



## wwPDB EM Validation Summary Report ⓘ

Jun 17, 2025 – 03:34 PM JST

PDB ID : 8KHC / pdb\_00008khc  
EMDB ID : EMD-37240  
Title : SARS-CoV-2 Omicron spike in complex with 5817 Fab  
Authors : Cao, L.; Wang, X.  
Deposited on : 2023-08-21  
Resolution : 3.00 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](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>.

---

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

EMDB validation analysis : 0.0.1.dev118  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
MolProbity : 4-5-2 with Phenix2.0rc1  
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) : 2.44

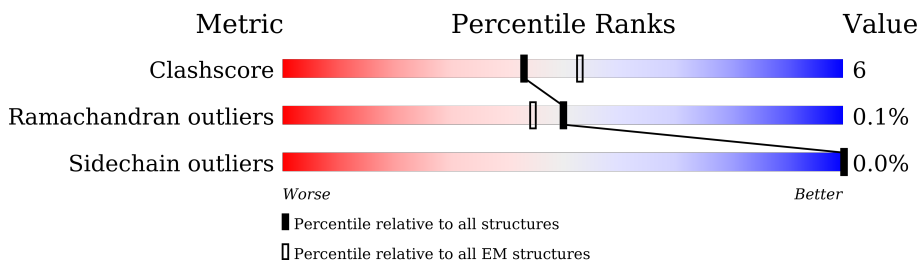
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 3.00 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)
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  $\geq 3$ , 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	1120	
1	B	1120	
1	C	1120	
2	F	125	
2	H	125	
3	G	108	
3	J	108	
4	D	2	

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Length	Quality of chain
4	E	2	 100%

## 2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 27173 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 Spike glycoprotein.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	1018	Total	C	N	O	S	0	0
			7729	4970	1282	1442	35		
1	B	1020	Total	C	N	O	S	0	0
			7738	4954	1289	1461	34		
1	C	1024	Total	C	N	O	S	0	0
			7642	4912	1267	1429	34		

There are 90 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	67	VAL	ALA	conflict	UNP P0DTC2
A	95	ILE	THR	conflict	UNP P0DTC2
A	142	ASP	GLY	conflict	UNP P0DTC2
A	156	ASP	GLU	conflict	UNP P0DTC2
A	339	ASP	GLY	conflict	UNP P0DTC2
A	371	LEU	SER	conflict	UNP P0DTC2
A	373	PRO	SER	conflict	UNP P0DTC2
A	375	PHE	SER	conflict	UNP P0DTC2
A	417	ASN	LYS	conflict	UNP P0DTC2
A	440	LYS	ASN	conflict	UNP P0DTC2
A	446	SER	GLY	conflict	UNP P0DTC2
A	477	ASN	SER	conflict	UNP P0DTC2
A	478	LYS	THR	conflict	UNP P0DTC2
A	484	ALA	GLU	conflict	UNP P0DTC2
A	493	ARG	GLN	conflict	UNP P0DTC2
A	496	SER	GLY	conflict	UNP P0DTC2
A	498	ARG	GLN	conflict	UNP P0DTC2
A	501	TYR	ASN	conflict	UNP P0DTC2
A	505	HIS	TYR	conflict	UNP P0DTC2
A	550	LYS	THR	conflict	UNP P0DTC2
A	617	GLY	ASP	conflict	UNP P0DTC2
A	658	TYR	HIS	conflict	UNP P0DTC2
A	767	LYS	ASN	conflict	UNP P0DTC2
A	799	TYR	ASP	conflict	UNP P0DTC2

*Continued on next page...*

*Continued from previous page...*

Chain	Residue	Modelled	Actual	Comment	Reference
A	859	LYS	ASN	conflict	UNP P0DTC2
A	957	HIS	GLN	conflict	UNP P0DTC2
A	972	LYS	ASN	conflict	UNP P0DTC2
A	984	PHE	LEU	conflict	UNP P0DTC2
A	989	PRO	LYS	conflict	UNP P0DTC2
A	990	PRO	VAL	conflict	UNP P0DTC2
B	67	VAL	ALA	conflict	UNP P0DTC2
B	95	ILE	THR	conflict	UNP P0DTC2
B	142	ASP	GLY	conflict	UNP P0DTC2
B	156	ASP	GLU	conflict	UNP P0DTC2
B	339	ASP	GLY	conflict	UNP P0DTC2
B	371	LEU	SER	conflict	UNP P0DTC2
B	373	PRO	SER	conflict	UNP P0DTC2
B	375	PHE	SER	conflict	UNP P0DTC2
B	417	ASN	LYS	conflict	UNP P0DTC2
B	440	LYS	ASN	conflict	UNP P0DTC2
B	446	SER	GLY	conflict	UNP P0DTC2
B	477	ASN	SER	conflict	UNP P0DTC2
B	478	LYS	THR	conflict	UNP P0DTC2
B	484	ALA	GLU	conflict	UNP P0DTC2
B	493	ARG	GLN	conflict	UNP P0DTC2
B	496	SER	GLY	conflict	UNP P0DTC2
B	498	ARG	GLN	conflict	UNP P0DTC2
B	501	TYR	ASN	conflict	UNP P0DTC2
B	505	HIS	TYR	conflict	UNP P0DTC2
B	550	LYS	THR	conflict	UNP P0DTC2
B	617	GLY	ASP	conflict	UNP P0DTC2
B	658	TYR	HIS	conflict	UNP P0DTC2
B	767	LYS	ASN	conflict	UNP P0DTC2
B	799	TYR	ASP	conflict	UNP P0DTC2
B	859	LYS	ASN	conflict	UNP P0DTC2
B	957	HIS	GLN	conflict	UNP P0DTC2
B	972	LYS	ASN	conflict	UNP P0DTC2
B	984	PHE	LEU	conflict	UNP P0DTC2
B	989	PRO	LYS	conflict	UNP P0DTC2
B	990	PRO	VAL	conflict	UNP P0DTC2
C	67	VAL	ALA	conflict	UNP P0DTC2
C	95	ILE	THR	conflict	UNP P0DTC2
C	142	ASP	GLY	conflict	UNP P0DTC2
C	156	ASP	GLU	conflict	UNP P0DTC2
C	342	ASP	GLY	conflict	UNP P0DTC2
C	374	LEU	SER	conflict	UNP P0DTC2

*Continued on next page...*

*Continued from previous page...*

Chain	Residue	Modelled	Actual	Comment	Reference
C	376	PRO	SER	conflict	UNP P0DTC2
C	378	PHE	SER	conflict	UNP P0DTC2
C	420	ASN	LYS	conflict	UNP P0DTC2
C	443	LYS	ASN	conflict	UNP P0DTC2
C	449	SER	GLY	conflict	UNP P0DTC2
C	480	ASN	SER	conflict	UNP P0DTC2
C	481	LYS	THR	conflict	UNP P0DTC2
C	487	ALA	GLU	conflict	UNP P0DTC2
C	496	ARG	GLN	conflict	UNP P0DTC2
C	499	SER	GLY	conflict	UNP P0DTC2
C	501	ARG	GLN	conflict	UNP P0DTC2
C	504	TYR	ASN	conflict	UNP P0DTC2
C	508	HIS	TYR	conflict	UNP P0DTC2
C	550	LYS	THR	conflict	UNP P0DTC2
C	617	GLY	ASP	conflict	UNP P0DTC2
C	658	TYR	HIS	conflict	UNP P0DTC2
C	767	LYS	ASN	conflict	UNP P0DTC2
C	799	TYR	ASP	conflict	UNP P0DTC2
C	859	LYS	ASN	conflict	UNP P0DTC2
C	957	HIS	GLN	conflict	UNP P0DTC2
C	972	LYS	ASN	conflict	UNP P0DTC2
C	984	PHE	LEU	conflict	UNP P0DTC2
C	989	PRO	LYS	conflict	UNP P0DTC2
C	990	PRO	VAL	conflict	UNP P0DTC2

- Molecule 2 is a protein called Heavy chain of 5817 Fab.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	F	125	Total	C	N	O	S	0	0
			917	577	149	184	7		
2	H	125	Total	C	N	O	S	0	0
			917	577	149	184	7		

- Molecule 3 is a protein called Light chain of 5817 Fab.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	G	108	Total	C	N	O	S	0	0
			806	497	141	166	2		
3	J	108	Total	C	N	O	S	0	0
			806	497	141	166	2		

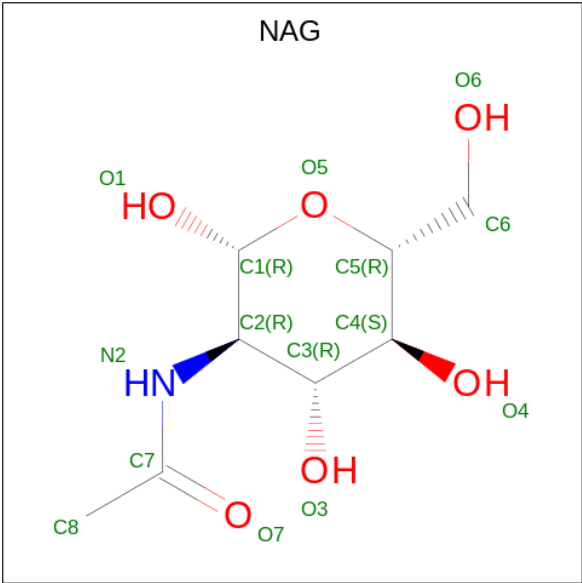
- Molecule 4 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-a

cetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				AltConf	Trace
4	D	2	Total	C	N	O	0	0
			28	16	2	10		
4	E	2	Total	C	N	O	0	0
			28	16	2	10		

- Molecule 5 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: C<sub>8</sub>H<sub>15</sub>NO<sub>6</sub>).



Mol	Chain	Residues	Atoms				AltConf
5	A	1	Total	C	N	O	0
			14	8	1	5	
5	A	1	Total	C	N	O	0
			14	8	1	5	
5	A	1	Total	C	N	O	0
			14	8	1	5	
5	A	1	Total	C	N	O	0
			14	8	1	5	
5	A	1	Total	C	N	O	0
			14	8	1	5	
5	A	1	Total	C	N	O	0
			14	8	1	5	

Continued on next page...

*Continued from previous page...*

Mol	Chain	Residues	Atoms				AltConf
5	A	1	Total 14	C 8	N 1	O 5	0
5	A	1	Total 14	C 8	N 1	O 5	0
5	A	1	Total 14	C 8	N 1	O 5	0
5	A	1	Total 14	C 8	N 1	O 5	0
5	A	1	Total 14	C 8	N 1	O 5	0
5	A	1	Total 14	C 8	N 1	O 5	0
5	B	1	Total 14	C 8	N 1	O 5	0
5	B	1	Total 14	C 8	N 1	O 5	0
5	B	1	Total 14	C 8	N 1	O 5	0
5	B	1	Total 14	C 8	N 1	O 5	0
5	B	1	Total 14	C 8	N 1	O 5	0
5	B	1	Total 14	C 8	N 1	O 5	0
5	B	1	Total 14	C 8	N 1	O 5	0
5	B	1	Total 14	C 8	N 1	O 5	0
5	B	1	Total 14	C 8	N 1	O 5	0
5	B	1	Total 14	C 8	N 1	O 5	0
5	B	1	Total 14	C 8	N 1	O 5	0
5	B	1	Total 14	C 8	N 1	O 5	0
5	C	1	Total 14	C 8	N 1	O 5	0
5	C	1	Total 14	C 8	N 1	O 5	0
5	C	1	Total 14	C 8	N 1	O 5	0

*Continued on next page...*



*Continued from previous page...*

Mol	Chain	Residues	Atoms				AltConf
5	C	1	Total	C	N	O	0
			14	8	1	5	
5	C	1	Total	C	N	O	0
			14	8	1	5	
5	C	1	Total	C	N	O	0
			14	8	1	5	
5	C	1	Total	C	N	O	0
			14	8	1	5	
5	C	1	Total	C	N	O	0
			14	8	1	5	
5	C	1	Total	C	N	O	0
			14	8	1	5	
5	C	1	Total	C	N	O	0
			14	8	1	5	
5	C	1	Total	C	N	O	0
			14	8	1	5	

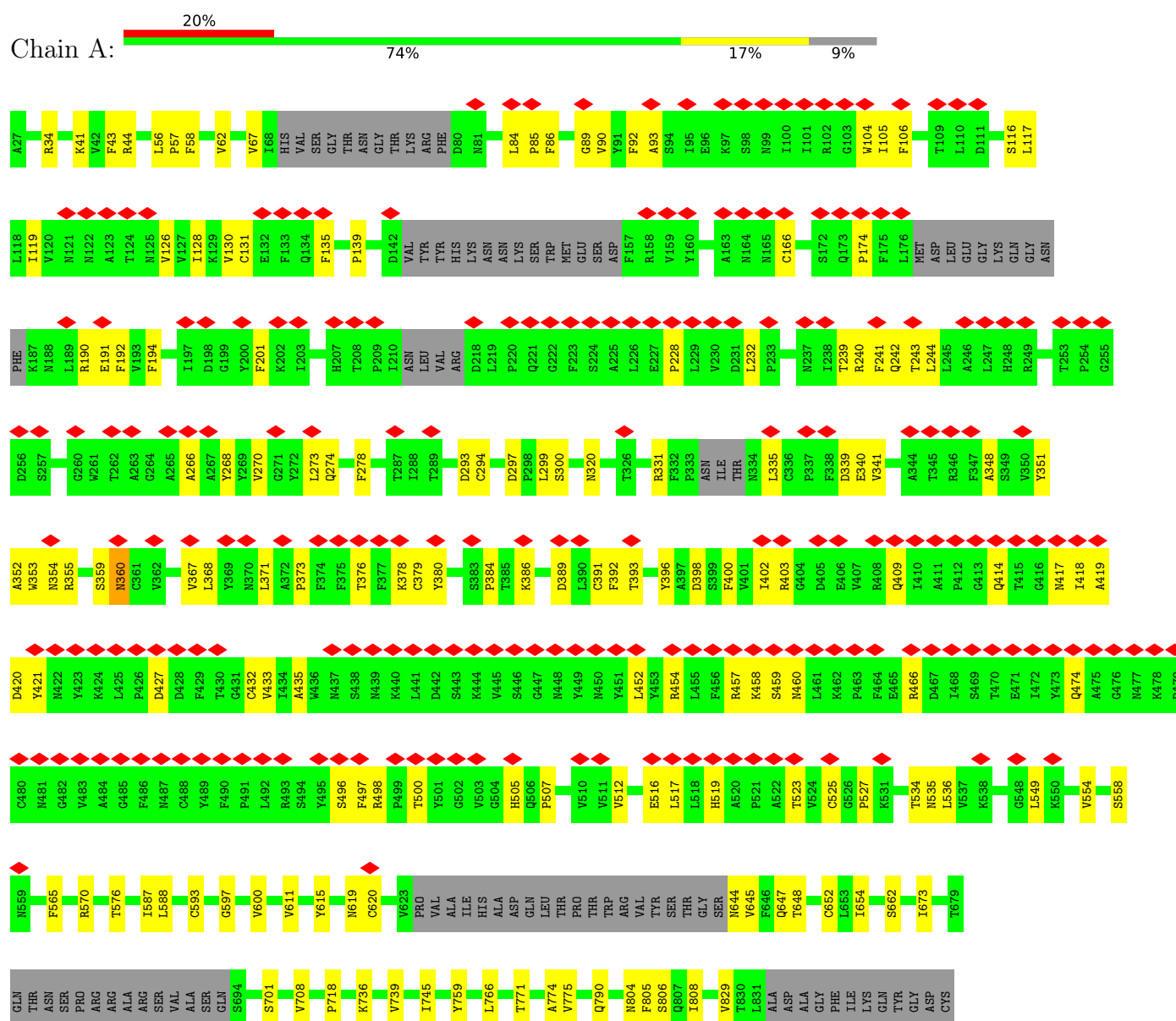
- Molecule 6 is water.

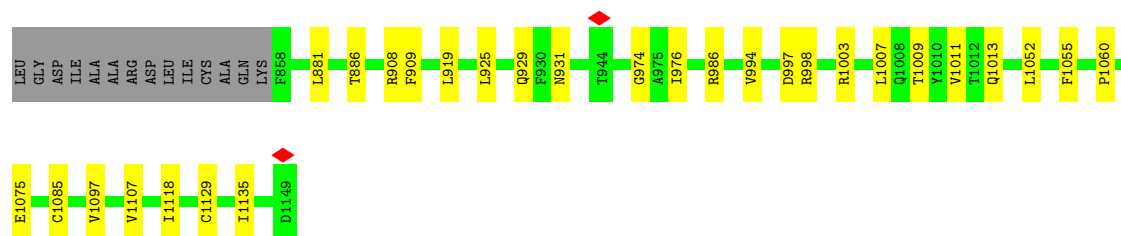
Mol	Chain	Residues	Atoms		AltConf
6	A	5	Total	O	0
			5	5	
6	B	4	Total	O	0
			4	4	
6	F	19	Total	O	0
			19	19	
6	G	6	Total	O	0
			6	6	
6	H	16	Total	O	0
			16	16	
6	J	8	Total	O	0
			8	8	

### 3 Residue-property plots

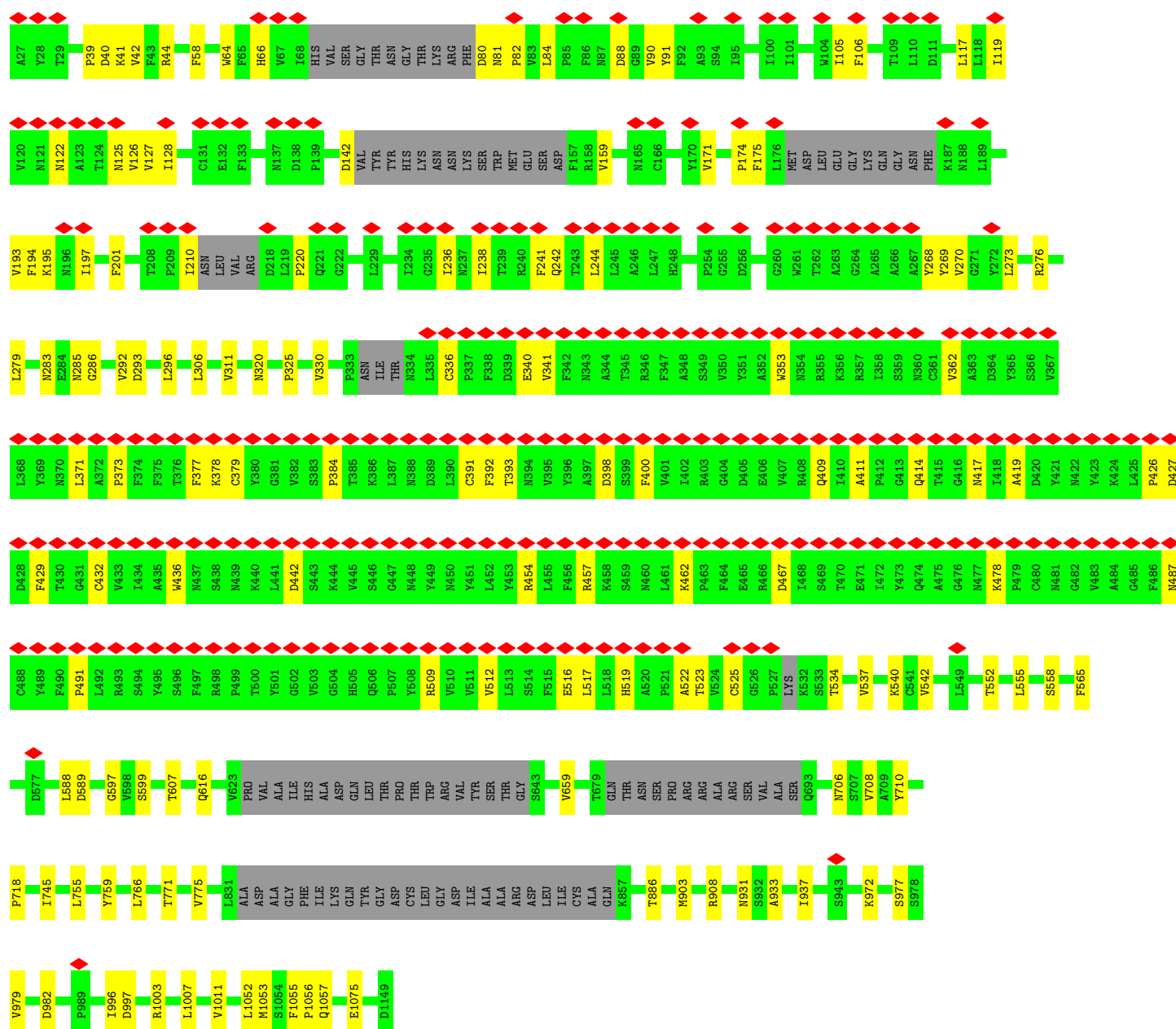
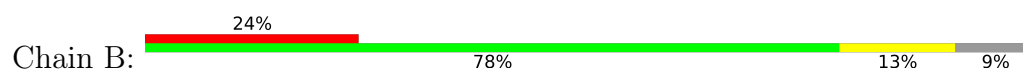
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion 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: Spike glycoprotein

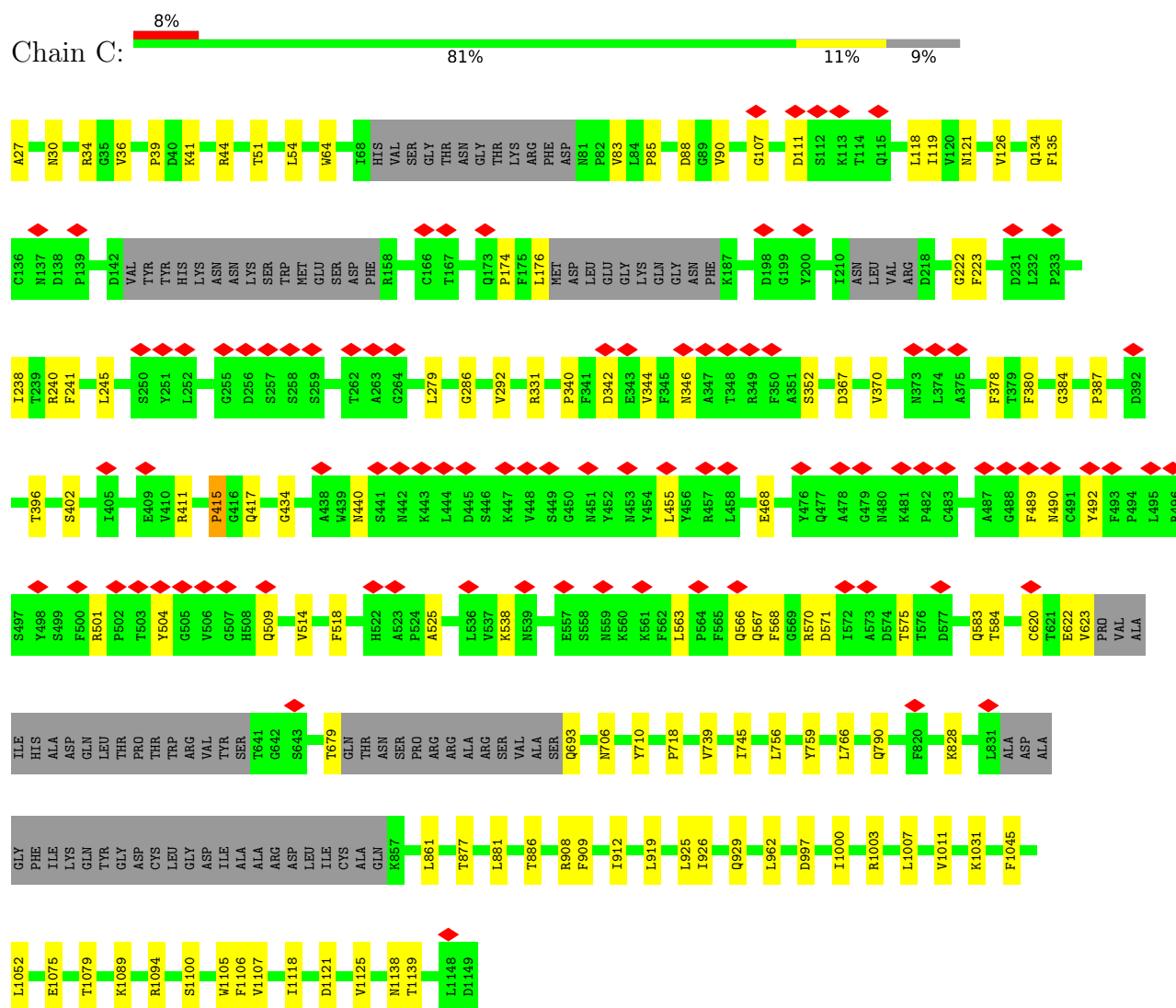




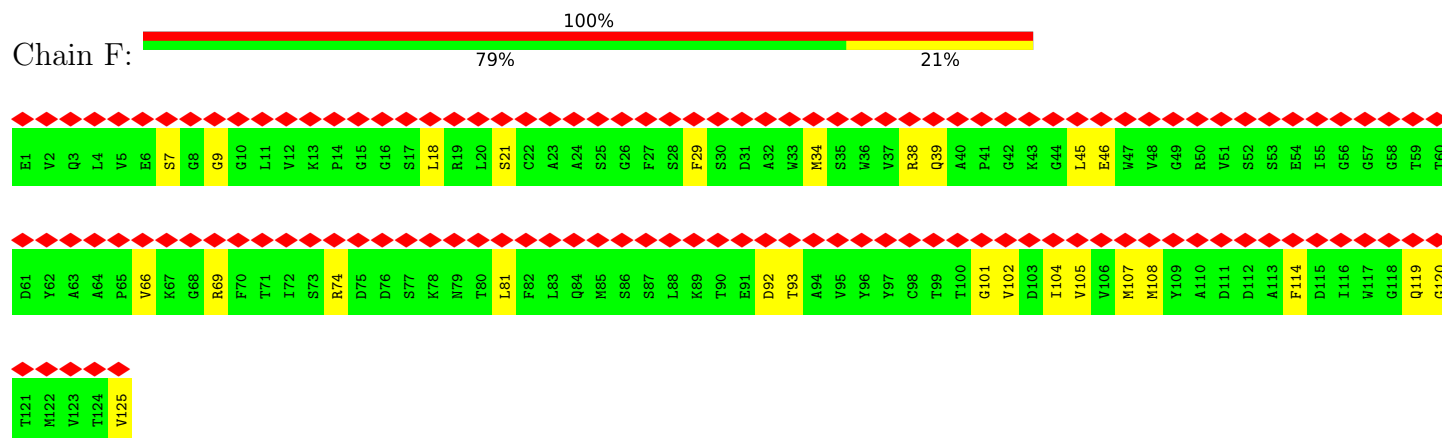
• Molecule 1: Spike glycoprotein



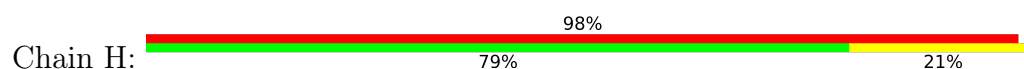
• Molecule 1: Spike glycoprotein

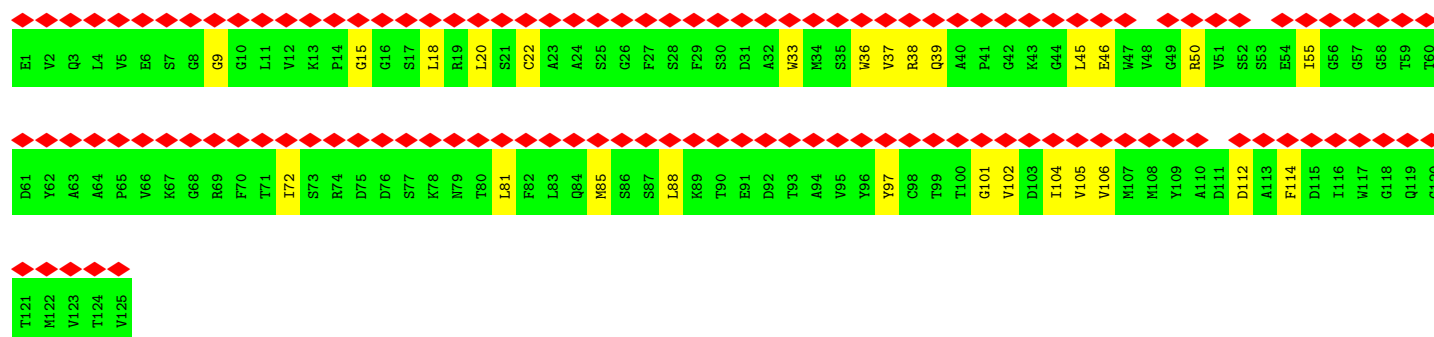


- Molecule 2: Heavy chain of 5817 Fab

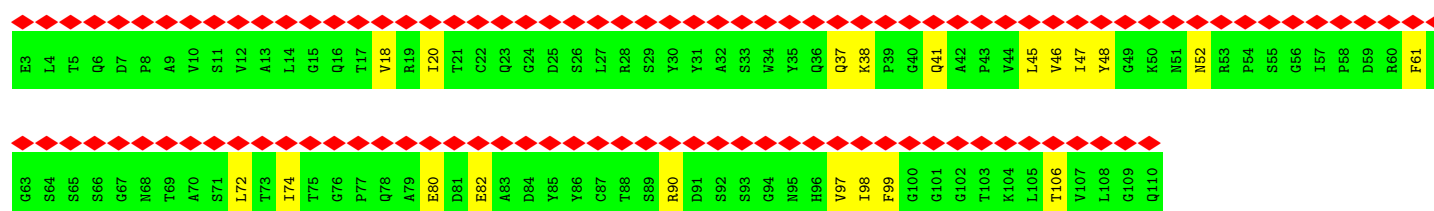
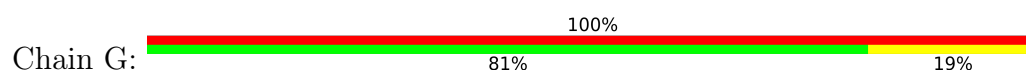


- Molecule 2: Heavy chain of 5817 Fab

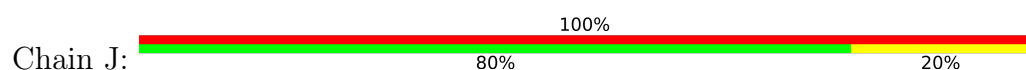




- Molecule 3: Light chain of 5817 Fab



- Molecule 3: Light chain of 5817 Fab



- Molecule 4: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



MAG1  
MAG2

- Molecule 4: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



MAG1  
MAG2

## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	5129	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 ( $e^-/\text{\AA}^2$ )	45	Depositor
Minimum defocus (nm)	1500	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	7.649	Depositor
Minimum map value	-4.437	Depositor
Average map value	-0.004	Depositor
Map value standard deviation	0.115	Depositor
Recommended contour level	0.45	Depositor
Map size (Å)	381.59998, 381.59998, 381.59998	wwPDB
Map dimensions	360, 360, 360	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.06, 1.06, 1.06	Depositor

## 5 Model quality

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: NAG

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	0.14	0/7911	0.35	0/10793
1	B	0.13	0/7918	0.34	0/10805
1	C	0.14	0/7823	0.36	1/10700 (0.0%)
2	F	0.11	0/934	0.30	0/1268
2	H	0.11	0/936	0.29	0/1274
3	G	0.08	0/822	0.28	0/1118
3	J	0.09	0/822	0.27	0/1118
All	All	0.13	0/27166	0.34	1/37076 (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	A	0	2

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	415	PRO	CA-N-CD	-8.24	100.47	112.00

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	360	ASN	Peptide
1	A	620	CYS	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	7729	0	7343	129	0
1	B	7738	0	7313	94	0
1	C	7642	0	7167	76	0
2	F	917	0	856	15	0
2	H	917	0	858	17	0
3	G	806	0	769	13	0
3	J	806	0	769	13	0
4	D	28	0	25	0	0
4	E	28	0	25	0	0
5	A	168	0	156	3	0
5	B	168	0	156	7	0
5	C	168	0	156	1	0
6	A	5	0	0	1	0
6	B	4	0	0	0	0
6	F	19	0	0	1	0
6	G	6	0	0	0	0
6	H	16	0	0	1	0
6	J	8	0	0	1	0
All	All	27173	0	25593	337	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 337 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:285:ASN:HB2	5:B:1303:NAG:HN2	1.47	0.79
1:A:201:PHE:HB3	1:A:232:LEU:HB2	1.66	0.76
1:A:402:ILE:HD11	1:A:418:ILE:HD13	1.69	0.73
1:A:384:PRO:HB3	1:C:490:ASN:HA	1.71	0.72
1:A:376:THR:HB	1:A:435:ALA:HB3	1.71	0.71

There are no symmetry-related clashes.



## 5.3 Torsion angles

### 5.3.1 Protein backbone

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	998/1120 (89%)	958 (96%)	39 (4%)	1 (0%)	48	81
1	B	1000/1120 (89%)	970 (97%)	30 (3%)	0	100	100
1	C	1008/1120 (90%)	973 (96%)	35 (4%)	0	100	100
2	F	120/125 (96%)	112 (93%)	8 (7%)	0	100	100
2	H	123/125 (98%)	113 (92%)	10 (8%)	0	100	100
3	G	106/108 (98%)	101 (95%)	4 (4%)	1 (1%)	14	49
3	J	106/108 (98%)	101 (95%)	4 (4%)	1 (1%)	14	49
All	All	3461/3826 (90%)	3328 (96%)	130 (4%)	3 (0%)	50	81

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	340	GLU
3	G	98	ILE
3	J	98	ILE

### 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	816/974 (84%)	816 (100%)	0	100	100
1	B	822/974 (84%)	822 (100%)	0	100	100
1	C	792/974 (81%)	791 (100%)	1 (0%)	92	98

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	F	95/100 (95%)	95 (100%)	0	100	100
2	H	95/100 (95%)	95 (100%)	0	100	100
3	G	88/88 (100%)	88 (100%)	0	100	100
3	J	88/88 (100%)	88 (100%)	0	100	100
All	All	2796/3298 (85%)	2795 (100%)	1 (0%)	100	100

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	30	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 27 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	1104	HIS
1	C	207	HIS
3	G	52	ASN
1	C	121	ASN
1	C	567	GLN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

## 5.5 Carbohydrates ⓘ

4 monosaccharides are modelled in this entry.

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	$\# Z  > 2$
4	NAG	D	1	1,4	14,14,15	0.24	0	17,19,21	0.42	0
4	NAG	D	2	4	14,14,15	0.25	0	17,19,21	0.40	0
4	NAG	E	1	1,4	14,14,15	0.22	0	17,19,21	0.42	0
4	NAG	E	2	4	14,14,15	0.22	0	17,19,21	0.43	0

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
4	NAG	D	1	1,4	-	0/6/23/26	0/1/1/1
4	NAG	D	2	4	-	0/6/23/26	0/1/1/1
4	NAG	E	1	1,4	-	0/6/23/26	0/1/1/1
4	NAG	E	2	4	-	2/6/23/26	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

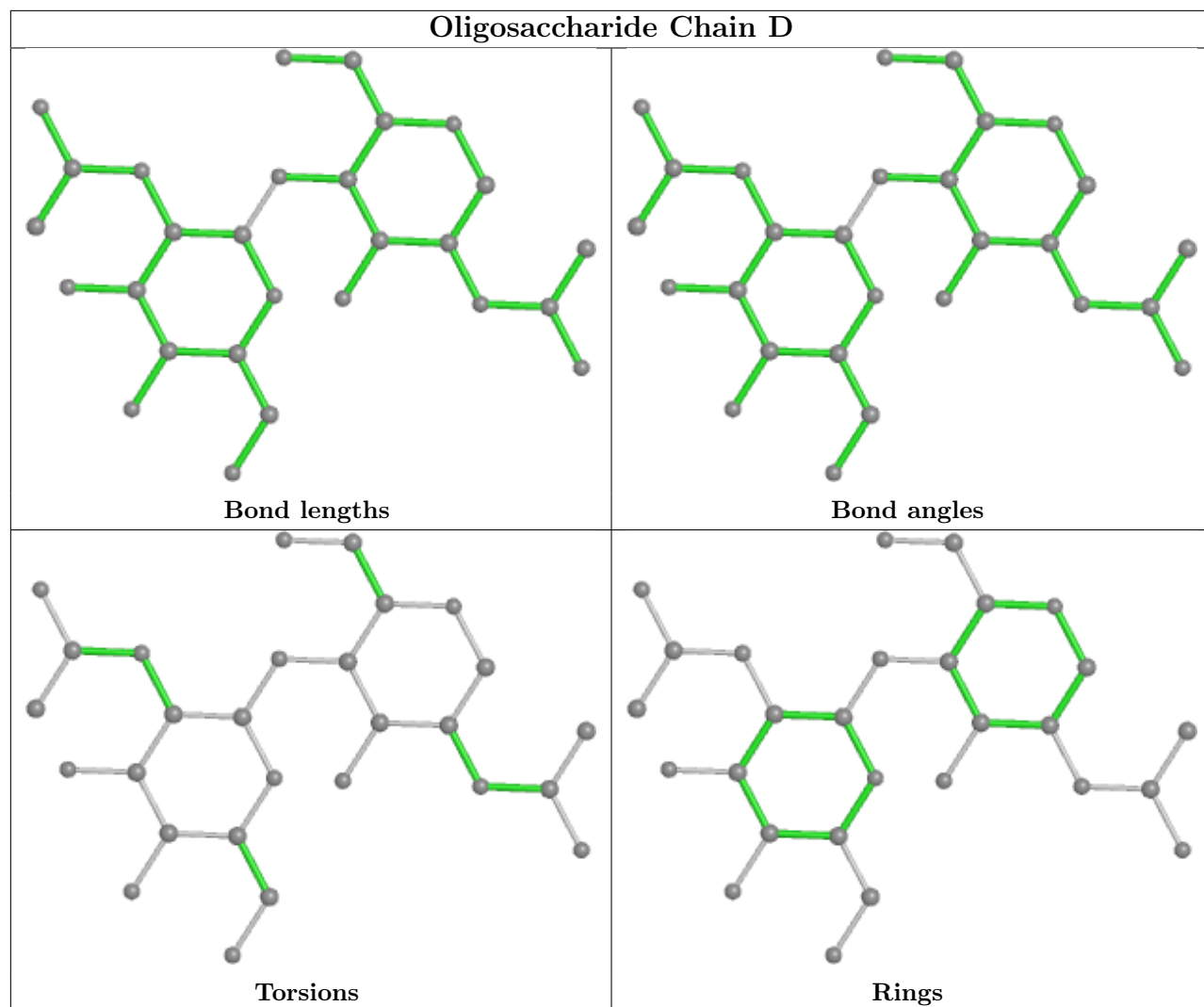
All (2) torsion outliers are listed below:

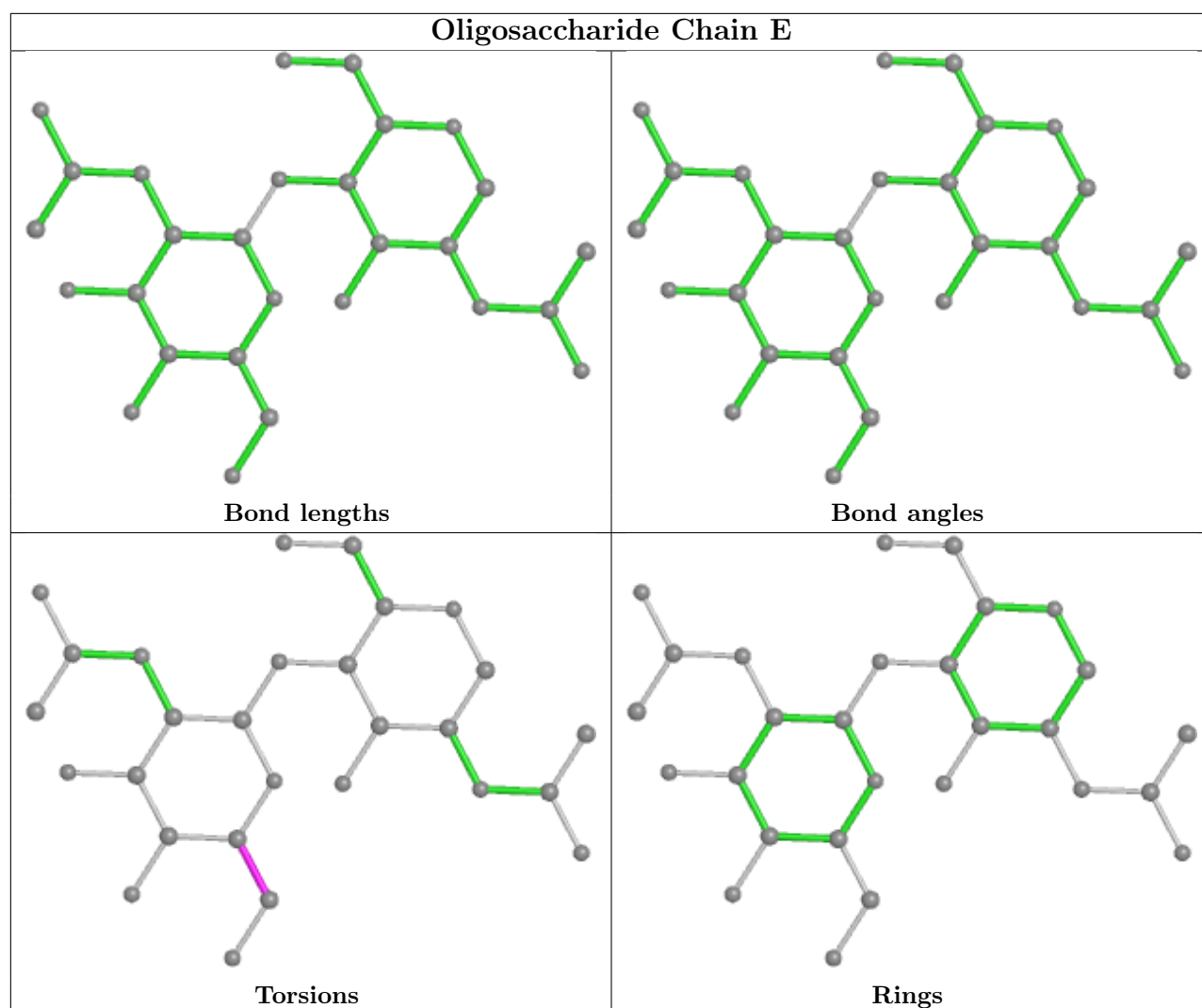
Mol	Chain	Res	Type	Atoms
4	E	2	NAG	C4-C5-C6-O6
4	E	2	NAG	O5-C5-C6-O6

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 oligosaccharide.





## 5.6 Ligand geometry [i](#)

36 ligands are modelled in this entry.

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	$\# Z  > 2$
5	NAG	A	1303	1	14,14,15	0.23	0	17,19,21	0.37	0
5	NAG	C	1305	1	14,14,15	0.20	0	17,19,21	0.43	0
5	NAG	C	1309	1	14,14,15	0.27	0	17,19,21	0.52	0
5	NAG	C	1301	1	14,14,15	0.45	0	17,19,21	0.44	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
5	NAG	B	1301	1	14,14,15	0.23	0	17,19,21	0.47	0
5	NAG	B	1305	1	14,14,15	0.22	0	17,19,21	0.37	0
5	NAG	B	1312	1	14,14,15	0.29	0	17,19,21	0.54	0
5	NAG	B	1307	1	14,14,15	0.21	0	17,19,21	0.37	0
5	NAG	B	1306	1	14,14,15	0.23	0	17,19,21	0.50	0
5	NAG	C	1304	1	14,14,15	0.29	0	17,19,21	0.43	0
5	NAG	A	1309	1	14,14,15	0.41	0	17,19,21	0.61	0
5	NAG	A	1312	1	14,14,15	0.24	0	17,19,21	0.43	0
5	NAG	A	1305	1	14,14,15	0.21	0	17,19,21	0.44	0
5	NAG	B	1304	1	14,14,15	0.22	0	17,19,21	0.42	0
5	NAG	C	1306	1	14,14,15	0.25	0	17,19,21	0.43	0
5	NAG	C	1308	1	14,14,15	0.35	0	17,19,21	0.50	0
5	NAG	A	1308	1	14,14,15	0.38	0	17,19,21	0.58	0
5	NAG	A	1307	1	14,14,15	0.20	0	17,19,21	0.43	0
5	NAG	A	1306	1	14,14,15	0.22	0	17,19,21	0.46	0
5	NAG	C	1310	1	14,14,15	0.26	0	17,19,21	0.50	0
5	NAG	A	1310	1	14,14,15	0.23	0	17,19,21	0.46	0
5	NAG	B	1309	1	14,14,15	0.19	0	17,19,21	0.36	0
5	NAG	C	1302	1	14,14,15	0.23	0	17,19,21	0.41	0
5	NAG	B	1302	1	14,14,15	0.24	0	17,19,21	0.45	0
5	NAG	A	1304	1	14,14,15	0.25	0	17,19,21	0.42	0
5	NAG	B	1308	1	14,14,15	0.24	0	17,19,21	0.42	0
5	NAG	B	1310	1	14,14,15	0.20	0	17,19,21	0.42	0
5	NAG	B	1303	1	14,14,15	0.61	0	17,19,21	0.70	1 (5%)
5	NAG	C	1311	1	14,14,15	0.22	0	17,19,21	0.51	0
5	NAG	A	1311	1	14,14,15	0.58	0	17,19,21	0.87	1 (5%)
5	NAG	C	1303	1	14,14,15	0.20	0	17,19,21	0.43	0
5	NAG	A	1302	1	14,14,15	0.21	0	17,19,21	0.41	0
5	NAG	B	1311	1	14,14,15	0.27	0	17,19,21	0.52	0
5	NAG	A	1301	1	14,14,15	0.23	0	17,19,21	0.42	0
5	NAG	C	1307	1	14,14,15	0.48	0	17,19,21	0.61	1 (5%)
5	NAG	C	1312	1	14,14,15	0.26	0	17,19,21	0.45	0

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
5	NAG	A	1303	1	-	0/6/23/26	0/1/1/1
5	NAG	C	1305	1	-	0/6/23/26	0/1/1/1
5	NAG	C	1309	1	-	2/6/23/26	0/1/1/1

Continued on next page...

*Continued from previous page...*

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	NAG	C	1301	1	-	0/6/23/26	0/1/1/1
5	NAG	B	1301	1	-	2/6/23/26	0/1/1/1
5	NAG	B	1305	1	-	1/6/23/26	0/1/1/1
5	NAG	B	1312	1	-	2/6/23/26	0/1/1/1
5	NAG	B	1307	1	-	1/6/23/26	0/1/1/1
5	NAG	B	1306	1	-	0/6/23/26	0/1/1/1
5	NAG	C	1304	1	-	2/6/23/26	0/1/1/1
5	NAG	A	1309	1	-	2/6/23/26	0/1/1/1
5	NAG	A	1312	1	-	0/6/23/26	0/1/1/1
5	NAG	A	1305	1	-	0/6/23/26	0/1/1/1
5	NAG	B	1304	1	-	1/6/23/26	0/1/1/1
5	NAG	C	1306	1	-	0/6/23/26	0/1/1/1
5	NAG	C	1308	1	-	2/6/23/26	0/1/1/1
5	NAG	A	1308	1	-	2/6/23/26	0/1/1/1
5	NAG	A	1307	1	-	1/6/23/26	0/1/1/1
5	NAG	A	1306	1	-	2/6/23/26	0/1/1/1
5	NAG	C	1310	1	-	2/6/23/26	0/1/1/1
5	NAG	A	1310	1	-	0/6/23/26	0/1/1/1
5	NAG	B	1309	1	-	2/6/23/26	0/1/1/1
5	NAG	C	1302	1	-	2/6/23/26	0/1/1/1
5	NAG	B	1302	1	-	0/6/23/26	0/1/1/1
5	NAG	A	1304	1	-	2/6/23/26	0/1/1/1
5	NAG	B	1308	1	-	2/6/23/26	0/1/1/1
5	NAG	B	1310	1	-	2/6/23/26	0/1/1/1
5	NAG	B	1303	1	-	1/6/23/26	0/1/1/1
5	NAG	C	1311	1	-	2/6/23/26	0/1/1/1
5	NAG	A	1311	1	-	2/6/23/26	0/1/1/1
5	NAG	C	1303	1	-	2/6/23/26	0/1/1/1
5	NAG	A	1302	1	-	2/6/23/26	0/1/1/1
5	NAG	B	1311	1	-	1/6/23/26	0/1/1/1
5	NAG	A	1301	1	-	0/6/23/26	0/1/1/1
5	NAG	C	1307	1	-	2/6/23/26	0/1/1/1
5	NAG	C	1312	1	-	0/6/23/26	0/1/1/1

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	1311	NAG	C1-O5-C5	2.91	116.14	112.19
5	B	1303	NAG	C1-O5-C5	2.47	115.54	112.19
5	C	1307	NAG	C1-O5-C5	2.05	114.98	112.19

There are no chirality outliers.

5 of 44 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	B	1309	NAG	C4-C5-C6-O6
5	B	1310	NAG	C4-C5-C6-O6
5	C	1304	NAG	C4-C5-C6-O6
5	A	1306	NAG	O5-C5-C6-O6
5	A	1308	NAG	O5-C5-C6-O6

There are no ring outliers.

8 monomers are involved in 11 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	1303	NAG	1	0
5	C	1309	NAG	1	0
5	B	1305	NAG	1	0
5	B	1307	NAG	1	0
5	A	1309	NAG	1	0
5	B	1309	NAG	1	0
5	B	1303	NAG	4	0
5	A	1311	NAG	1	0

## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [i](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
2	F	2
1	A	2
1	B	1

All chain breaks are listed below:



Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	F	1:GLU	C	2:VAL	N	4.21
1	A	527:PRO	C	531:LYS	N	4.20
1	A	497:PHE	C	498:ARG	N	3.33
1	F	28:SER	C	29:PHE	N	3.27
1	B	497:PHE	C	498:ARG	N	3.17

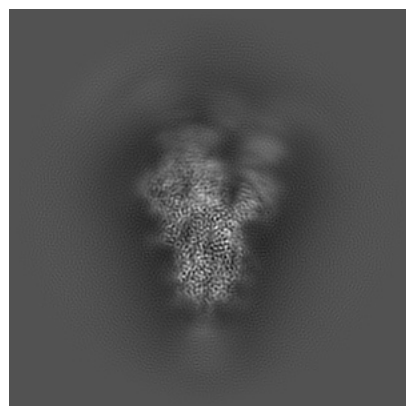
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-37240. These allow visual inspection of the internal detail of the map and identification of artifacts.

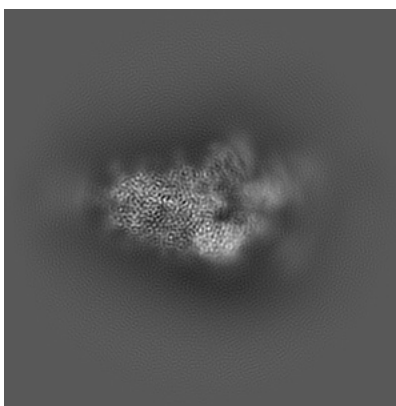
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

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

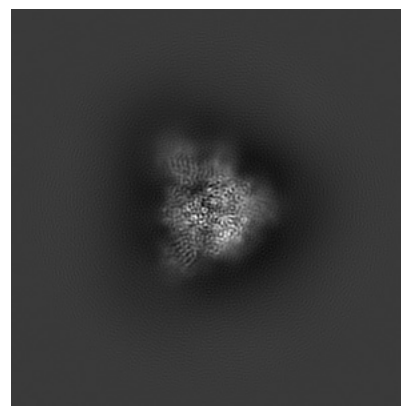
#### 6.1.1 Primary map



X

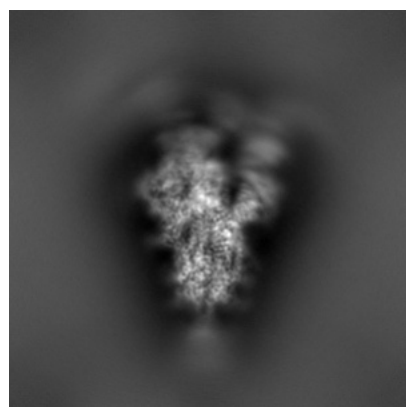


Y

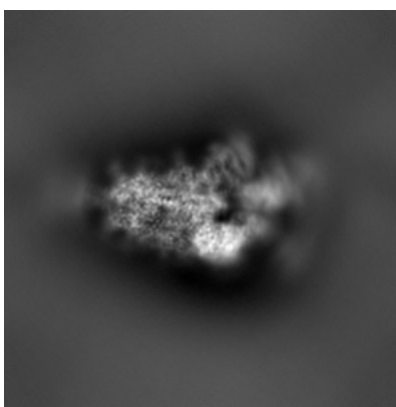


Z

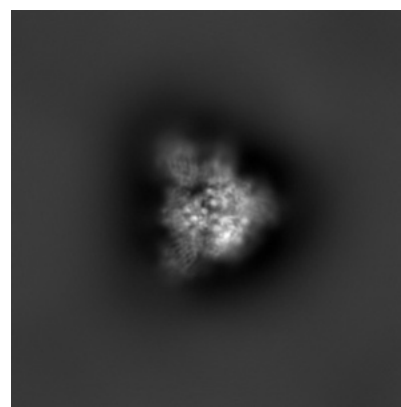
#### 6.1.2 Raw map



X



Y

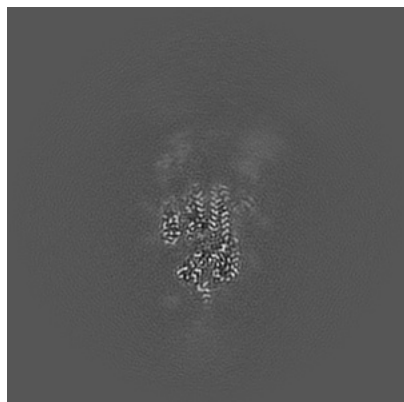


Z

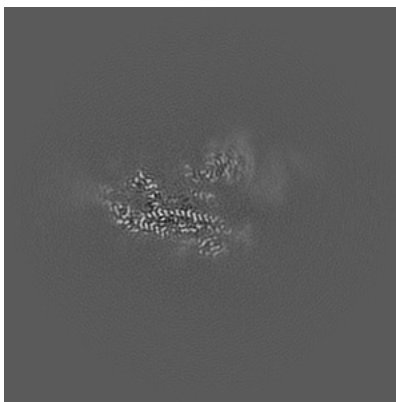
The images above show the map projected in three orthogonal directions.

## 6.2 Central slices [i](#)

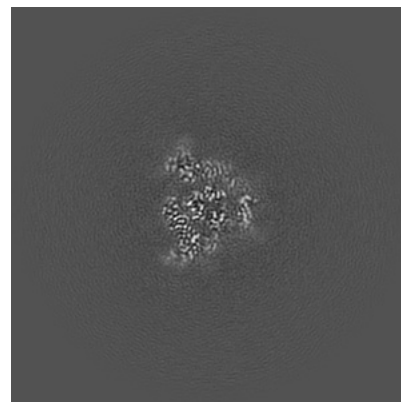
### 6.2.1 Primary map



X Index: 180

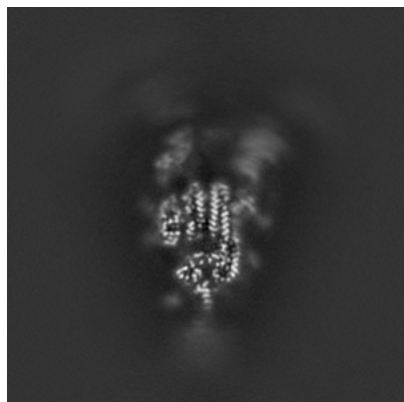


Y Index: 180

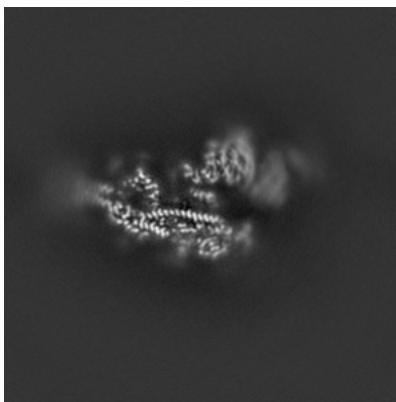


Z Index: 180

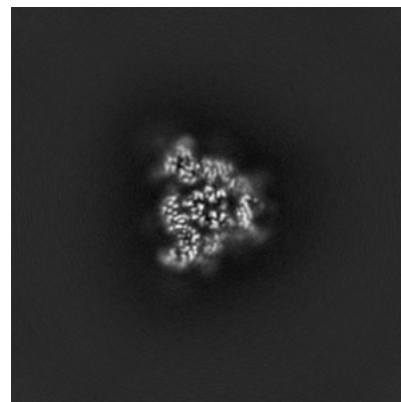
### 6.2.2 Raw map



X Index: 180



Y Index: 180

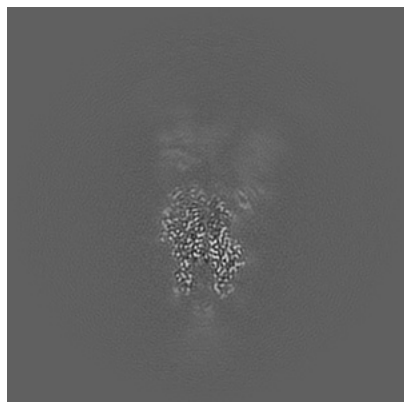


Z Index: 180

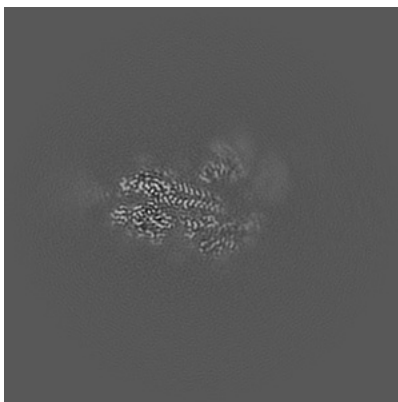
The images above show central slices of the map in three orthogonal directions.

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

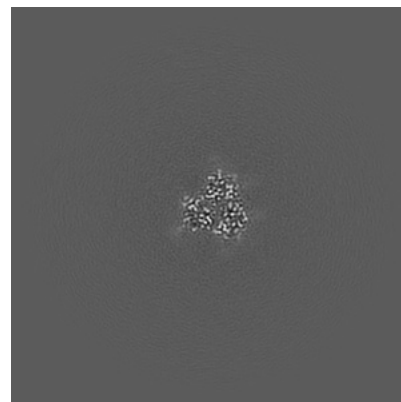
### 6.3.1 Primary map



X Index: 187

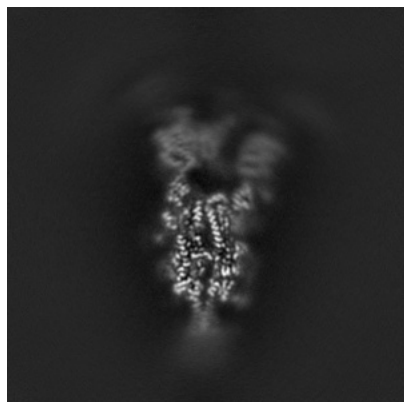


Y Index: 173

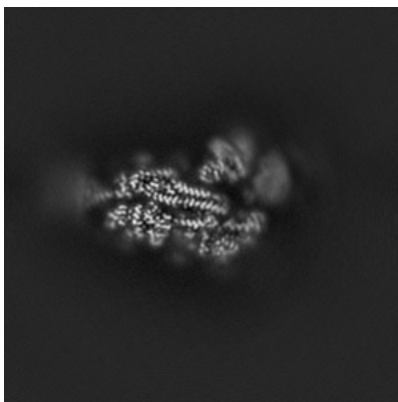


Z Index: 128

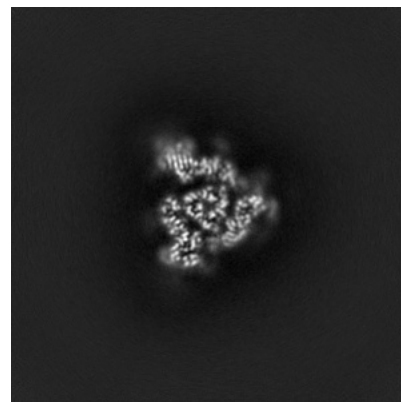
### 6.3.2 Raw map



X Index: 192



Y Index: 172

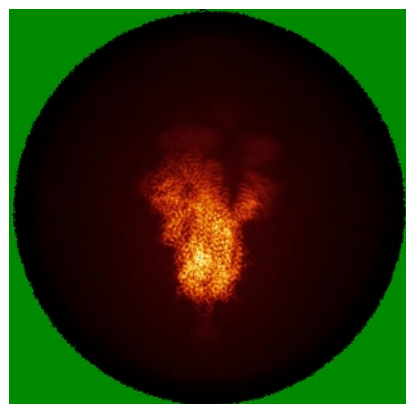


Z Index: 185

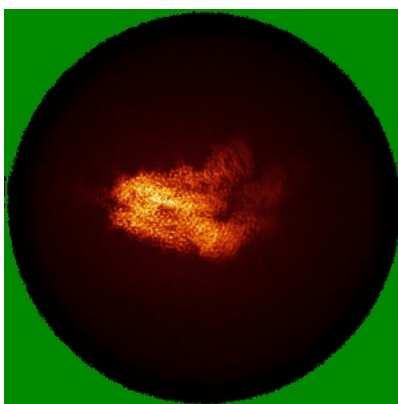
The images above show the largest variance slices of the map in three orthogonal directions.

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

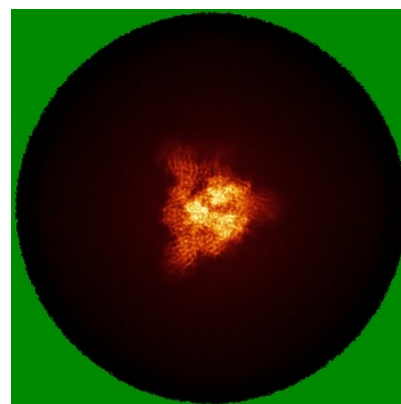
### 6.4.1 Primary map



X

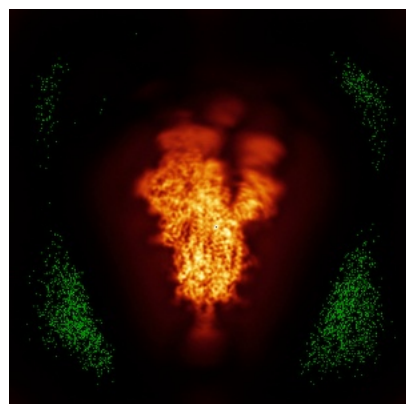


Y

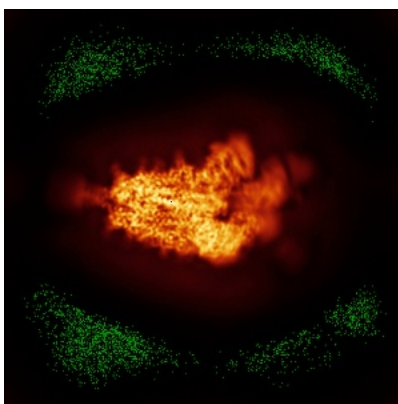


Z

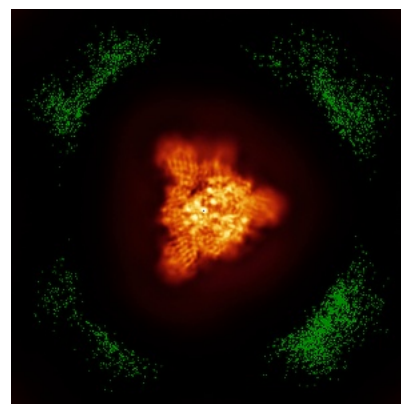
### 6.4.2 Raw map



X



Y

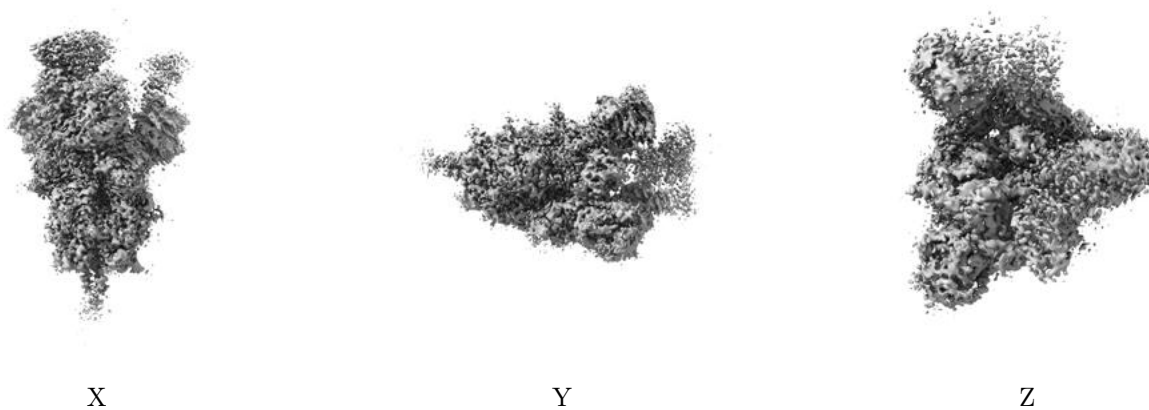


Z

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

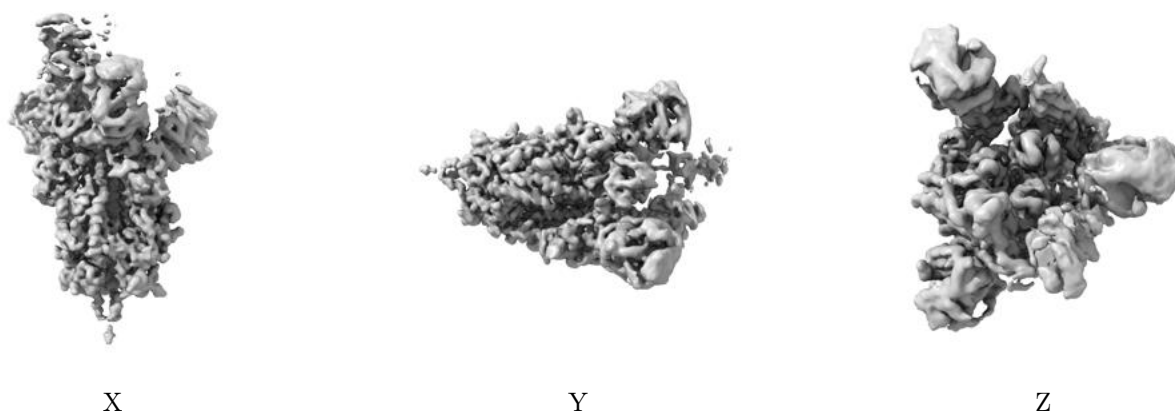
## 6.5 Orthogonal surface views [i](#)

### 6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.45. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

### 6.5.2 Raw map



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

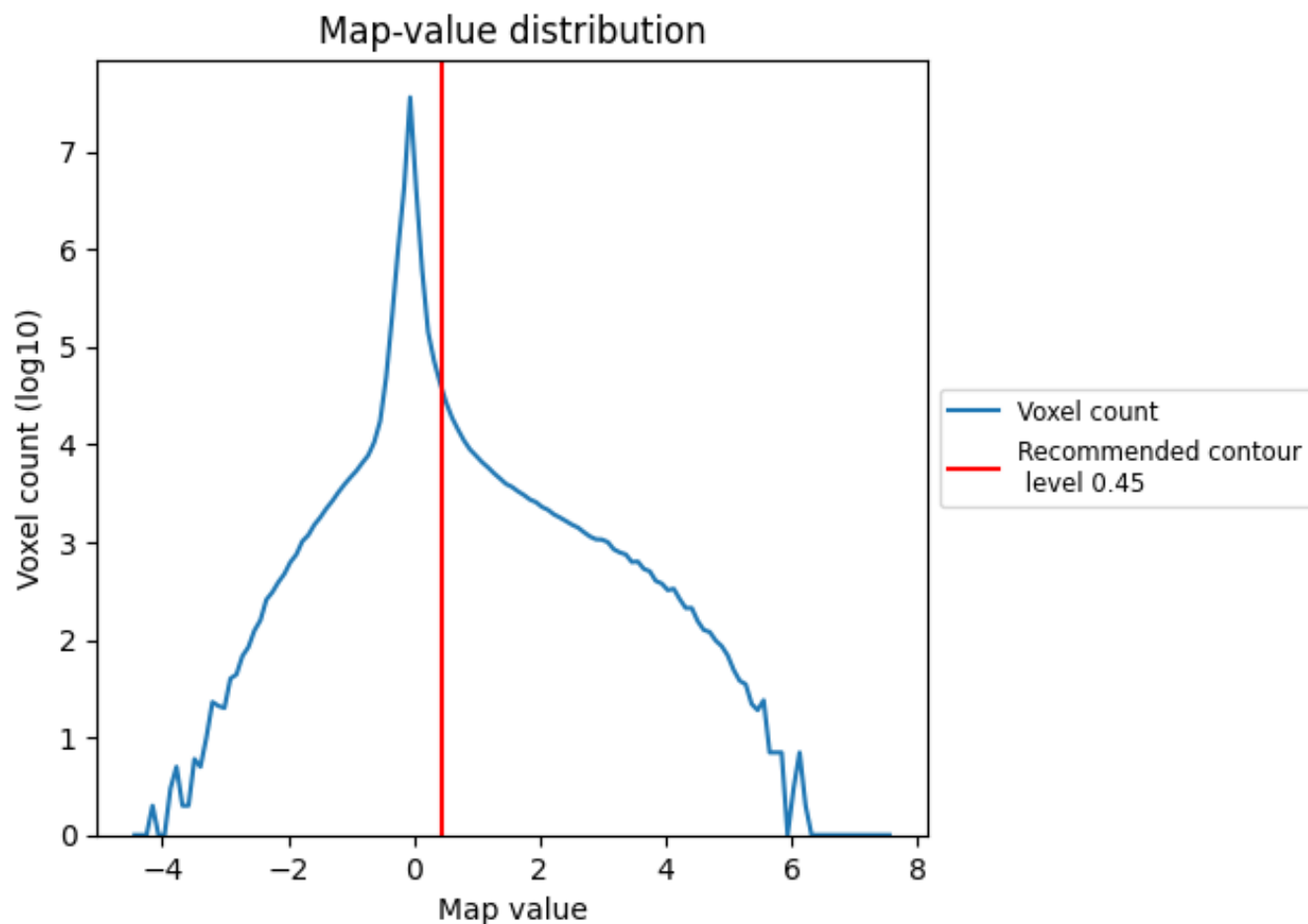
## 6.6 Mask visualisation [i](#)

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

## 7 Map analysis [i](#)

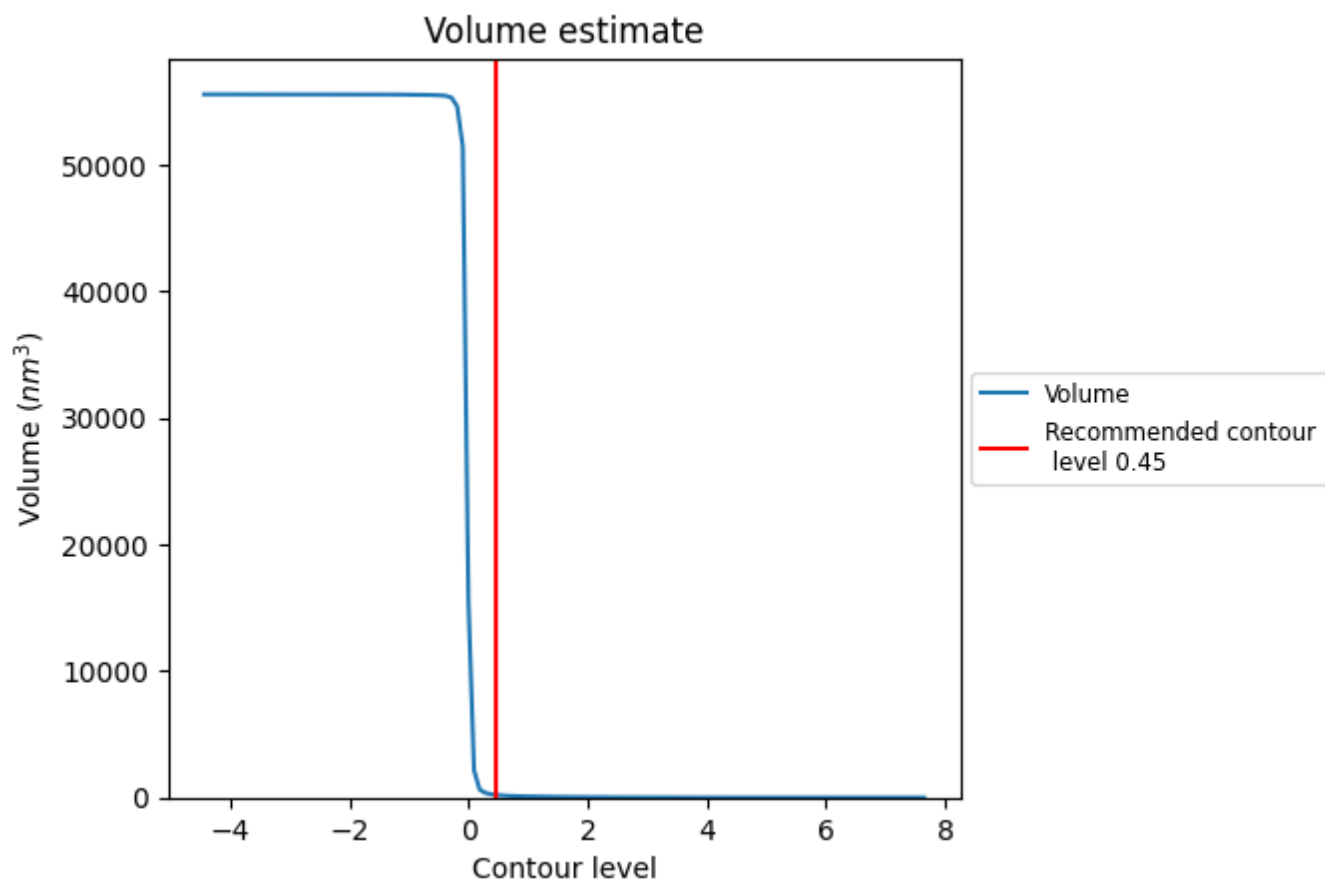
This section contains the results of statistical analysis of the map.

### 7.1 Map-value distribution [i](#)



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

## 7.2 Volume estimate [i](#)

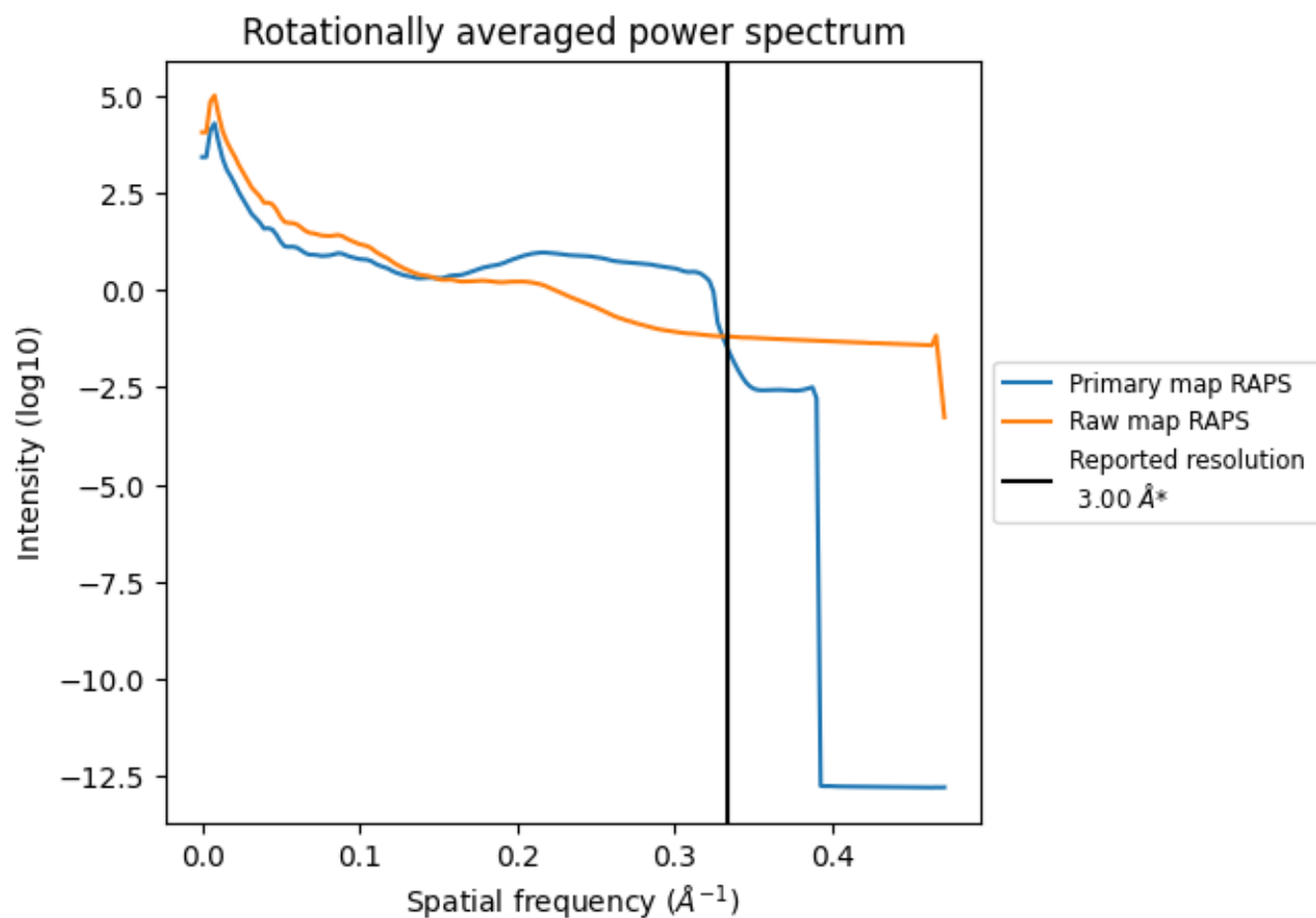


The volume at the recommended contour level is 216  $\text{nm}^3$ ; this corresponds to an approximate mass of 195 kDa.

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



### 7.3 Rotationally averaged power spectrum ⓘ

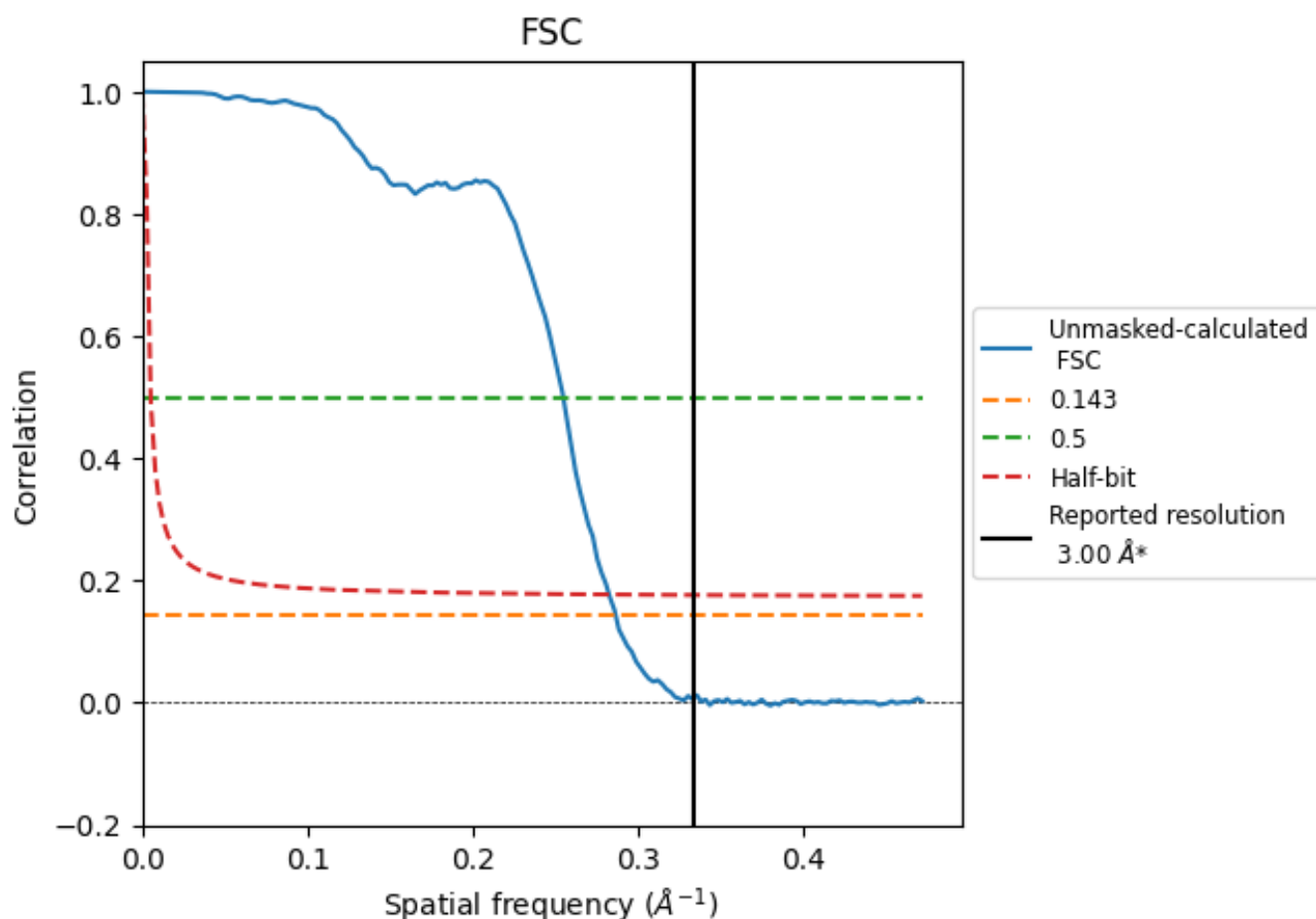


\*Reported resolution corresponds to spatial frequency of 0.333  $\text{\AA}^{-1}$

## 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  $0.333 \text{\AA}^{-1}$

## 8.2 Resolution estimates [i](#)

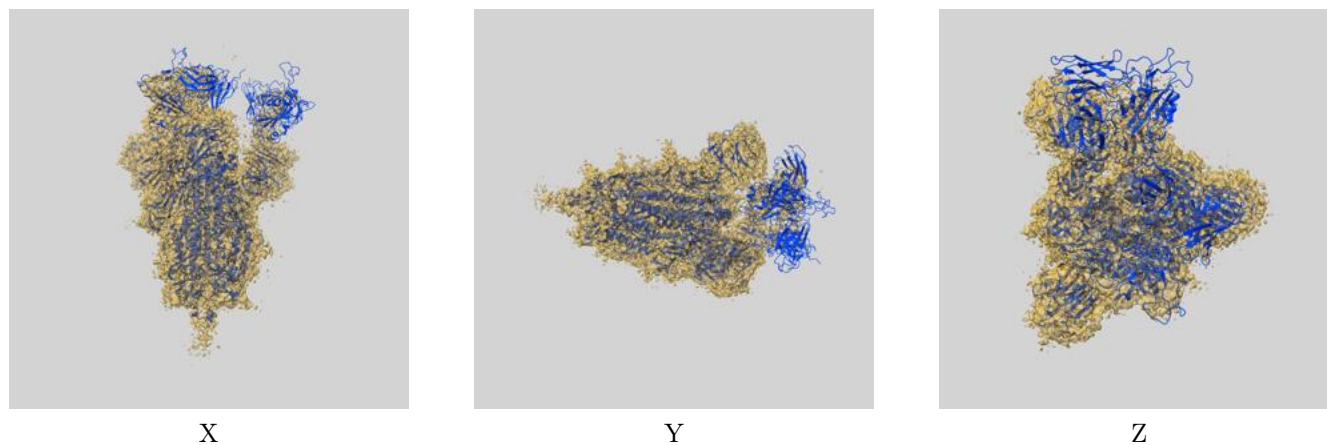
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.00	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	3.49	3.93	3.54

\*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 3.49 differs from the reported value 3.0 by more than 10 %

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

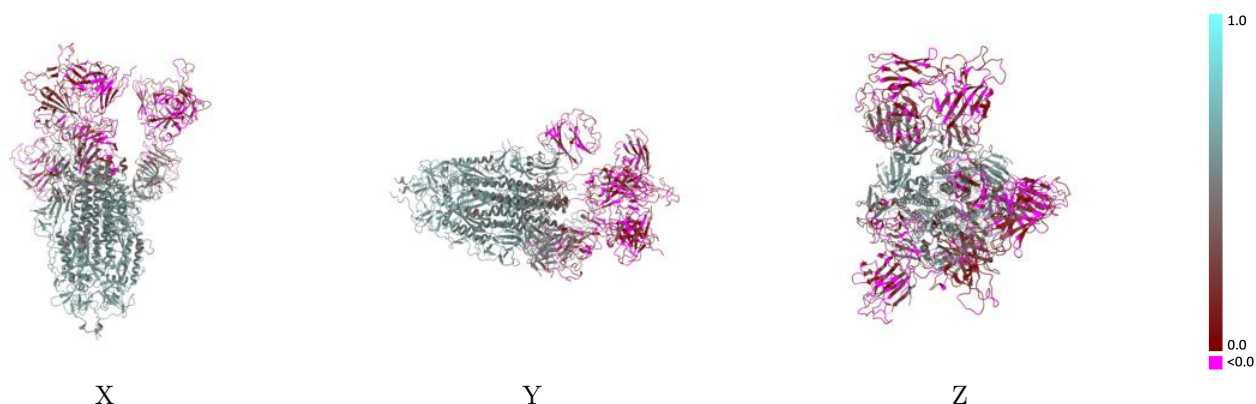
This section contains information regarding the fit between EMDB map EMD-37240 and PDB model 8KHC. Per-residue inclusion information can be found in section [3](#) on page [10](#).

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



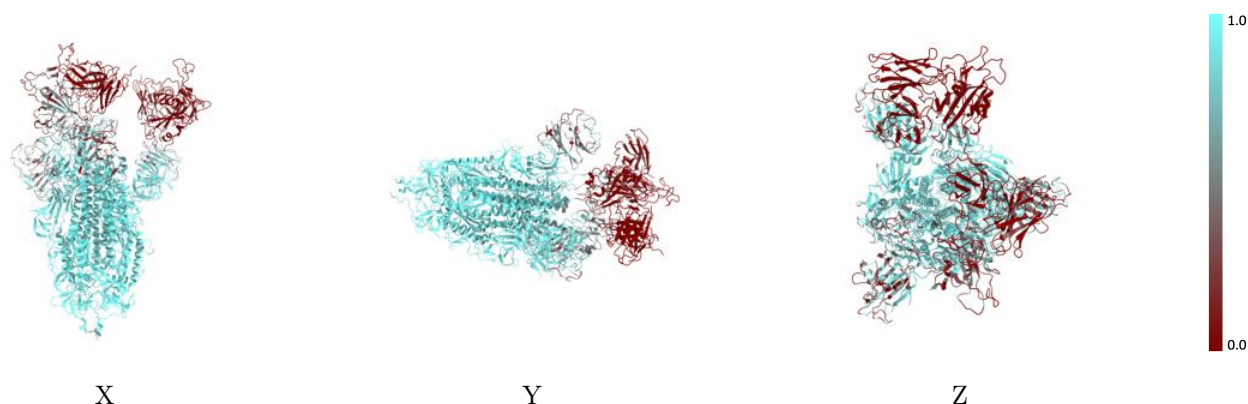
The images above show the 3D surface view of the map at the recommended contour level 0.45 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



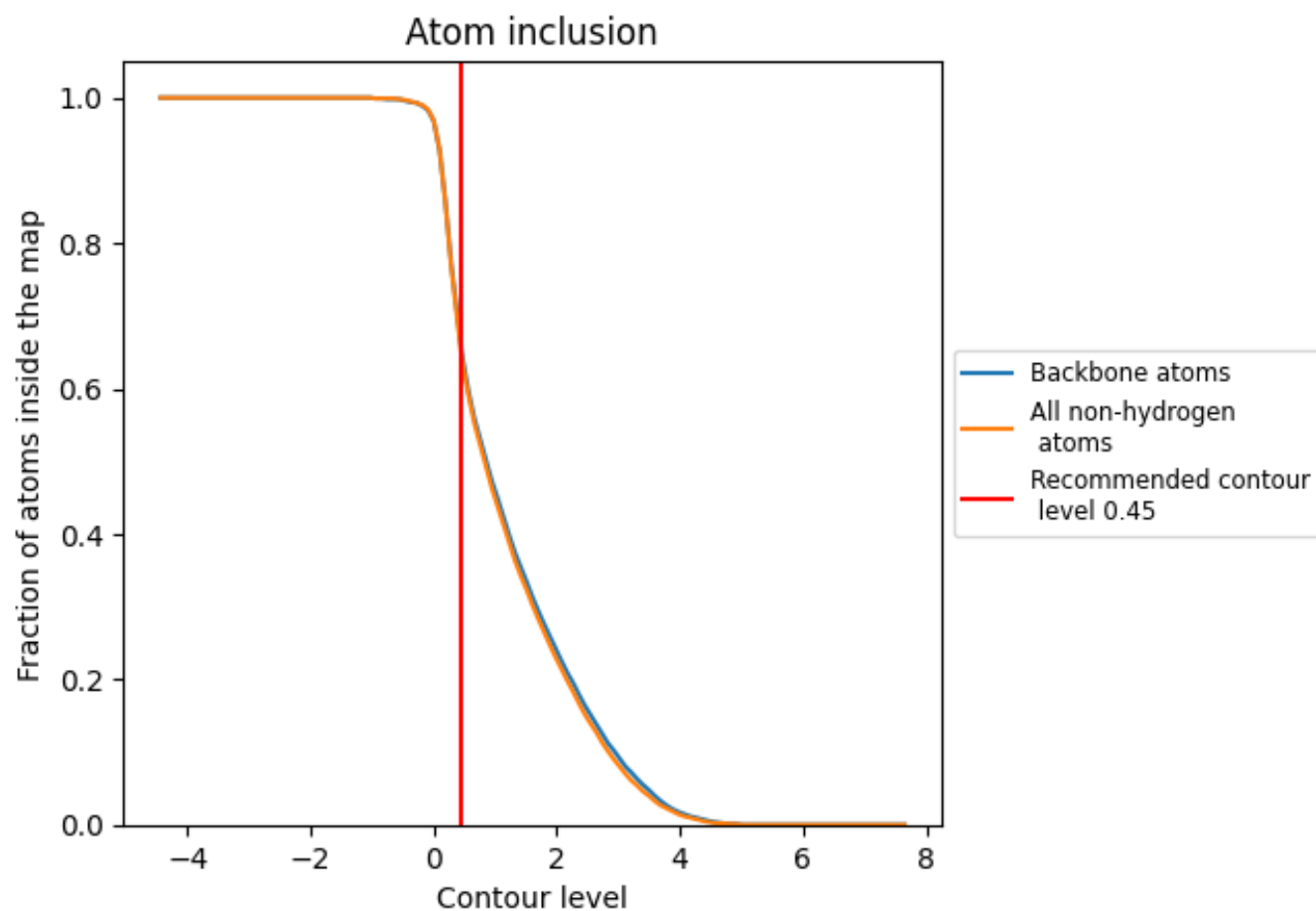
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.45).

## 9.4 Atom inclusion [i](#)



At the recommended contour level, 65% of all backbone atoms, 65% 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 (0.45) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	<div></div> 0.6460	<div></div> 0.3510
A	<div></div> 0.7120	<div></div> 0.3810
B	<div></div> 0.6710	<div></div> 0.3620
C	<div></div> 0.8210	<div></div> 0.4360
D	<div></div> 0.7860	<div></div> 0.4250
E	<div></div> 0.9640	<div></div> 0.4980
F	<div></div> 0.0150	<div></div> 0.0610
G	<div></div> 0.0130	<div></div> 0.0620
H	<div></div> 0.0760	<div></div> 0.0770
J	<div></div> 0.0370	<div></div> 0.0620

