458 K459 E460 Y461 Y462 E463 I464 A465 G466 R467 F468 S469 L470 I471 S472 D479 V488 E500 L501 R502 E503 L508 S509 Q510 E511 Q516 D519 L523 D526 I534 K535 S536 T537 I538 D539 A540 K541 K542 S543 L568 S569 D570 S573 S574 I575

S576 R577 G578 S579 S580 I581 R582 S583 I584 G585 S586 D593 V594 S595 T596 Q597 I598 THR ASP ILE SER SER SER VAL S606 S609 T610 Q611 L619 R620 M624 A625 T626 E629 D635 T643 K647 S648 T649 Q650 I651 S652 P663 N654 T655 I656 P657 D658 I659 D679

E683 K689 D696 D704 D710 L711 V712 T713 D714 D723 T726 D732 R738 R750 R753 N757 I767 I771 R775 L776

• Molecule 1: Outer capsid protein VP4

Chain C:

33%

73% 15% 11%

• Molecule 2: Outer capsid glycoprotein VP7

Chain D:

• Molecule 2: Outer capsid glycoprotein VP7

Chain E:

66%   8%   25%

• Molecule 2: Outer capsid glycoprotein VP7

Chain F:

70%   11%   18%

• Molecule 2: Outer capsid glycoprotein VP7

Chain G:

71%   11%   18%

• Molecule 2: Outer capsid glycoprotein VP7

Chain H:

64%   10%   26%

• Molecule 2: Outer capsid glycoprotein VP7

Chain I:

71% 10% 19%

• Molecule 2: Outer capsid glycoprotein VP7

Chain J:

72% 8% 19%

• Molecule 2: Outer capsid glycoprotein VP7

Chain K:

68% 11% 21%

• Molecule 2: Outer capsid glycoprotein VP7

Chain L:

69% 12% 19%

MET TYR GLY ILE GLU TYR THR THR VAL LEU THR PHE LEU ILE SER ILE ILE LEU LEU ASN TYR ILE LEU LYS SER LEU THR ARG ILE MET ASP PHE ILE ILE TYR ARG LEU PHE ILE ILE VAL ILE LEU SER PRO PHE LEU ARG ALA **Q51 N52** I55 **D64 I65 A66** TYR ALA

ASN SER THR GLN GLU GLU PRO PHE LEU **T78** C82 A89 I93 Q104 T108 I124 Y134 C135 D136 M142 Q149 S153 D157 N161 L164 Q176 **D179 E180 A181 N182** S186 I193 Q201 T202 T220 N234 L237 K250

R255 V263 S266 D267 I268 M285 N288 **W289** K290 R313 **S314** R315 A321 **V326**

• Molecule 2: Outer capsid glycoprotein VP7

Chain M:

72% 10% 18%

MET TYR GLY ILE GLU TYR THR THR VAL LEU THR PHE LEU ILE SER ILE ILE LEU LEU ASN TYR ILE LEU LYS SER LEU THR ARG ILE MET ASP PHE ILE ILE TYR ARG PHE LEU ILE ILE VAL ILE LEU SER PRO PHE LEU ARG ALA **Q51 N52** **A68** ASN SER THR GLN GLU GLU

PRO PHE LEU **T78** N96 D100 C135 V139 Y144 Q149 D157 N161 P167 I170 **E180 A181 N182 K183** N199 T200 Q201 T202 D211 **A212** T213 V239 R255 I268 **T272 A273 D274 P275 T276 T277 A278** P279 N288 M310 F322 Y323

Y324 **R325** V326

• Molecule 2: Outer capsid glycoprotein VP7

Chain N:

69% 12% 19%

MET TYR GLY ILE GLU TYR THR THR VAL LEU THR PHE LEU ILE SER ILE ILE LEU LEU ASN TYR ILE LEU LYS SER LEU THR ARG ILE MET ASP PHE ILE ILE TYR ARG LEU PHE ILE ILE VAL ILE LEU SER PRO PHE LEU ARG ALA **Q51** I55 **N56** **M63** ASP ILE ALA TYR

ALA ASN SER THR GLN GLU GLU PRO PHE **L77 T78** S79 T87 I93 S115 Y121 T122 L133 L141 Y144 T147 L148 Q149 S153 I170 T171 **E180 A181 N182 K183** C191 **T192** I193 N199 T202 L203 **D211** E216 V239 R255 V258

V263 I268 T277 **A278** P279 **W289** W293 F296 V300 L317 A321 **V326**

• Molecule 2: Outer capsid glycoprotein VP7

Chain O:

73% 8% 19%

MET TYR GLY ILE GLU TYR THR THR VAL LEU THR PHE LEU ILE SER ILE ILE LEU LEU ASN TYR ILE LEU LYS SER LEU THR ARG ILE MET ASP PHE ILE ILE TYR ARG PHE LEU ILE ILE VAL ILE LEU SER PRO PHE LEU ARG ALA **Q51** **I65 A66** TYR ALA ASN SER THR GLN

GLU GLU PRO PHE LEU **T78** P86 T87 E120 Y121 D130 P131 Q132 C135 T147 L148 Q149 L158 T171 Q176 N182 V195 Q201 T202 **D211** T220 L224 V225 N234 L237 C249 D267 I268 R286 S311 **V326**

• Molecule 2: Outer capsid glycoprotein VP7

Chain P:

66%　　　9%　　　26%

MET TYR GLY ILE GLU TYR THR THR VAL LEU THR PHE LEU ILE SER ILE ILE LEU LEU ASN TYR ILE LEU LYS SER SER LEU THR ARG ILE MET ASP PHE ILE ILE TYR ARG PHE LEU PHE ILE ILE VAL ILE LEU SER PRO PHE LEU ARG ALA GLN ASN TYR GLY ILE ASN LEU **P58** **M63**

ASP ILE ALA TYR ALA ASN SER THR GLN GLU GLU PRO PHE LEU THR **S79** **C82** **F106** **I124** **Y134** **C135** **L141** **N166** **I170** **N182** **K183** **W184** **M187** **T200** **Q201** **T202** **L224** **D228** **L237** **D238** **V239** **I261** **T272** **T281** **E282** **F296** **V300**

I306 **M310** **R313** **S314** ARG SER LEU ASN SER ALA ALA PHE TYR TYR ARG VAL

• Molecule 3: Intermediate capsid protein VP6

Chain d:

99%

M1 **F129** **N156** **D242** **Y374** **K397**

• Molecule 3: Intermediate capsid protein VP6

Chain e:

99%

M1 **N60** **L70** **R106** **F129** **N143** **N156** **R215** **Y374** **K397**

• Molecule 3: Intermediate capsid protein VP6

Chain f:

99%

M1 **N60** **F129** **Y374** **K397**

• Molecule 3: Intermediate capsid protein VP6

Chain g:

99%

M1 **D2** **D16** **N60** **R106** **E187** **R215** **Y374** **K397**

• Molecule 3: Intermediate capsid protein VP6

Chain h:

99%

• Molecule 3: Intermediate capsid protein VP6

Chain i:

99%

• Molecule 3: Intermediate capsid protein VP6

Chain j:

99%

• Molecule 3: Intermediate capsid protein VP6

Chain k:

99%

• Molecule 3: Intermediate capsid protein VP6

Chain l:

100%

• Molecule 3: Intermediate capsid protein VP6

Chain m:

98%

• Molecule 3: Intermediate capsid protein VP6

Chain n:

99%

• Molecule 3: Intermediate capsid protein VP6

Chain o: 98%

M1 L70 R106 F129 N156 R215 L370 Y374 K397

• Molecule 3: Intermediate capsid protein VP6

Chain p: 99%

M1 G67 T68 T69 N128 F129 Q274 N310 D337 E340 Y374 K397

• Molecule 4: Inner capsid protein VP2

Chain q: 86% 13%

MET ALA TYR ARG LYS ARG GLY ALA ARG ARG GLU THR ASN LEU LYS GLN ASP GLU ARG MET GLN LYS GLU LYS ASP SER LYS ASN ILE ASN ASP SER PRO LYS SER GLN LEU SER GLU LYS VAL LEU SER LYS LYS GLU ILE ILE THR ASP ASN GLN GLU GLU VAL LYS ILE SER

ASP GLU VAL LYS LYS SER ASN LYS GLU GLU SER LYS GLN LEU LEU GLU GLU VAL LEU LYS THR LYS GLU GLU HIS GLN LYS GLU VAL GLN TYR GLU ILE LEU GLN LYS THR ILE PRO THR PHE GLU PRO LYS GLU S103 I104 L105 K106 D110 E114 R143 V200 R231 F271

D335 D352 E356 ALA LEU THR ILE GLN SER GLU THR GLN F366 D395 M521 L536 L550 K698 K827 D834 N878 E879 L880

• Molecule 4: Inner capsid protein VP2

Chain r: 89% 10%

MET ALA TYR ARG LYS ARG GLY ALA ARG ARG GLU THR ASN LEU LYS GLN ASP GLU ARG MET GLN LYS GLU LYS ASP SER LYS ASN ILE ASN ASP SER PRO LYS SER GLN LEU SER GLU LYS VAL LEU SER LYS LYS GLU ILE ILE THR ASP ASN GLN GLU GLU VAL LYS ILE SER

ASP GLU VAL LYS LYS SER ASN LYS GLU GLU SER LYS GLN LEU LEU GLU GLU VAL LEU LYS K77 T78 K79 E80 E81 E99 E102 E114 D157 R194 D214 D235 N266 D352 E356 ALA LEU THR ILE GLN SER GLU THR GLN F366 R448 V483 I497

S528 L686 M717 Y718 N722 L799 D816 L854 N867 E879 L880

4   Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	36363	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose $(e^-/\text{Å}^2)$	39.8	Depositor
Minimum defocus (nm)	500	Depositor
Maximum defocus (nm)	3000	Depositor
Magnification	Not provided	
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	0.075	Depositor
Minimum map value	-0.029	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.005	Depositor
Recommended contour level	0.014	Depositor
Map size (Å)	367.36, 367.36, 367.36	wwPDB
Map dimensions	448, 448, 448	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.82, 0.82, 0.82	Depositor

5 Model quality ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: CA, 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 RMSZ	Bond lengths #$|Z|$>5	Bond angles RMSZ	Bond angles #$|Z|$>5
1	A	0.26	0/5832	0.48	0/7925
1	B	0.26	0/5980	0.48	0/8129
1	C	0.27	0/5583	0.48	0/7586
2	D	0.31	0/2119	0.46	0/2893
2	E	0.31	0/1967	0.46	0/2685
2	F	0.32	0/2162	0.47	0/2950
2	G	0.32	0/2169	0.47	0/2961
2	H	0.32	0/1952	0.46	0/2664
2	I	0.33	0/2139	0.47	0/2918
2	J	0.32	0/2143	0.47	0/2925
2	K	0.31	0/2072	0.46	0/2827
2	L	0.31	0/2144	0.47	0/2925
2	M	0.31	0/2162	0.47	0/2950
2	N	0.31	0/2130	0.47	0/2907
2	O	0.32	0/2144	0.46	0/2925
2	P	0.31	0/1952	0.47	0/2664
3	d	0.31	0/3234	0.50	0/4402
3	e	0.31	0/3234	0.50	0/4402
3	f	0.31	0/3234	0.51	0/4402
3	g	0.32	0/3234	0.51	0/4402
3	h	0.32	0/3234	0.51	0/4402
3	i	0.32	0/3234	0.51	0/4402
3	j	0.31	0/3234	0.51	0/4402
3	k	0.32	0/3234	0.51	0/4402
3	l	0.32	0/3234	0.51	0/4402
3	m	0.31	0/3234	0.51	0/4402
3	n	0.32	0/3234	0.51	0/4402
3	o	0.32	0/3234	0.51	0/4402
3	p	0.31	0/3234	0.51	0/4402
4	q	0.31	0/6360	0.49	0/8630
4	r	0.31	0/6590	0.49	0/8939
All	All	0.31	0/99642	0.49	0/135629

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	A	0	1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	705	VAL	Peptide

5.2　Too-close contacts　ⓘ

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	5714	5589	5598	168	0
1	B	5859	5737	5737	188	0
1	C	5470	5343	5345	94	0
2	D	2076	2035	2035	24	0
2	E	1928	1892	1892	16	0
2	F	2118	2067	2067	27	0
2	G	2125	2078	2078	21	0
2	H	1913	1874	1874	18	0
2	I	2096	2048	2048	26	0
2	J	2100	2053	2053	27	0
2	K	2030	1991	1991	23	0
2	L	2101	2053	2053	30	0
2	M	2118	2067	2067	24	0
2	N	2087	2044	2044	28	0
2	O	2101	2053	2053	18	0
2	P	1913	1874	1874	18	0
3	d	3163	3113	3114	0	0
3	e	3163	3113	3114	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	f	3163	3114	3114	0	0
3	g	3163	3113	3114	0	0
3	h	3163	3114	3114	0	0
3	i	3163	3114	3114	0	0
3	j	3163	3113	3114	0	0
3	k	3163	3113	3114	0	0
3	l	3163	3113	3114	0	0
3	m	3163	3113	3114	0	0
3	n	3163	3113	3114	0	0
3	o	3163	3113	3114	0	0
3	p	3163	3114	3114	0	0
4	q	6247	6273	6276	0	0
4	r	6472	6502	6503	0	0
5	D	3	0	0	0	0
5	E	3	0	0	0	0
5	F	3	0	0	0	0
5	G	3	0	0	0	0
5	H	3	0	0	0	0
5	I	3	0	0	0	0
5	J	3	0	0	0	0
5	K	3	0	0	0	0
5	L	3	0	0	0	0
5	M	3	0	0	0	0
5	N	3	0	0	0	0
5	O	3	0	0	0	0
5	P	3	0	0	0	0
6	e	1	0	0	0	0
6	g	1	0	0	0	0
6	j	1	0	0	0	0
6	m	1	0	0	0	0
6	p	1	0	0	0	0
All	All	97631	96046	96070	680	0

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

The worst 5 of 680 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:133:LEU:HD13	2:D:258:VAL:HG11	1.37	1.05
1:A:280:THR:HG1	1:A:295:SER:HG	1.12	0.93

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:292:SER:O	1:A:340:SER:OG	1.94	0.85
1:B:510:GLN:NE2	2:F:67:TYR:O	2.10	0.84
1:C:320:VAL:HG21	1:C:345:ILE:HG21	1.61	0.82

There are no symmetry-related clashes.

5.3 Torsion angles (i)

5.3.1 Protein backbone (i)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	718/776 (92%)	653 (91%)	65 (9%)	0	100	100
1	B	738/776 (95%)	684 (93%)	54 (7%)	0	100	100
1	C	680/776 (88%)	646 (95%)	34 (5%)	0	100	100
2	D	258/326 (79%)	248 (96%)	10 (4%)	0	100	100
2	E	240/326 (74%)	234 (98%)	6 (2%)	0	100	100
2	F	263/326 (81%)	255 (97%)	8 (3%)	0	100	100
2	G	264/326 (81%)	253 (96%)	11 (4%)	0	100	100
2	H	238/326 (73%)	230 (97%)	8 (3%)	0	100	100
2	I	260/326 (80%)	252 (97%)	8 (3%)	0	100	100
2	J	261/326 (80%)	253 (97%)	8 (3%)	0	100	100
2	K	252/326 (77%)	241 (96%)	11 (4%)	0	100	100
2	L	261/326 (80%)	257 (98%)	4 (2%)	0	100	100
2	M	263/326 (81%)	251 (95%)	12 (5%)	0	100	100
2	N	259/326 (79%)	248 (96%)	11 (4%)	0	100	100
2	O	261/326 (80%)	253 (97%)	8 (3%)	0	100	100
2	P	238/326 (73%)	230 (97%)	8 (3%)	0	100	100
3	d	395/397 (100%)	383 (97%)	12 (3%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
3	e	395/397 (100%)	380 (96%)	15 (4%)	0	100	100
3	f	395/397 (100%)	384 (97%)	11 (3%)	0	100	100
3	g	395/397 (100%)	379 (96%)	16 (4%)	0	100	100
3	h	395/397 (100%)	376 (95%)	19 (5%)	0	100	100
3	i	395/397 (100%)	382 (97%)	13 (3%)	0	100	100
3	j	395/397 (100%)	380 (96%)	15 (4%)	0	100	100
3	k	395/397 (100%)	382 (97%)	13 (3%)	0	100	100
3	l	395/397 (100%)	373 (94%)	22 (6%)	0	100	100
3	m	395/397 (100%)	382 (97%)	13 (3%)	0	100	100
3	n	395/397 (100%)	382 (97%)	13 (3%)	0	100	100
3	o	395/397 (100%)	376 (95%)	19 (5%)	0	100	100
3	p	395/397 (100%)	378 (96%)	17 (4%)	0	100	100
4	q	765/882 (87%)	742 (97%)	23 (3%)	0	100	100
4	r	791/882 (90%)	762 (96%)	29 (4%)	0	100	100
All	All	12145/13491 (90%)	11629 (96%)	516 (4%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2   Protein sidechains ⓘ

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	642/689 (93%)	627 (98%)	15 (2%)	45	74
1	B	659/689 (96%)	640 (97%)	19 (3%)	37	67
1	C	613/689 (89%)	601 (98%)	12 (2%)	50	78
2	D	235/296 (79%)	231 (98%)	4 (2%)	56	81
2	E	221/296 (75%)	219 (99%)	2 (1%)	75	90
2	F	239/296 (81%)	235 (98%)	4 (2%)	56	81
2	G	240/296 (81%)	237 (99%)	3 (1%)	65	85

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	H	219/296 (74%)	215 (98%)	4 (2%)	54	80
2	I	238/296 (80%)	236 (99%)	2 (1%)	79	91
2	J	238/296 (80%)	235 (99%)	3 (1%)	65	85
2	K	231/296 (78%)	229 (99%)	2 (1%)	75	90
2	L	238/296 (80%)	235 (99%)	3 (1%)	65	85
2	M	239/296 (81%)	236 (99%)	3 (1%)	65	85
2	N	237/296 (80%)	236 (100%)	1 (0%)	89	96
2	O	238/296 (80%)	236 (99%)	2 (1%)	79	91
2	P	219/296 (74%)	218 (100%)	1 (0%)	86	95
3	d	351/351 (100%)	347 (99%)	4 (1%)	70	87
3	e	351/351 (100%)	346 (99%)	5 (1%)	62	84
3	f	351/351 (100%)	348 (99%)	3 (1%)	75	90
3	g	351/351 (100%)	348 (99%)	3 (1%)	75	90
3	h	351/351 (100%)	346 (99%)	5 (1%)	62	84
3	i	351/351 (100%)	346 (99%)	5 (1%)	62	84
3	j	351/351 (100%)	349 (99%)	2 (1%)	84	94
3	k	351/351 (100%)	346 (99%)	5 (1%)	62	84
3	l	351/351 (100%)	350 (100%)	1 (0%)	91	97
3	m	351/351 (100%)	345 (98%)	6 (2%)	56	81
3	n	351/351 (100%)	346 (99%)	5 (1%)	62	84
3	o	351/351 (100%)	345 (98%)	6 (2%)	56	81
3	p	351/351 (100%)	346 (99%)	5 (1%)	62	84
4	q	698/809 (86%)	688 (99%)	10 (1%)	62	84
4	r	724/809 (90%)	710 (98%)	14 (2%)	52	79
All	All	10931/12096 (90%)	10772 (98%)	159 (2%)	60	83

5 of 159 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	m	142	GLN
4	q	827	LYS
3	n	60	ASN
3	p	128	ASN
4	r	497	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 9 such sidechains are listed below:

Mol	Chain	Res	Type
3	m	173	HIS
3	m	189	GLN
2	J	235	HIS
2	L	56	ASN
2	L	288	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 44 ligands modelled in this entry, 44 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Map visualisation (i)

This section contains visualisations of the EMDB entry EMD-16146. 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
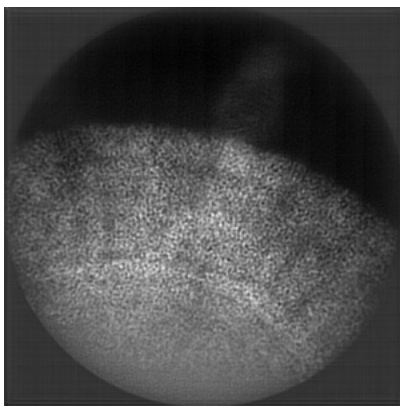
X
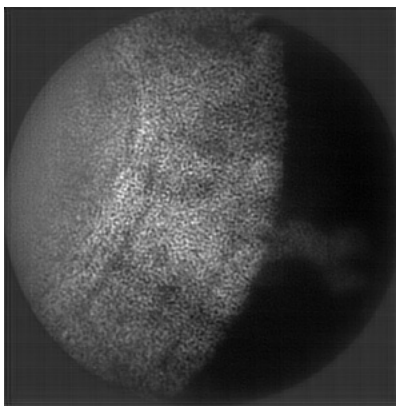
Y
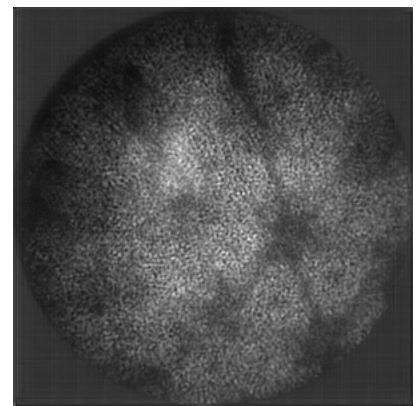
Z

6.1.2 Raw map

X

Y

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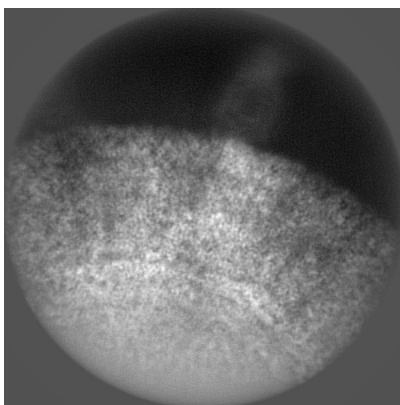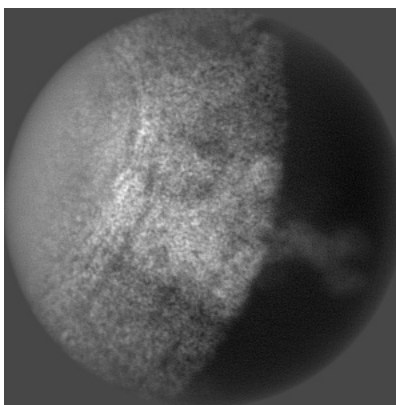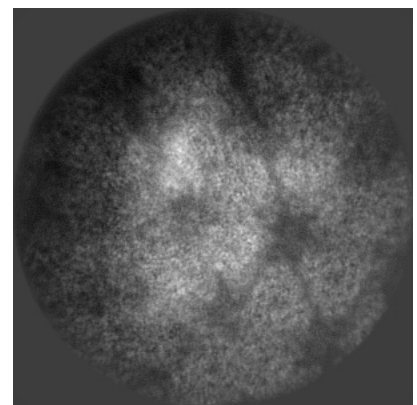
The images above show the map projected in three orthogonal directions.

6.2   Central slices   ⓘ
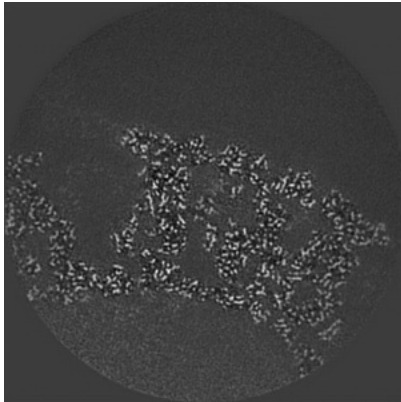
6.2.1   Primary map
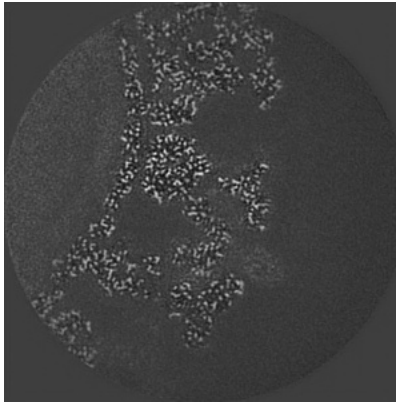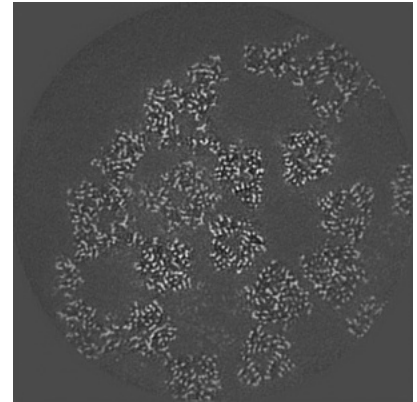
X Index: 224   Y Index: 224   Z Index: 224

6.2.2   Raw map
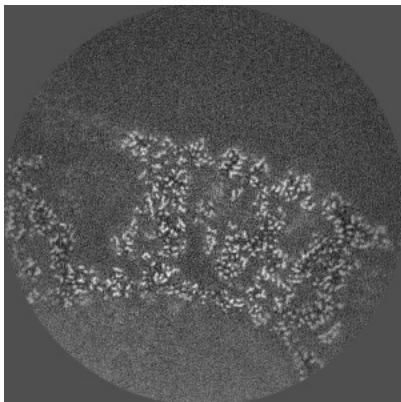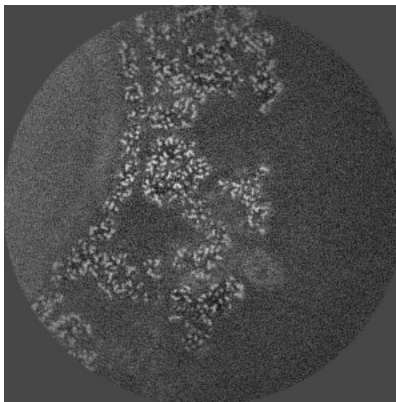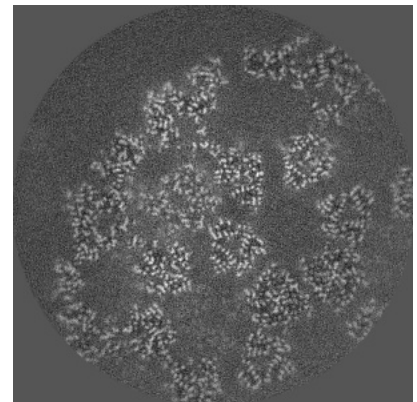
X Index: 224   Y Index: 224   Z Index: 224

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

6.3 Largest variance slices (i)

6.3.1 Primary map
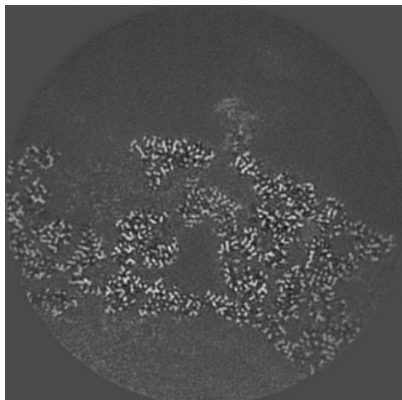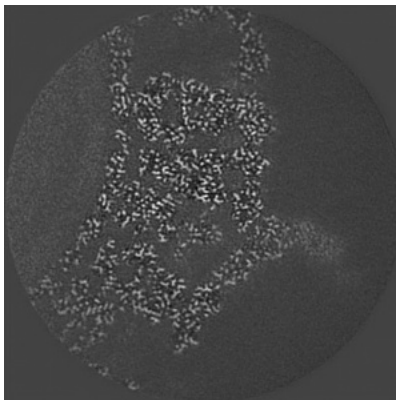
X Index: 205   Y Index: 261   Z Index: 183
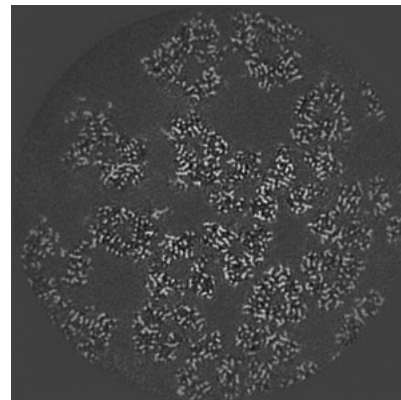
6.3.2 Raw map
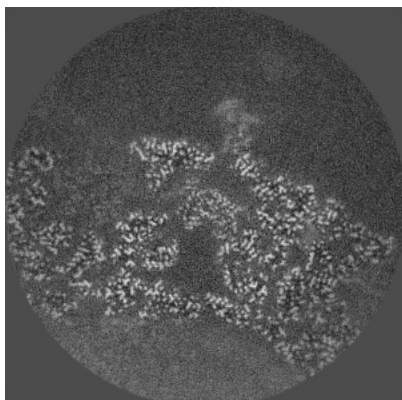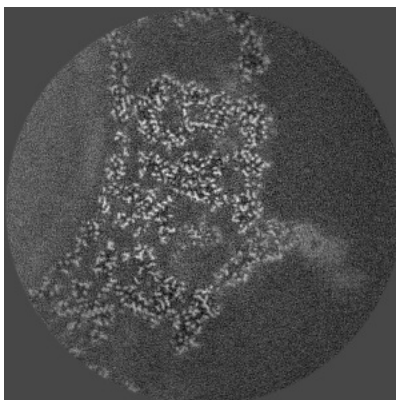
X Index: 205   Y Index: 262   Z Index: 200
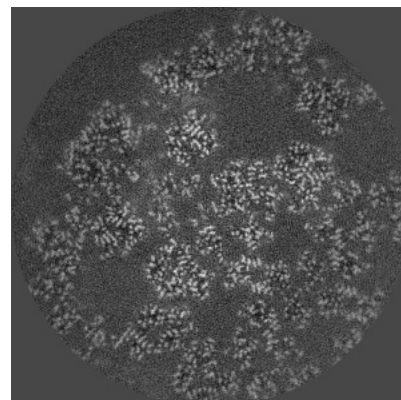
The images above show the largest variance slices of the map in three orthogonal directions.

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

6.4.1 Primary map
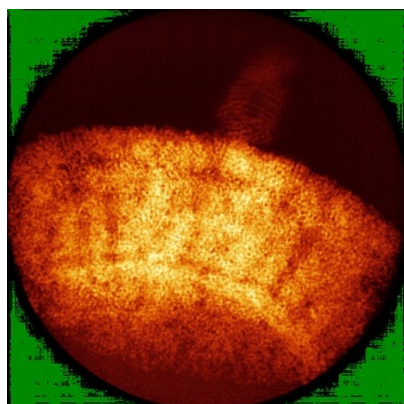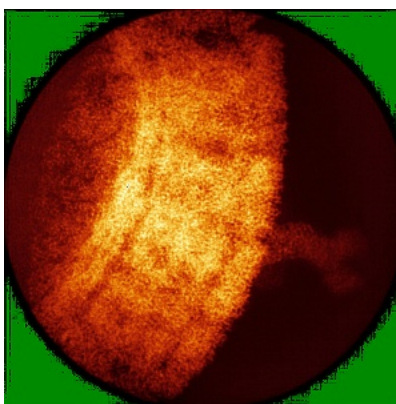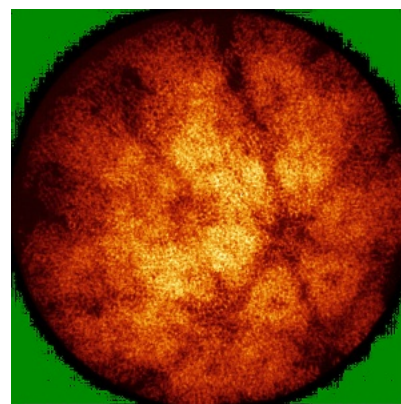
X	Y	Z

6.4.2 Raw map

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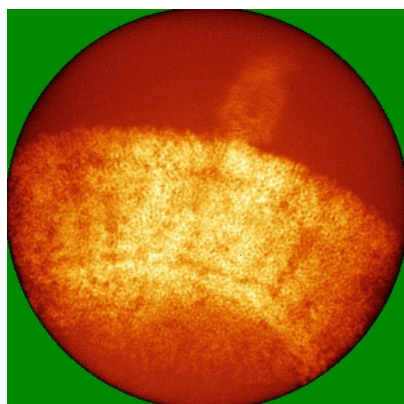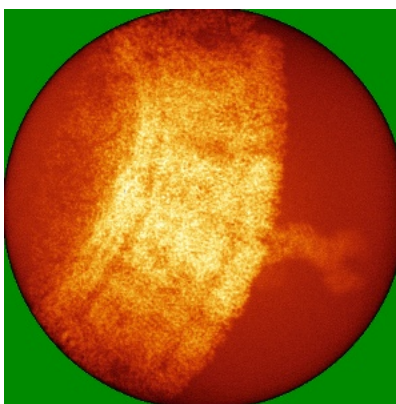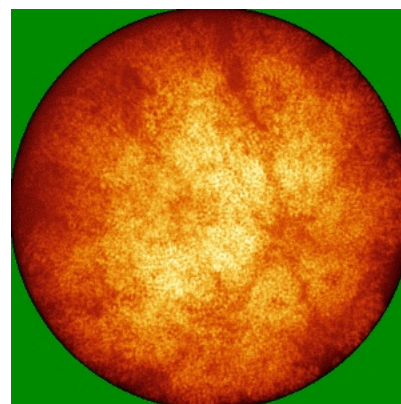
The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

6.5 Orthogonal surface views (i)

6.5.1 Primary map

| X | Y | Z |

The images above show the 3D surface view of the map at the recommended contour level 0.014. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 Raw map

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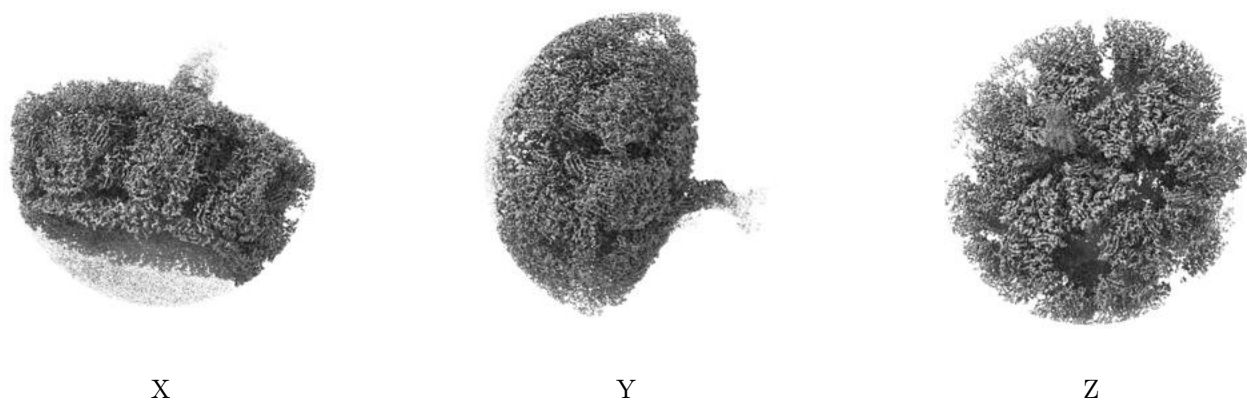
These images show the 3D surface of the raw map. The raw map's contour level was selected so that its surface encloses the same volume as the primary map does at its recommended contour level.

6.6 Mask visualisation (i)

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

7 Map analysis ⓘ

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

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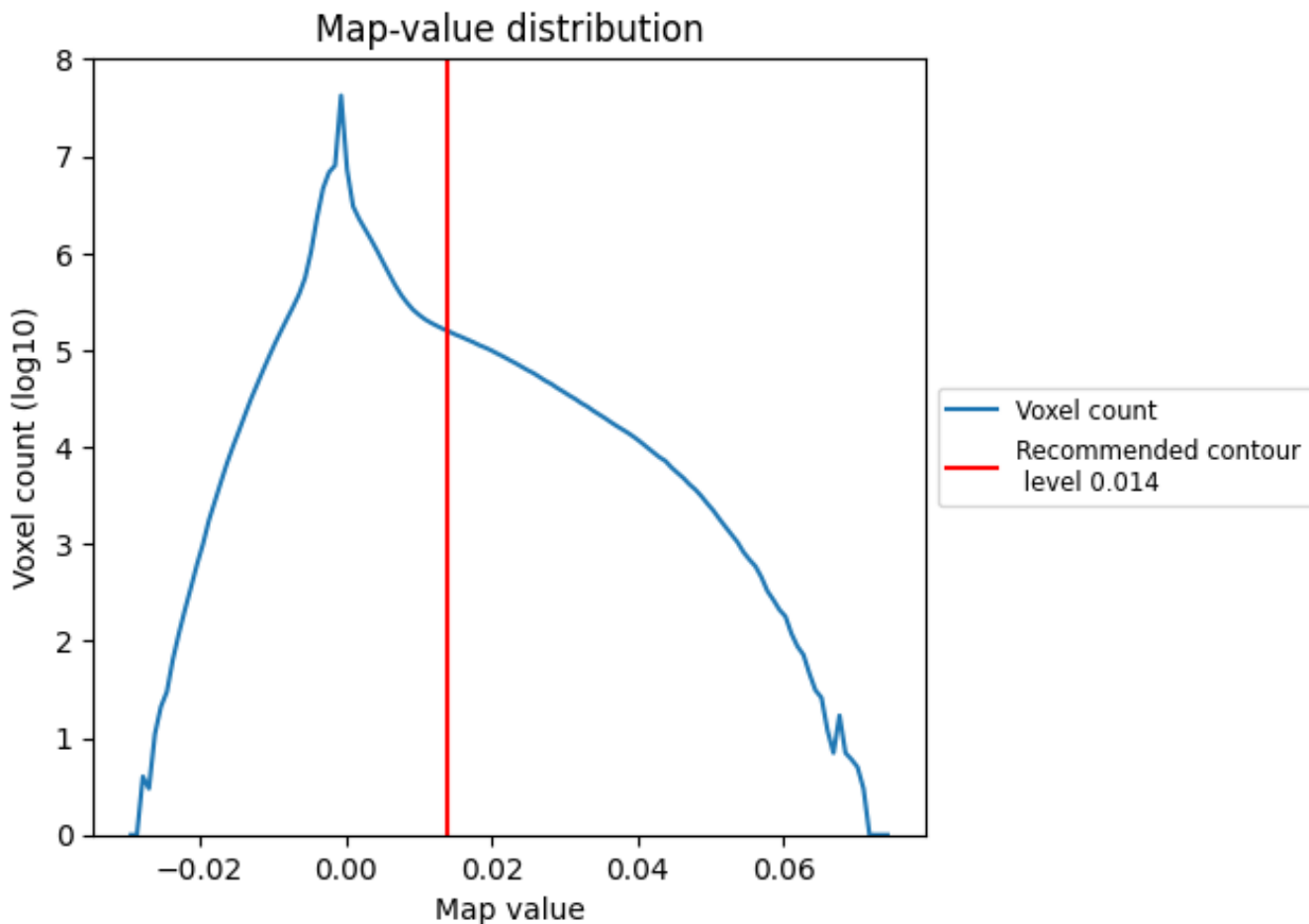
The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

7.2   Volume estimate ⓘ
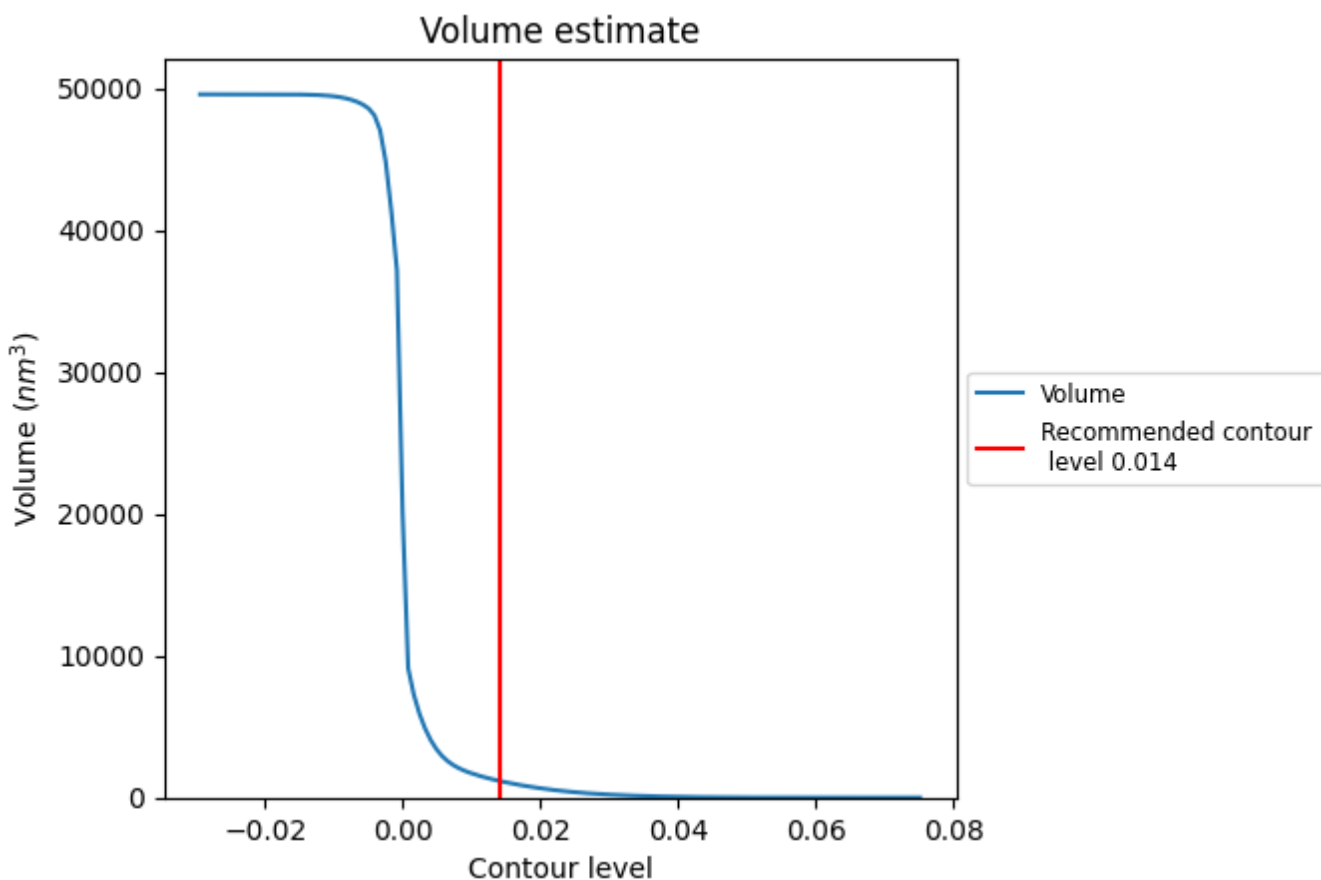
The volume at the recommended contour level is 1176 nm^3; this corresponds to an approximate mass of 1063 kDa.

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)
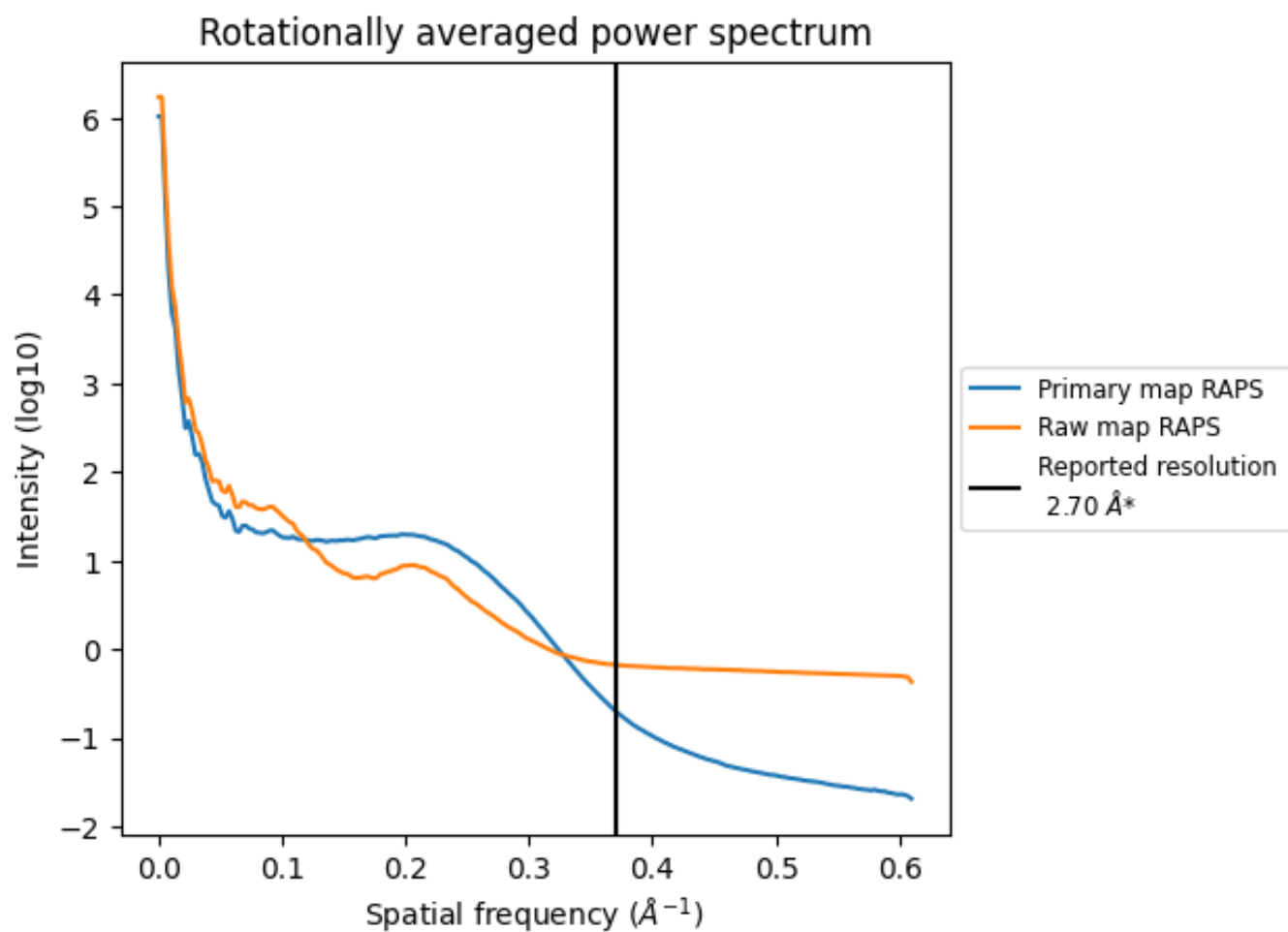
*Reported resolution corresponds to spatial frequency of 0.370 Å^{-1}

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)
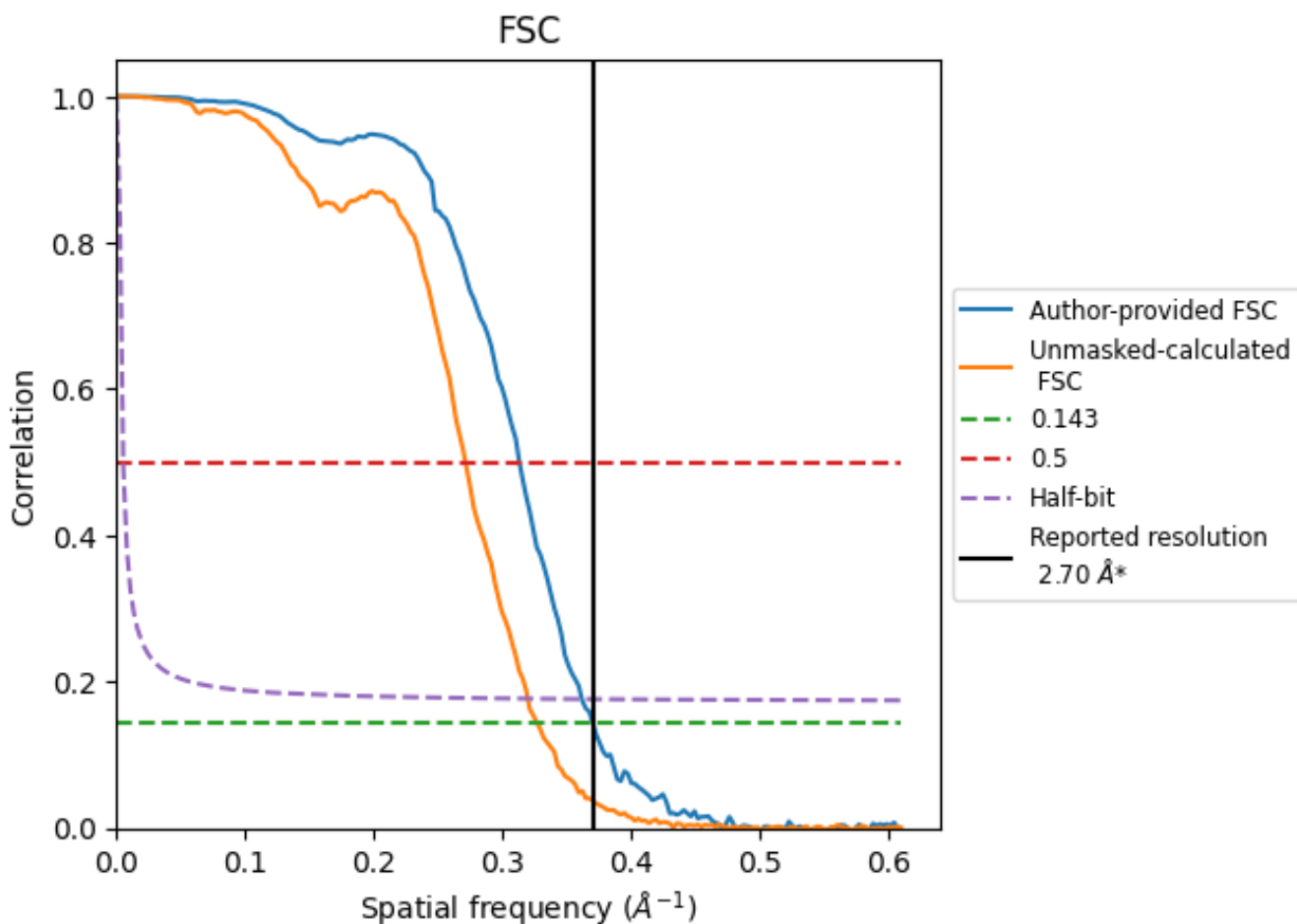
*Reported resolution corresponds to spatial frequency of 0.370 Å^{-1}

8.2 Resolution estimates (i)

Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.70	-	-
Author-provided FSC curve	2.70	3.19	2.76
Unmasked-calculated*	3.06	3.69	3.13

*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 3.06 differs from the reported value 2.7 by more than 10 %

9 Map-model fit ⓘ

This section contains information regarding the fit between EMDB map EMD-16146 and PDB model 8BP8. Per-residue inclusion information can be found in section 3 on page 10.

9.1 Map-model overlay ⓘ

| X | Y | Z |
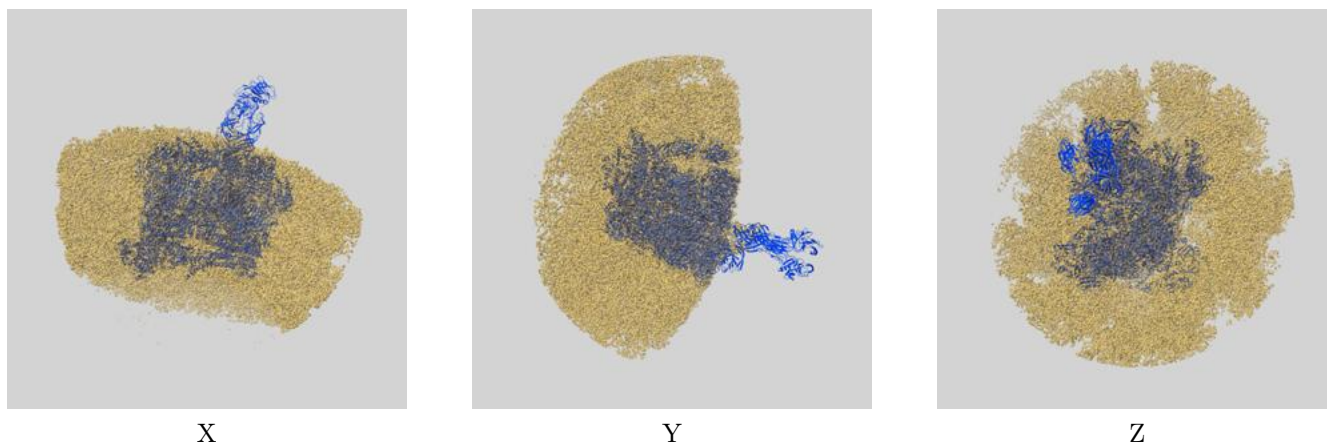
The images above show the 3D surface view of the map at the recommended contour level 0.014 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

9.2   Q-score mapped to coordinate model ⓘ

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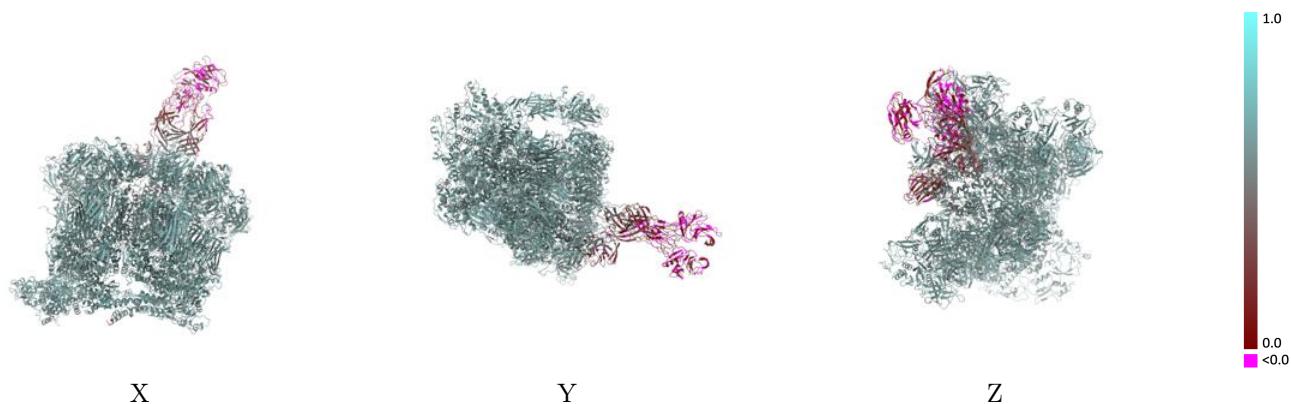
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions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

9.3   Atom inclusion mapped to coordinate model ⓘ

X   Y   Z
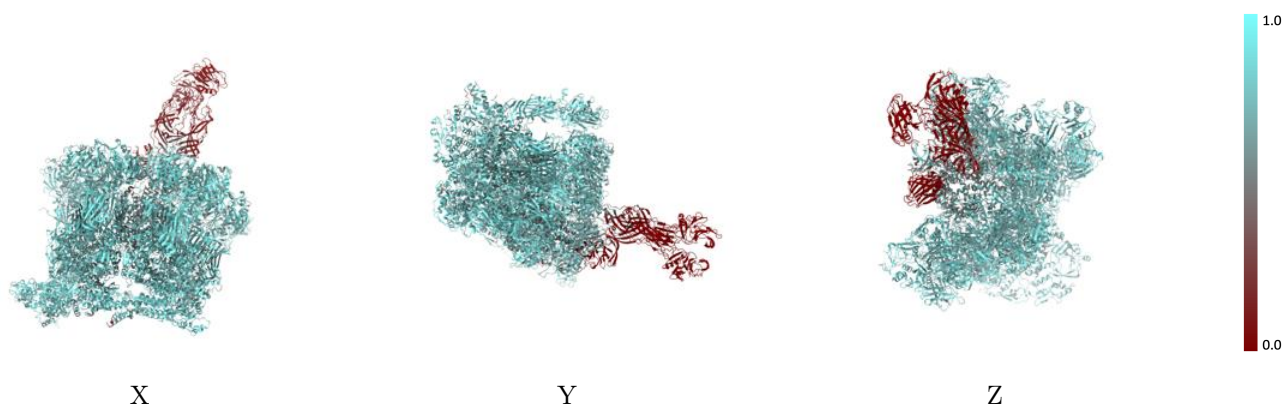
The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.014).

9.4 Atom inclusion ⓘ
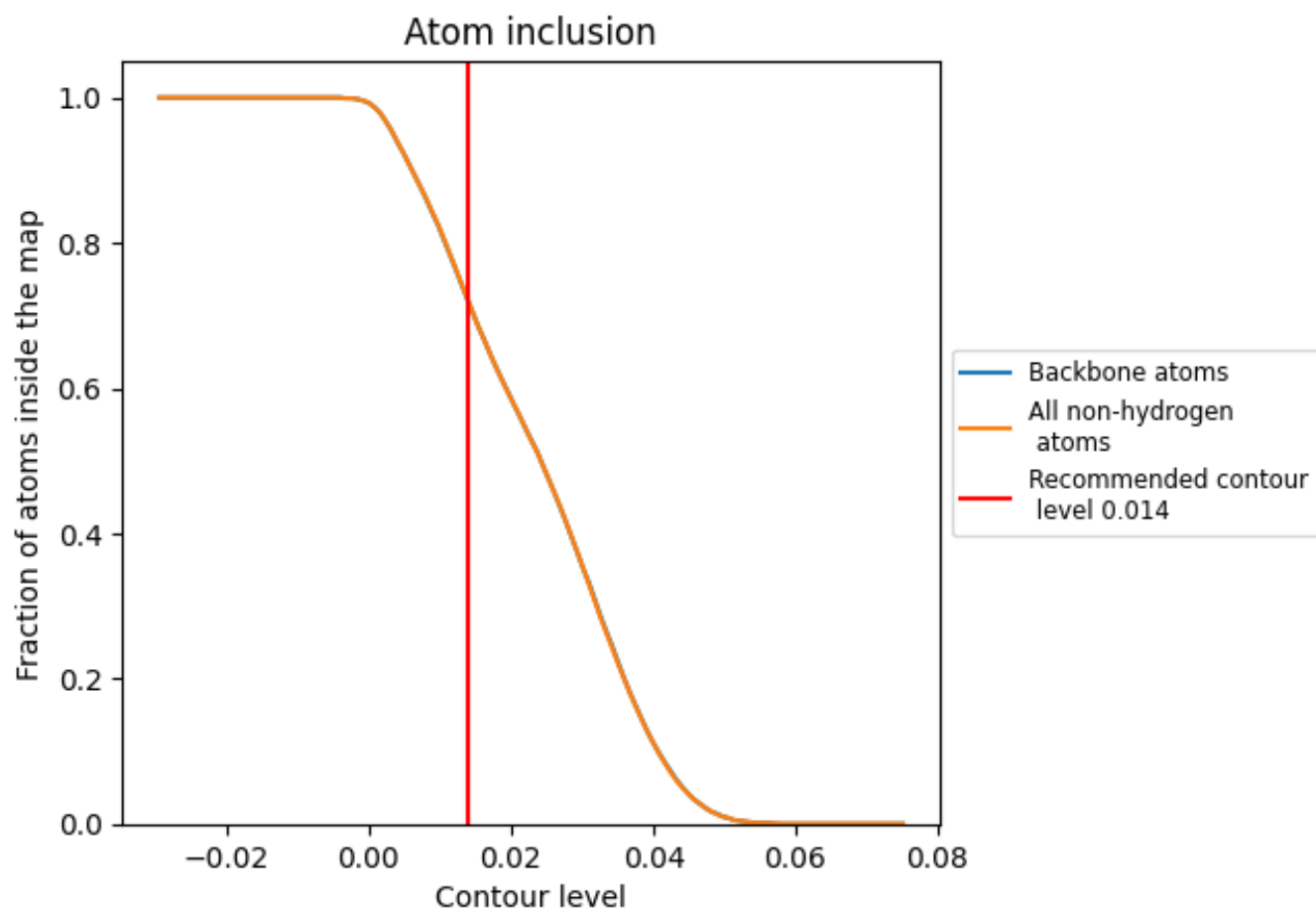
At the recommended contour level, 72% of all backbone atoms, 72% of all non-hydrogen atoms, are inside the map.

9.5   Map-model fit summary ⓘ

The table lists the average atom inclusion at the recommended contour level (0.014) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.7200	0.5670
A	0.3020	0.3240
B	0.3100	0.3360
C	0.4610	0.4860
D	0.7630	0.5940
E	0.7650	0.5950
F	0.7910	0.5960
G	0.7980	0.6000
H	0.7840	0.6020
I	0.8080	0.6060
J	0.7930	0.6040
K	0.7790	0.5940
L	0.7950	0.6030
M	0.7790	0.6000
N	0.7710	0.5920
O	0.7890	0.5960
P	0.7630	0.5910
d	0.8090	0.6080
e	0.7970	0.6070
f	0.8250	0.6140
g	0.8240	0.6160
h	0.8210	0.6160
i	0.8330	0.6210
j	0.8220	0.6160
k	0.8300	0.6180
l	0.8240	0.6170
m	0.8270	0.6150
n	0.8120	0.6100
o	0.8070	0.6110
p	0.7850	0.6060
q	0.7920	0.5980
r	0.7950	0.6000

1.0

0.0
<0.0