



## Full wwPDB EM Validation Report ⓘ

Nov 13, 2022 – 09:37 AM EST

PDB ID : 6UE9  
EMDB ID : EMD-20751  
Title : Structure of tetrameric sIgA complex (Class 2)  
Authors : Kumar, N.; Arthur, C.P.; Ciferri, C.; Matsumoto, M.L.  
Deposited on : 2019-09-20  
Resolution : 2.90 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:

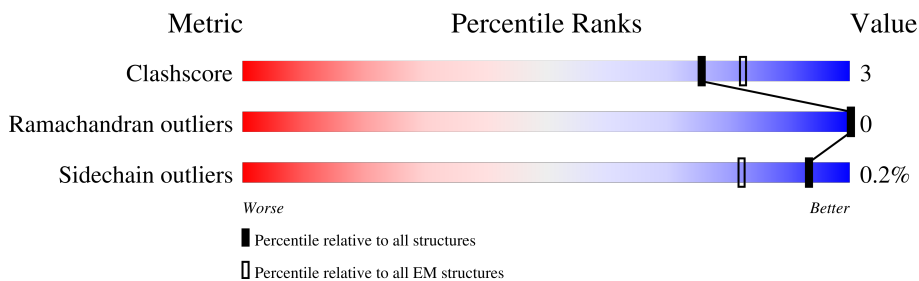
EMDB validation analysis : 0.0.1.dev43  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
MolProbity : 4.02b-467  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
MapQ : 1.9.9  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.31.2

# 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 2.90 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.



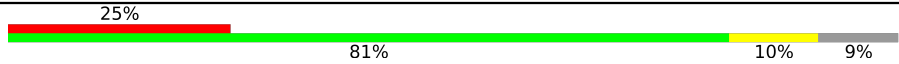
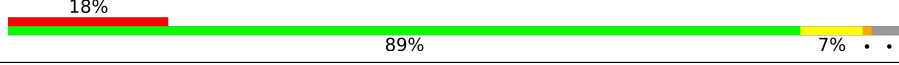

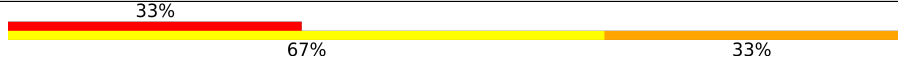
Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	158937	4297
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 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	245	
1	B	245	
1	E	245	
1	F	245	
1	G	245	
1	H	245	
1	K	245	
1	L	245	

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Mol	Chain	Length	Quality of chain
2	C	591	
3	D	137	
4	I	2	
5	J	3	

## 2 Entry composition i

There are 6 unique types of molecules in this entry. The entry contains 18227 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 Immunoglobulin heavy constant alpha 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	221	Total 1616	C 1021	N 283	O 304	S 8	0	0
1	B	231	Total 1686	C 1063	N 295	O 319	S 9	0	0
1	F	231	Total 1656	C 1044	N 289	O 313	S 10	0	0
1	G	231	Total 1666	C 1051	N 292	O 314	S 9	0	0
1	E	227	Total 1570	C 994	N 269	O 298	S 9	0	0
1	H	224	Total 1556	C 988	N 270	O 290	S 8	0	0
1	K	221	Total 1581	C 1000	N 275	O 298	S 8	0	0
1	L	220	Total 1543	C 980	N 267	O 288	S 8	0	0

There are 120 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	228	ASP	-	expression tag	UNP P01877
A	229	TYR	-	expression tag	UNP P01877
A	230	LYS	-	expression tag	UNP P01877
A	231	ASP	-	expression tag	UNP P01877
A	232	ASP	-	expression tag	UNP P01877
A	233	ASP	-	expression tag	UNP P01877
A	234	ASP	-	expression tag	UNP P01877
A	235	LYS	-	expression tag	UNP P01877
A	236	LEU	-	expression tag	UNP P01877
A	237	VAL	-	expression tag	UNP P01877
A	238	PRO	-	expression tag	UNP P01877
A	239	ARG	-	expression tag	UNP P01877
A	240	GLY	-	expression tag	UNP P01877
A	241	SER	-	expression tag	UNP P01877

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Chain	Residue	Modelled	Actual	Comment	Reference
A	451	LEU	MET	conflict	UNP P01877
B	228	ASP	-	expression tag	UNP P01877
B	229	TYR	-	expression tag	UNP P01877
B	230	LYS	-	expression tag	UNP P01877
B	231	ASP	-	expression tag	UNP P01877
B	232	ASP	-	expression tag	UNP P01877
B	233	ASP	-	expression tag	UNP P01877
B	234	ASP	-	expression tag	UNP P01877
B	235	LYS	-	expression tag	UNP P01877
B	236	LEU	-	expression tag	UNP P01877
B	237	VAL	-	expression tag	UNP P01877
B	238	PRO	-	expression tag	UNP P01877
B	239	ARG	-	expression tag	UNP P01877
B	240	GLY	-	expression tag	UNP P01877
B	241	SER	-	expression tag	UNP P01877
B	451	LEU	MET	conflict	UNP P01877
F	228	ASP	-	expression tag	UNP P01877
F	229	TYR	-	expression tag	UNP P01877
F	230	LYS	-	expression tag	UNP P01877
F	231	ASP	-	expression tag	UNP P01877
F	232	ASP	-	expression tag	UNP P01877
F	233	ASP	-	expression tag	UNP P01877
F	234	ASP	-	expression tag	UNP P01877
F	235	LYS	-	expression tag	UNP P01877
F	236	LEU	-	expression tag	UNP P01877
F	237	VAL	-	expression tag	UNP P01877
F	238	PRO	-	expression tag	UNP P01877
F	239	ARG	-	expression tag	UNP P01877
F	240	GLY	-	expression tag	UNP P01877
F	241	SER	-	expression tag	UNP P01877
F	451	LEU	MET	conflict	UNP P01877
G	228	ASP	-	expression tag	UNP P01877
G	229	TYR	-	expression tag	UNP P01877
G	230	LYS	-	expression tag	UNP P01877
G	231	ASP	-	expression tag	UNP P01877
G	232	ASP	-	expression tag	UNP P01877
G	233	ASP	-	expression tag	UNP P01877
G	234	ASP	-	expression tag	UNP P01877
G	235	LYS	-	expression tag	UNP P01877
G	236	LEU	-	expression tag	UNP P01877
G	237	VAL	-	expression tag	UNP P01877
G	238	PRO	-	expression tag	UNP P01877

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Chain	Residue	Modelled	Actual	Comment	Reference
G	239	ARG	-	expression tag	UNP P01877
G	240	GLY	-	expression tag	UNP P01877
G	241	SER	-	expression tag	UNP P01877
G	451	LEU	MET	conflict	UNP P01877
E	228	ASP	-	expression tag	UNP P01877
E	229	TYR	-	expression tag	UNP P01877
E	230	LYS	-	expression tag	UNP P01877
E	231	ASP	-	expression tag	UNP P01877
E	232	ASP	-	expression tag	UNP P01877
E	233	ASP	-	expression tag	UNP P01877
E	234	ASP	-	expression tag	UNP P01877
E	235	LYS	-	expression tag	UNP P01877
E	236	LEU	-	expression tag	UNP P01877
E	237	VAL	-	expression tag	UNP P01877
E	238	PRO	-	expression tag	UNP P01877
E	239	ARG	-	expression tag	UNP P01877
E	240	GLY	-	expression tag	UNP P01877
E	241	SER	-	expression tag	UNP P01877
E	451	LEU	MET	conflict	UNP P01877
H	228	ASP	-	expression tag	UNP P01877
H	229	TYR	-	expression tag	UNP P01877
H	230	LYS	-	expression tag	UNP P01877
H	231	ASP	-	expression tag	UNP P01877
H	232	ASP	-	expression tag	UNP P01877
H	233	ASP	-	expression tag	UNP P01877
H	234	ASP	-	expression tag	UNP P01877
H	235	LYS	-	expression tag	UNP P01877
H	236	LEU	-	expression tag	UNP P01877
H	237	VAL	-	expression tag	UNP P01877
H	238	PRO	-	expression tag	UNP P01877
H	239	ARG	-	expression tag	UNP P01877
H	240	GLY	-	expression tag	UNP P01877
H	241	SER	-	expression tag	UNP P01877
H	451	LEU	MET	conflict	UNP P01877
K	228	ASP	-	expression tag	UNP P01877
K	229	TYR	-	expression tag	UNP P01877
K	230	LYS	-	expression tag	UNP P01877
K	231	ASP	-	expression tag	UNP P01877
K	232	ASP	-	expression tag	UNP P01877
K	233	ASP	-	expression tag	UNP P01877
K	234	ASP	-	expression tag	UNP P01877
K	235	LYS	-	expression tag	UNP P01877

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Chain	Residue	Modelled	Actual	Comment	Reference
K	236	LEU	-	expression tag	UNP P01877
K	237	VAL	-	expression tag	UNP P01877
K	238	PRO	-	expression tag	UNP P01877
K	239	ARG	-	expression tag	UNP P01877
K	240	GLY	-	expression tag	UNP P01877
K	241	SER	-	expression tag	UNP P01877
K	451	LEU	MET	conflict	UNP P01877
L	228	ASP	-	expression tag	UNP P01877
L	229	TYR	-	expression tag	UNP P01877
L	230	LYS	-	expression tag	UNP P01877
L	231	ASP	-	expression tag	UNP P01877
L	232	ASP	-	expression tag	UNP P01877
L	233	ASP	-	expression tag	UNP P01877
L	234	ASP	-	expression tag	UNP P01877
L	235	LYS	-	expression tag	UNP P01877
L	236	LEU	-	expression tag	UNP P01877
L	237	VAL	-	expression tag	UNP P01877
L	238	PRO	-	expression tag	UNP P01877
L	239	ARG	-	expression tag	UNP P01877
L	240	GLY	-	expression tag	UNP P01877
L	241	SER	-	expression tag	UNP P01877
L	451	LEU	MET	conflict	UNP P01877

- Molecule 2 is a protein called Polymeric immunoglobulin receptor.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	C	537	4150	2614	719	797	20	0	0

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	586	HIS	-	expression tag	UNP P01833
C	587	HIS	-	expression tag	UNP P01833
C	588	HIS	-	expression tag	UNP P01833
C	589	HIS	-	expression tag	UNP P01833
C	590	HIS	-	expression tag	UNP P01833
C	591	HIS	-	expression tag	UNP P01833

- Molecule 3 is a protein called Immunoglobulin J chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	D	132	1038	639	181	209	9	0	0

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



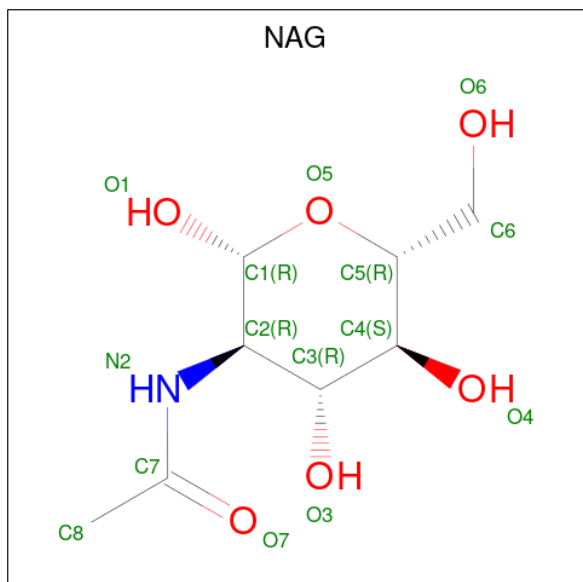
Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
4	I	2	28	16	2	10	0	0

- Molecule 5 is an oligosaccharide called beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
5	J	3	39	22	2	15	0	0

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



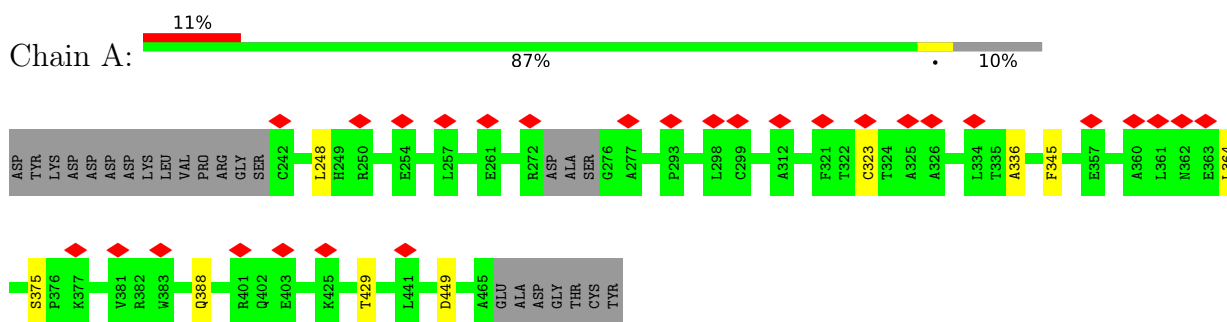


<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>				<b>AltConf</b>
6	A	1	Total	C	N	O	0
			14	8	1	5	
6	B	1	Total	C	N	O	0
			14	8	1	5	
6	C	1	Total	C	N	O	0
			42	24	3	15	
6	C	1	Total	C	N	O	0
			42	24	3	15	
6	C	1	Total	C	N	O	0
			42	24	3	15	
6	F	1	Total	C	N	O	0
			14	8	1	5	
6	G	1	Total	C	N	O	0
			14	8	1	5	

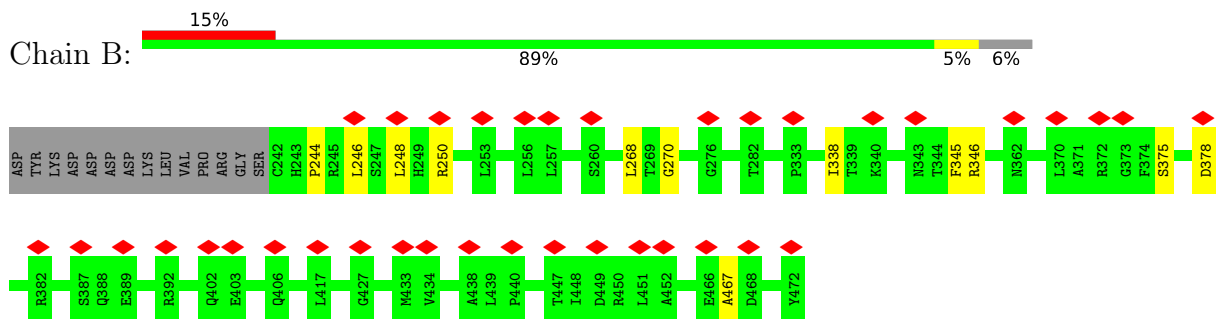
### 3 Residue-property plots [i](#)

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

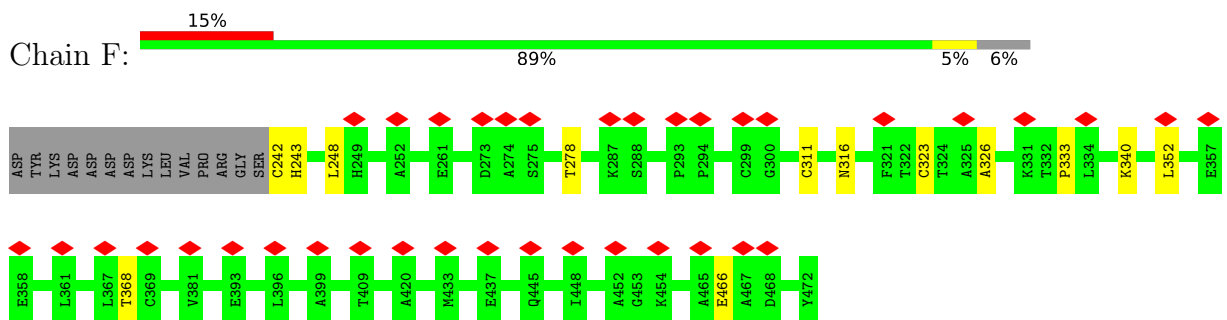
- Molecule 1: Immunoglobulin heavy constant alpha 2



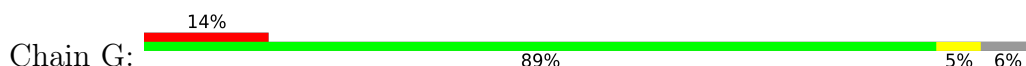
- Molecule 1: Immunoglobulin heavy constant alpha 2

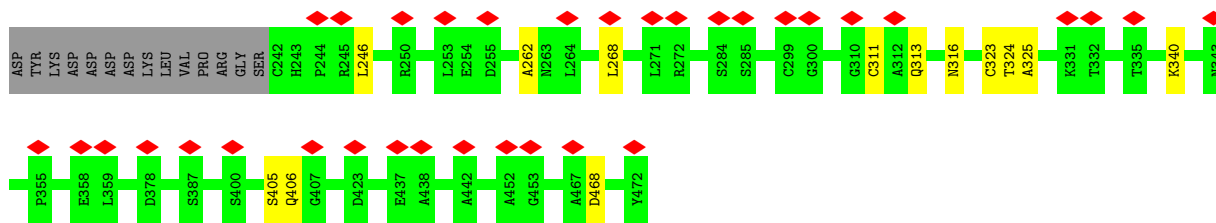


- Molecule 1: Immunoglobulin heavy constant alpha 2



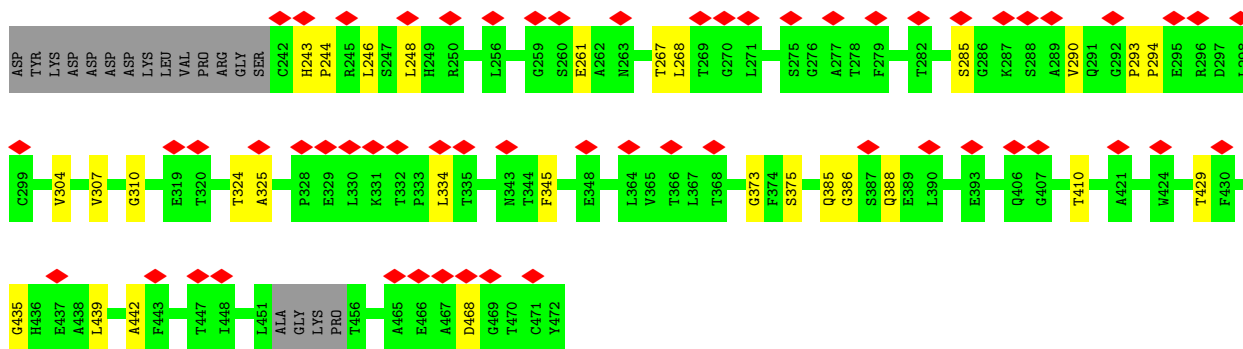
- Molecule 1: Immunoglobulin heavy constant alpha 2





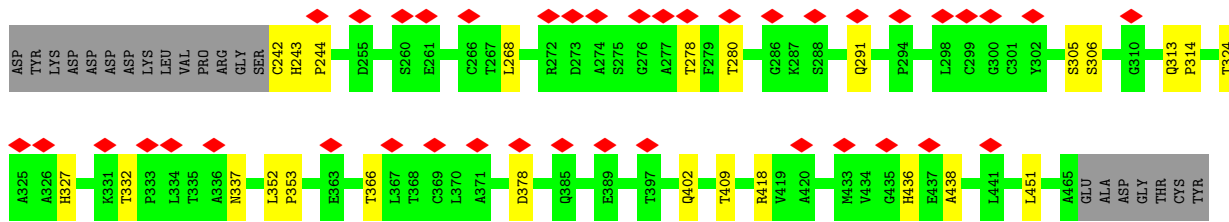
- Molecule 1: Immunoglobulin heavy constant alpha 2

Chain E: 24% 81% 12% 7%



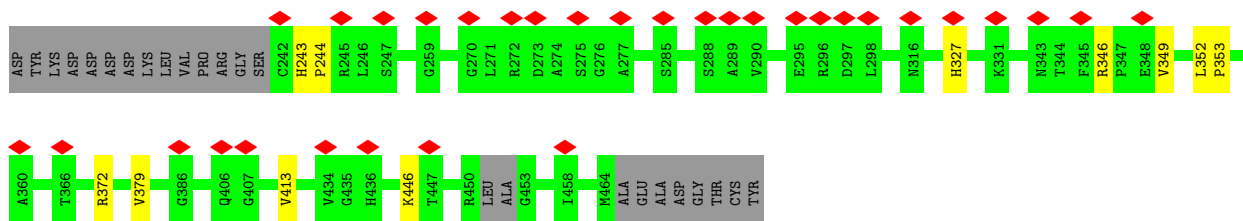
- Molecule 1: Immunoglobulin heavy constant alpha 2

Chain H: 16% 81% 10% 9%



- Molecule 1: Immunoglobulin heavy constant alpha 2

Chain K: 13% 86% 10%



- Molecule 1: Immunoglobulin heavy constant alpha 2

Chain L: 30% 79% 11% 10%



Chain I:  50% 50%

MAG1  
MAG2

- Molecule 5: beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain J:  33% 67% 33%

MAG1  
MAG2  
EMA3

## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	144523	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 ( $e^-/\text{\AA}^2$ )	51.91	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	18.104	Depositor
Minimum map value	-8.026	Depositor
Average map value	-0.013	Depositor
Map value standard deviation	0.420	Depositor
Recommended contour level	2.5	Depositor
Map size (Å)	391.2192, 391.2192, 391.2192	wwPDB
Map dimensions	384, 384, 384	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.0188, 1.0188, 1.0188	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, BMA

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	0.36	0/1655	0.58	1/2268 (0.0%)
1	B	0.35	0/1728	0.60	0/2371
1	E	0.31	0/1610	0.61	1/2226 (0.0%)
1	F	0.34	0/1698	0.56	0/2335
1	G	0.34	0/1709	0.57	0/2349
1	H	0.29	0/1597	0.56	1/2206 (0.0%)
1	K	0.28	0/1621	0.55	0/2228
1	L	0.28	0/1583	0.64	2/2184 (0.1%)
2	C	0.36	0/4240	0.59	2/5763 (0.0%)
3	D	0.45	0/1052	0.63	0/1432
All	All	0.34	0/18493	0.59	7/25362 (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	F	0	1
1	G	0	1
1	K	0	1
1	L	0	1
All	All	0	4

There are no bond length outliers.

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	L	256	LEU	CA-CB-CG	7.44	132.41	115.30
1	L	299	CYS	CA-CB-SG	5.63	124.14	114.00

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Mol	Chain	Res	Type	Atoms	Z	Observed( $^{\circ}$ )	Ideal( $^{\circ}$ )
2	C	306	LEU	CA-CB-CG	5.54	128.03	115.30
1	A	364	LEU	CA-CB-CG	5.46	127.86	115.30
1	H	451	LEU	CA-CB-CG	5.39	127.70	115.30
2	C	157	LEU	CA-CB-CG	5.20	127.27	115.30
1	E	248	LEU	CA-CB-CG	5.01	126.81	115.30

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	F	311	CYS	Peptide
1	G	313	GLN	Peptide
1	K	327	HIS	Peptide
1	L	276	GLY	Peptide

## 5.2 Too-close contacts [i](#)

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	1616	0	1555	5	0
1	B	1686	0	1616	7	0
1	E	1570	0	1413	16	0
1	F	1656	0	1563	7	0
1	G	1666	0	1576	7	0
1	H	1556	0	1430	13	0
1	K	1581	0	1484	6	0
1	L	1543	0	1428	13	0
2	C	4150	0	4035	33	0
3	D	1038	0	1014	8	0
4	I	28	0	25	0	0
5	J	39	0	34	1	0
6	A	14	0	13	0	0
6	B	14	0	13	0	0
6	C	42	0	39	0	0
6	F	14	0	13	0	0
6	G	14	0	13	0	0
All	All	18227	0	17264	110	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 3.

All (110) 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:A:248:LEU:HD11	1:A:323:CYS:HB3	1.80	0.63
1:A:388:GLN:OE1	1:K:346:ARG:NH2	2.36	0.59
1:H:305:SER:OG	1:H:306:SER:N	2.36	0.59
1:E:290:VAL:HG13	1:E:307:VAL:HG13	1.85	0.59
1:B:346:ARG:NH1	3:D:132:ASP:OD1	2.37	0.58
2:C:394:ARG:NH2	2:C:417:ASP:OD2	2.37	0.57
2:C:423:CYS:SG	2:C:433:THR:OG1	2.62	0.57
2:C:158:VAL:HB	2:C:166:ASN:HB2	1.85	0.56
1:E:386:GLY:HA2	1:E:429:THR:HG23	1.88	0.56
3:D:45:ASN:ND2	1:F:466:GLU:OE2	2.35	0.56
3:D:54:THR:OG1	3:D:55:SER:N	2.39	0.56
2:C:59:LYS:O	2:C:63:ARG:NH1	2.39	0.56
1:E:324:THR:OG1	1:E:325:ALA:N	2.40	0.55
3:D:52:ASP:OD1	3:D:52:ASP:N	2.32	0.55
1:L:385:GLN:NE2	1:L:423:ASP:OD2	2.40	0.55
1:E:261:GLU:HA	1:E:310:GLY:HA2	1.90	0.54
1:L:395:TYR:HB3	1:L:417:LEU:HD13	1.90	0.54
2:C:230:ASP:N	2:C:230:ASP:OD1	2.40	0.54
1:K:349:VAL:O	1:K:446:LYS:NZ	2.40	0.54
1:E:246:LEU:HD13	1:E:334:LEU:HD11	1.89	0.53
1:F:278:THR:HB	1:F:326:ALA:H	1.74	0.53
5:J:1:NAG:H61	5:J:2:NAG:H82	1.91	0.53
1:K:379:VAL:HG21	1:K:413:VAL:HG21	1.90	0.53
2:C:158:VAL:HG23	2:C:159:ILE:HD12	1.91	0.52
1:L:281:TRP:HB3	1:L:283:PRO:HD2	1.91	0.52
2:C:479:LYS:NZ	2:C:519:ALA:O	2.38	0.52
2:C:271:ARG:NH2	2:C:371:GLY:O	2.42	0.52
1:H:327:HIS:NE2	1:H:332:THR:O	2.43	0.52
1:H:402:GLN:NE2	1:H:409:THR:OG1	2.42	0.52
1:E:246:LEU:HB2	1:E:268:LEU:HD12	1.92	0.51
2:C:256:SER:OG	2:C:257:SER:N	2.44	0.50
1:L:323:CYS:HB2	1:L:336:ALA:HB3	1.92	0.50
1:H:242:CYS:SG	1:H:243:HIS:N	2.79	0.50
1:E:435:GLY:HA2	1:E:442:ALA:HB1	1.94	0.50
1:G:323:CYS:SG	1:G:324:THR:N	2.85	0.50
2:C:99:ARG:NH2	1:G:468:ASP:OD2	2.44	0.50
1:F:248:LEU:HD11	1:F:323:CYS:HB3	1.94	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:C:83:SER:OG	2:C:84:GLN:N	2.45	0.50
1:E:439:LEU:HD23	1:E:442:ALA:HA	1.94	0.50
3:D:14:LYS:NZ	3:D:100:THR:O	2.44	0.49
1:B:244:PRO:HA	1:B:270:GLY:HA3	1.94	0.49
1:G:316:ASN:HA	1:G:340:LYS:HD2	1.94	0.49
1:H:366:THR:OG1	1:H:418:ARG:NH1	2.45	0.49
1:G:405:SER:OG	1:G:406:GLN:N	2.44	0.49
2:C:122:TYR:OH	2:C:133:ASN:OD1	2.29	0.49
1:L:381:VAL:O	1:L:382:ARG:NH1	2.45	0.49
1:L:366:THR:OG1	1:L:418:ARG:NH1	2.46	0.48
1:G:246:LEU:HD13	1:G:325:ALA:HB2	1.96	0.48
2:C:143:LYS:HG3	2:C:206:ASP:H	1.77	0.48
2:C:452:VAL:HB	2:C:542:VAL:HG12	1.96	0.48
2:C:51:SER:OG	2:C:52:SER:N	2.46	0.48
1:B:345:PHE:HD2	1:B:375:SER:HB2	1.79	0.48
1:F:316:ASN:OD1	1:F:340:LYS:NZ	2.47	0.47
1:B:246:LEU:HD12	1:B:268:LEU:HD13	1.95	0.47
2:C:143:LYS:HB2	2:C:205:GLY:HA2	1.95	0.47
1:H:244:PRO:HB3	1:H:268:LEU:HD11	1.97	0.47
2:C:236:THR:HG22	2:C:293:VAL:HG22	1.96	0.47
1:L:384:LEU:HA	1:L:389:GLU:HA	1.96	0.47
1:A:429:THR:HG22	1:A:449:ASP:HB3	1.96	0.47
1:E:373:GLY:HA2	1:E:410:THR:HB	1.97	0.47
2:C:357:ARG:O	2:C:360:SER:OG	2.33	0.46
1:B:250:ARG:NH1	1:B:378:ASP:OD2	2.48	0.46
2:C:160:ASP:HB2	2:C:164:TYR:HB2	1.98	0.46
1:G:246:LEU:HD12	1:G:268:LEU:HB3	1.98	0.46
1:H:313:GLN:HG2	1:H:314:PRO:HD3	1.98	0.46
1:L:397:THR:HG23	1:L:415:SER:HB2	1.98	0.45
1:H:378:ASP:OD1	1:H:378:ASP:N	2.50	0.45
2:C:351:VAL:HG21	2:C:435:VAL:HG11	1.99	0.45
1:H:436:HIS:CD2	1:H:438:ALA:H	2.34	0.45
1:E:345:PHE:HD2	1:E:375:SER:HB2	1.81	0.45
2:C:367:CYS:HB2	2:C:422:TRP:HB2	1.99	0.45
2:C:211:ASN:OD1	2:C:211:ASN:N	2.50	0.44
2:C:250:LYS:O	2:C:267:THR:OG1	2.34	0.44
1:F:352:LEU:HD12	1:F:368:THR:HB	1.99	0.44
1:E:468:ASP:OD1	1:E:468:ASP:N	2.37	0.44
1:A:248:LEU:HD13	1:A:336:ALA:HB3	1.99	0.44
2:C:202:CYS:SG	2:C:203:GLN:N	2.91	0.44
2:C:25:PRO:HA	2:C:26:PRO:HD3	1.75	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:K:372:ARG:HD2	1:L:418:ARG:HD2	2.00	0.43
1:L:373:GLY:HA2	1:L:410:THR:HB	2.01	0.43
1:F:242:CYS:HB3	1:F:243:HIS:H	1.63	0.43
1:H:280:THR:O	1:H:324:THR:OG1	2.27	0.43
1:B:248:LEU:HD23	1:B:338:ILE:HB	2.00	0.43
1:B:467:ALA:O	3:D:36:ARG:NH1	2.52	0.43
1:H:337:ASN:OD1	1:H:337:ASN:N	2.52	0.42
2:C:230:ASP:HA	2:C:329:ASN:H	1.85	0.42
2:C:453:THR:OG1	2:C:454:ALA:N	2.52	0.42
1:F:326:ALA:HA	1:F:333:PRO:HB3	2.01	0.42
2:C:34:ARG:NH1	2:C:95:GLY:O	2.52	0.41
1:E:285:SER:O	1:E:285:SER:OG	2.32	0.41
2:C:478:CYS:HB3	2:C:485:CYS:HB2	1.90	0.41
1:H:278:THR:HA	1:H:291:GLN:HE22	1.85	0.41
1:A:345:PHE:HD2	1:A:375:SER:HB2	1.86	0.41
1:E:293:PRO:HA	1:E:294:PRO:HD3	1.83	0.41
1:L:373:GLY:N	1:L:411:TYR:O	2.46	0.41
1:G:262:ALA:HB3	1:G:311:CYS:HA	2.02	0.41
2:C:515:LEU:HD12	2:C:515:LEU:HA	1.95	0.41
1:E:243:HIS:HA	1:E:244:PRO:HD3	1.96	0.41
1:H:352:LEU:HA	1:H:353:PRO:HD3	1.95	0.41
1:K:243:HIS:CD2	1:K:244:PRO:HD2	2.56	0.41
2:C:57:SER:OG	2:C:58:SER:N	2.54	0.41
2:C:505:ASN:N	2:C:505:ASN:OD1	2.54	0.41
2:C:545:GLU:OE1	2:C:547:ARG:N	2.53	0.40
3:D:73:ASP:N	3:D:73:ASP:OD1	2.52	0.40
3:D:32:ASP:OD1	3:D:32:ASP:N	2.54	0.40
1:E:385:GLN:N	1:E:388:GLN:O	2.53	0.40
1:L:383:TRP:CE2	1:L:432:CYS:HB3	2.57	0.40
1:E:267:THR:OG1	1:E:304:VAL:O	2.39	0.40
1:K:352:LEU:HA	1:K:353:PRO:HD3	1.91	0.40
1:L:361:LEU:HD12	1:L:363:GLU:H	1.87	0.40

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	215/245 (88%)	195 (91%)	20 (9%)	0	100	100
1	B	229/245 (94%)	205 (90%)	24 (10%)	0	100	100
1	E	223/245 (91%)	190 (85%)	33 (15%)	0	100	100
1	F	229/245 (94%)	202 (88%)	27 (12%)	0	100	100
1	G	229/245 (94%)	196 (86%)	33 (14%)	0	100	100
1	H	222/245 (91%)	202 (91%)	20 (9%)	0	100	100
1	K	215/245 (88%)	201 (94%)	14 (6%)	0	100	100
1	L	216/245 (88%)	184 (85%)	32 (15%)	0	100	100
2	C	533/591 (90%)	482 (90%)	51 (10%)	0	100	100
3	D	128/137 (93%)	108 (84%)	20 (16%)	0	100	100
All	All	2439/2688 (91%)	2165 (89%)	274 (11%)	0	100	100

There are no Ramachandran outliers to report.

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

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	170/208 (82%)	170 (100%)	0	100	100
1	B	176/208 (85%)	176 (100%)	0	100	100
1	E	150/208 (72%)	150 (100%)	0	100	100
1	F	170/208 (82%)	170 (100%)	0	100	100
1	G	171/208 (82%)	171 (100%)	0	100	100
1	H	150/208 (72%)	150 (100%)	0	100	100
1	K	162/208 (78%)	162 (100%)	0	100	100
1	L	152/208 (73%)	151 (99%)	1 (1%)	84	95

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	C	455/501 (91%)	454 (100%)	1 (0%)	93	98
3	D	122/129 (95%)	121 (99%)	1 (1%)	81	94
All	All	1878/2294 (82%)	1875 (100%)	3 (0%)	93	98

All (3) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	C	43	ARG
3	D	52	ASP
1	L	372	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (19) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	263	ASN
1	A	291	GLN
1	B	406	GLN
2	C	209	ASN
2	C	310	HIS
2	C	530	GLN
3	D	11	ASN
3	D	30	ASN
1	F	362	ASN
1	F	457	HIS
1	G	263	ASN
1	G	291	GLN
1	E	385	GLN
1	E	459	ASN
1	H	402	GLN
1	H	459	ASN
1	K	243	HIS
1	K	313	GLN
1	K	445	GLN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

## 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](#)

5 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	I	1	4,2	14,14,15	0.56	0	17,19,21	0.70	0
4	NAG	I	2	4	14,14,15	0.28	0	17,19,21	1.14	2 (11%)
5	NAG	J	1	5,3	14,14,15	0.54	0	17,19,21	0.77	0
5	NAG	J	2	5	14,14,15	0.58	0	17,19,21	2.31	3 (17%)
5	BMA	J	3	5	11,11,12	0.87	0	15,15,17	1.00	1 (6%)

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	I	1	4,2	-	4/6/23/26	0/1/1/1
4	NAG	I	2	4	-	3/6/23/26	0/1/1/1
5	NAG	J	1	5,3	-	0/6/23/26	0/1/1/1
5	NAG	J	2	5	-	4/6/23/26	0/1/1/1
5	BMA	J	3	5	-	0/2/19/22	0/1/1/1

There are no bond length outliers.

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	J	2	NAG	C2-N2-C7	7.93	134.20	122.90
5	J	2	NAG	C1-C2-N2	4.00	117.33	110.49
4	I	2	NAG	C2-N2-C7	3.05	127.24	122.90

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	I	2	NAG	C1-O5-C5	2.66	115.79	112.19
5	J	3	BMA	O2-C2-C3	-2.08	105.96	110.14
5	J	2	NAG	C8-C7-N2	2.08	119.63	116.10

There are no chirality outliers.

All (11) torsion outliers are listed below:

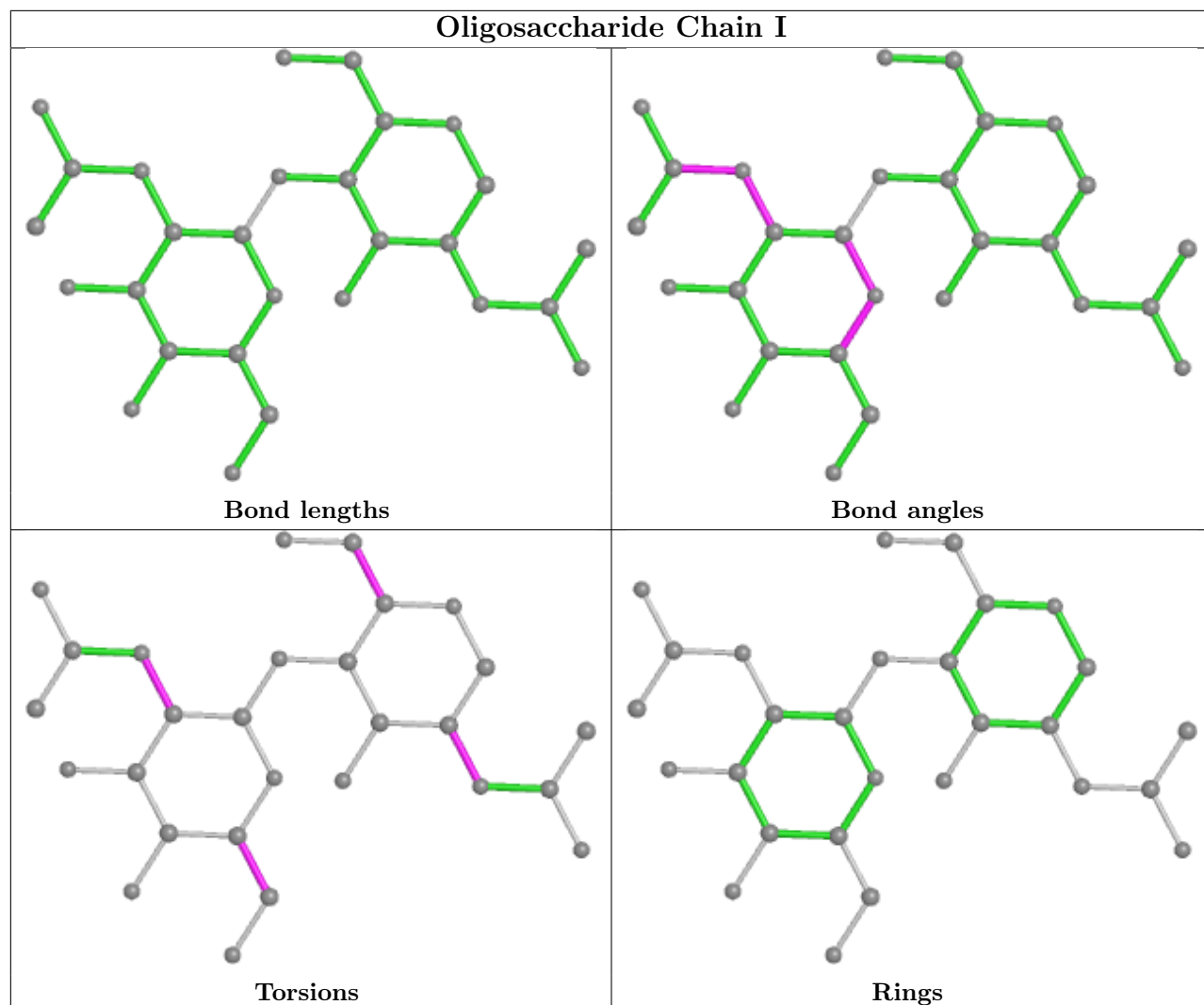
Mol	Chain	Res	Type	Atoms
4	I	2	NAG	C4-C5-C6-O6
4	I	2	NAG	O5-C5-C6-O6
4	I	1	NAG	C4-C5-C6-O6
5	J	2	NAG	C8-C7-N2-C2
5	J	2	NAG	O7-C7-N2-C2
4	I	1	NAG	O5-C5-C6-O6
4	I	1	NAG	C1-C2-N2-C7
4	I	1	NAG	C3-C2-N2-C7
4	I	2	NAG	C3-C2-N2-C7
5	J	2	NAG	C3-C2-N2-C7
5	J	2	NAG	C4-C5-C6-O6

There are no ring outliers.

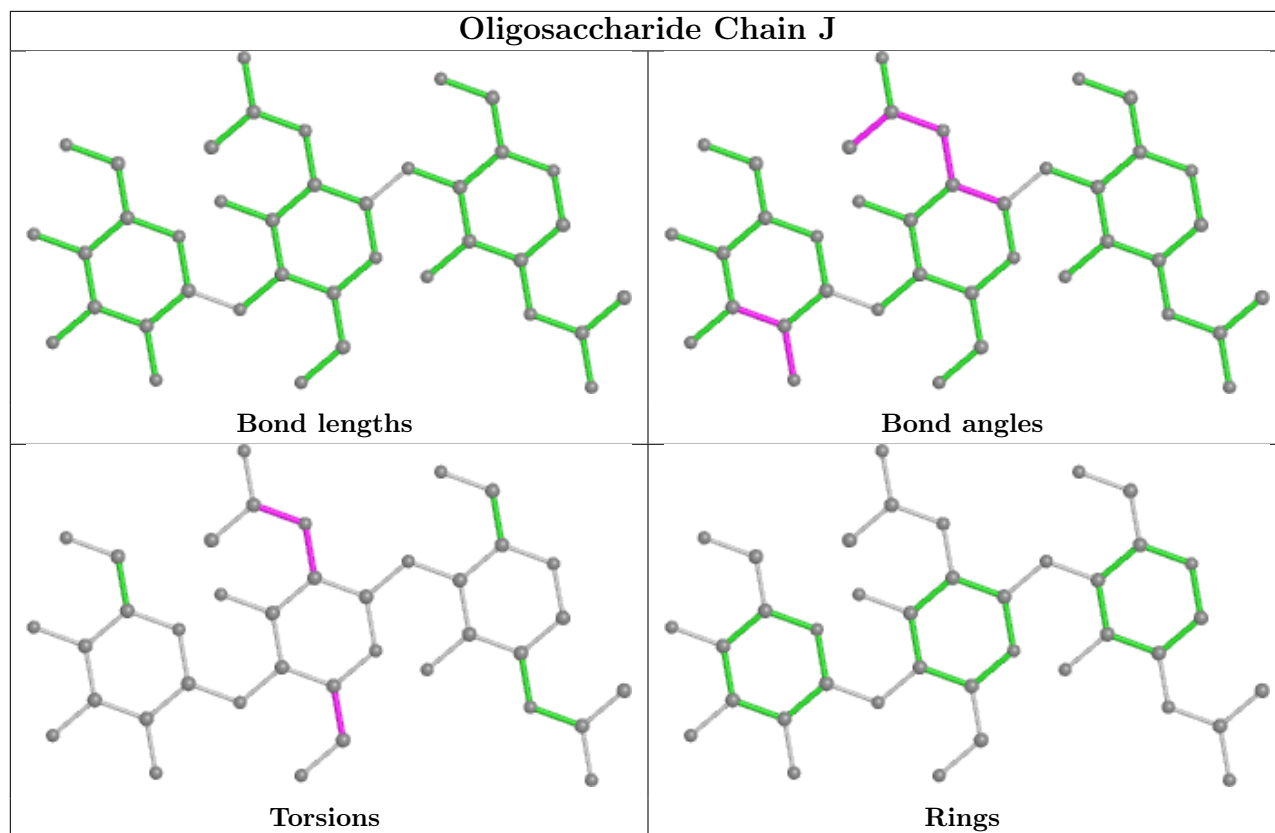
2 monomers are involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	J	1	NAG	1	0
5	J	2	NAG	1	0

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](#)

7 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	$\# Z  > 2$
6	NAG	C	604	2	14,14,15	0.58	0	17,19,21	0.59	0
6	NAG	C	601	2	14,14,15	0.44	0	17,19,21	0.65	1 (5%)
6	NAG	G	501	1	14,14,15	0.58	0	17,19,21	0.43	0
6	NAG	B	501	1	14,14,15	0.45	0	17,19,21	0.49	0
6	NAG	C	605	2	14,14,15	0.62	1 (7%)	17,19,21	0.46	0
6	NAG	F	501	1	14,14,15	0.44	0	17,19,21	0.42	0
6	NAG	A	501	1	14,14,15	0.93	1 (7%)	17,19,21	2.20	3 (17%)

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. '2' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
6	NAG	C	604	2	-	4/6/23/26	0/1/1/1
6	NAG	C	601	2	-	0/6/23/26	0/1/1/1
6	NAG	G	501	1	-	0/6/23/26	0/1/1/1
6	NAG	B	501	1	-	2/6/23/26	0/1/1/1
6	NAG	C	605	2	-	2/6/23/26	0/1/1/1
6	NAG	F	501	1	-	2/6/23/26	0/1/1/1
6	NAG	A	501	1	-	5/6/23/26	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	A	501	NAG	C1-C2	2.94	1.56	1.52
6	C	605	NAG	O5-C1	2.12	1.47	1.43

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	A	501	NAG	C2-N2-C7	7.78	133.97	122.90
6	A	501	NAG	C1-C2-N2	3.47	116.41	110.49
6	C	601	NAG	C1-O5-C5	2.25	115.25	112.19
6	A	501	NAG	C8-C7-N2	2.16	119.75	116.10

There are no chirality outliers.

All (15) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	C	604	NAG	O5-C5-C6-O6
6	C	605	NAG	C4-C5-C6-O6
6	F	501	NAG	O5-C5-C6-O6
6	C	604	NAG	C4-C5-C6-O6
6	C	605	NAG	O5-C5-C6-O6
6	F	501	NAG	C4-C5-C6-O6
6	A	501	NAG	C8-C7-N2-C2
6	A	501	NAG	O7-C7-N2-C2
6	C	604	NAG	C8-C7-N2-C2
6	C	604	NAG	O7-C7-N2-C2
6	A	501	NAG	O5-C5-C6-O6

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Mol	Chain	Res	Type	Atoms
6	A	501	NAG	C4-C5-C6-O6
6	B	501	NAG	C4-C5-C6-O6
6	B	501	NAG	O5-C5-C6-O6
6	A	501	NAG	C3-C2-N2-C7

There are no ring outliers.

No monomer is involved in short contacts.

## 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
1	A	1
1	K	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	A	293:PRO	C	294:PRO	N	3.24
1	K	354:PRO	C	355:PRO	N	3.21

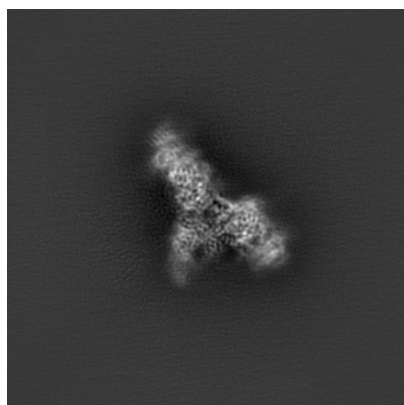
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-20751. These allow visual inspection of the internal detail of the map and identification of artifacts.

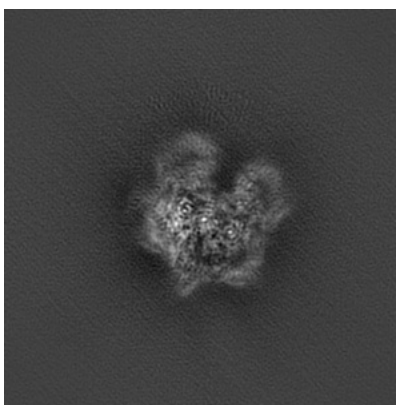
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

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

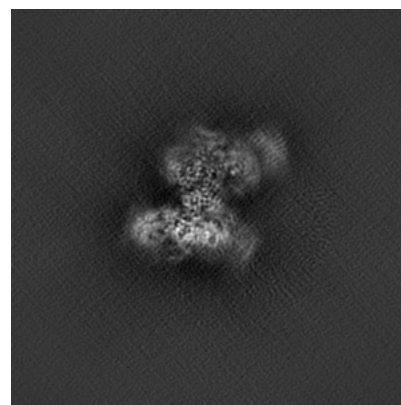
#### 6.1.1 Primary map



X



Y

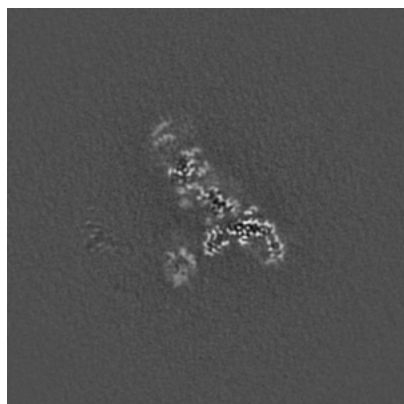


Z

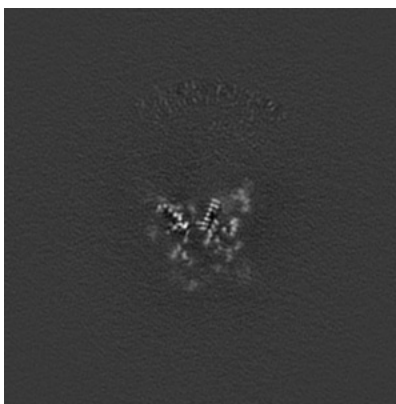
The images above show the map projected in three orthogonal directions.

### 6.2 Central slices [i](#)

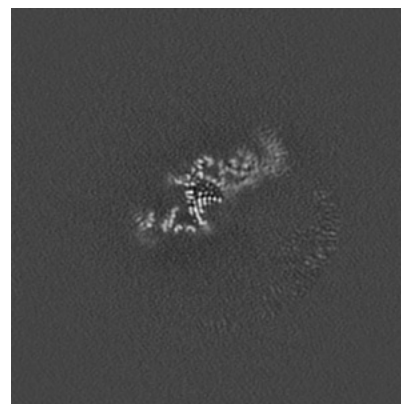
#### 6.2.1 Primary map



X Index: 192



Y Index: 192

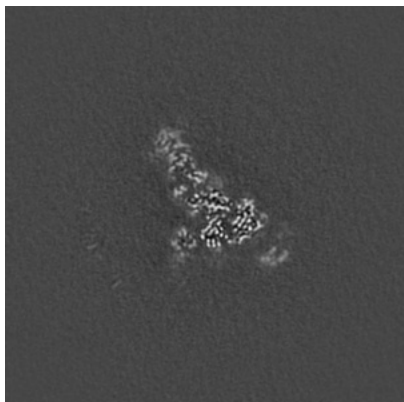


Z Index: 192

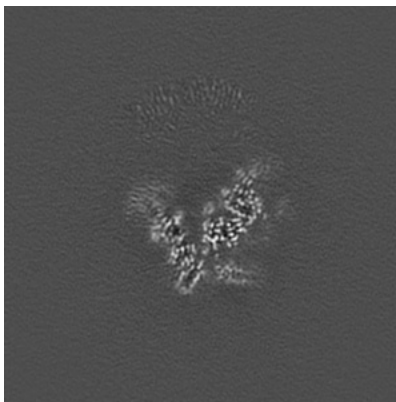
The images above show central slices of the map in three orthogonal directions.

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

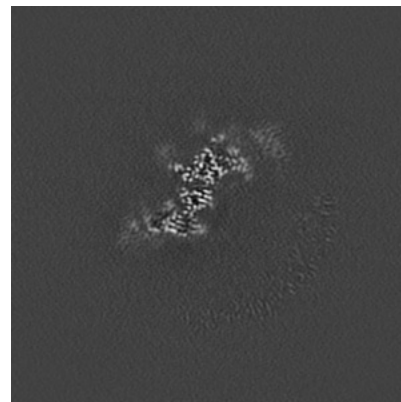
### 6.3.1 Primary map



X Index: 180



Y Index: 172



Z Index: 167

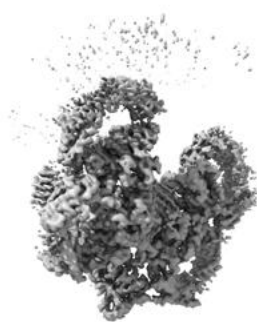
The images above show the largest variance slices of the map in three orthogonal directions.

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

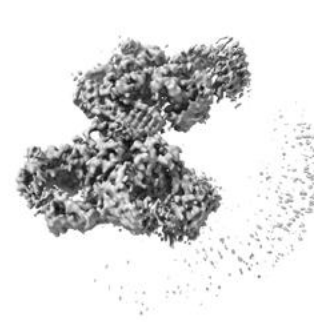
### 6.4.1 Primary map



X



Y



Z

The images above show the 3D surface view of the map at the recommended contour level 2.5. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

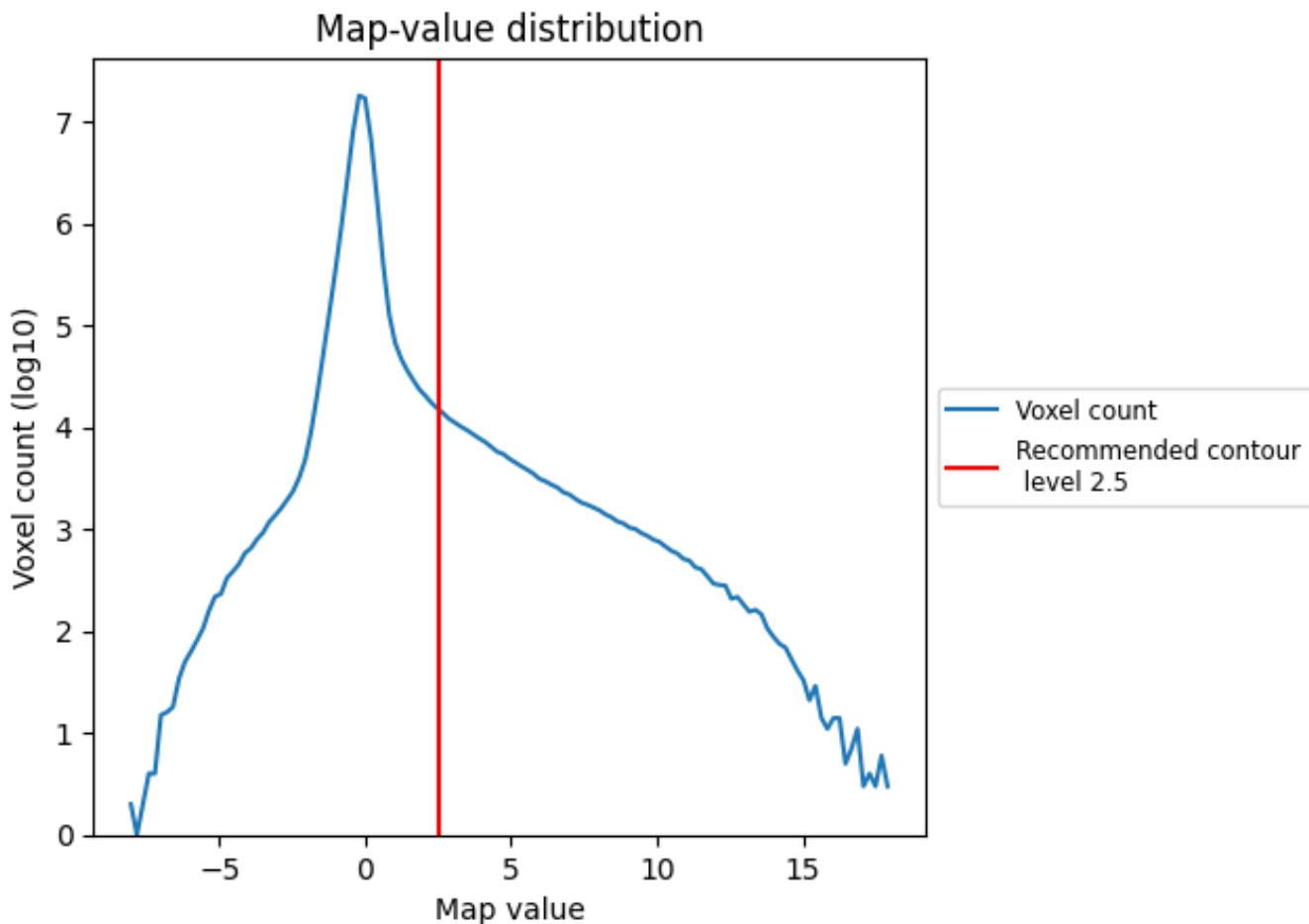
## 6.5 Mask visualisation

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

## 7 Map analysis [i](#)

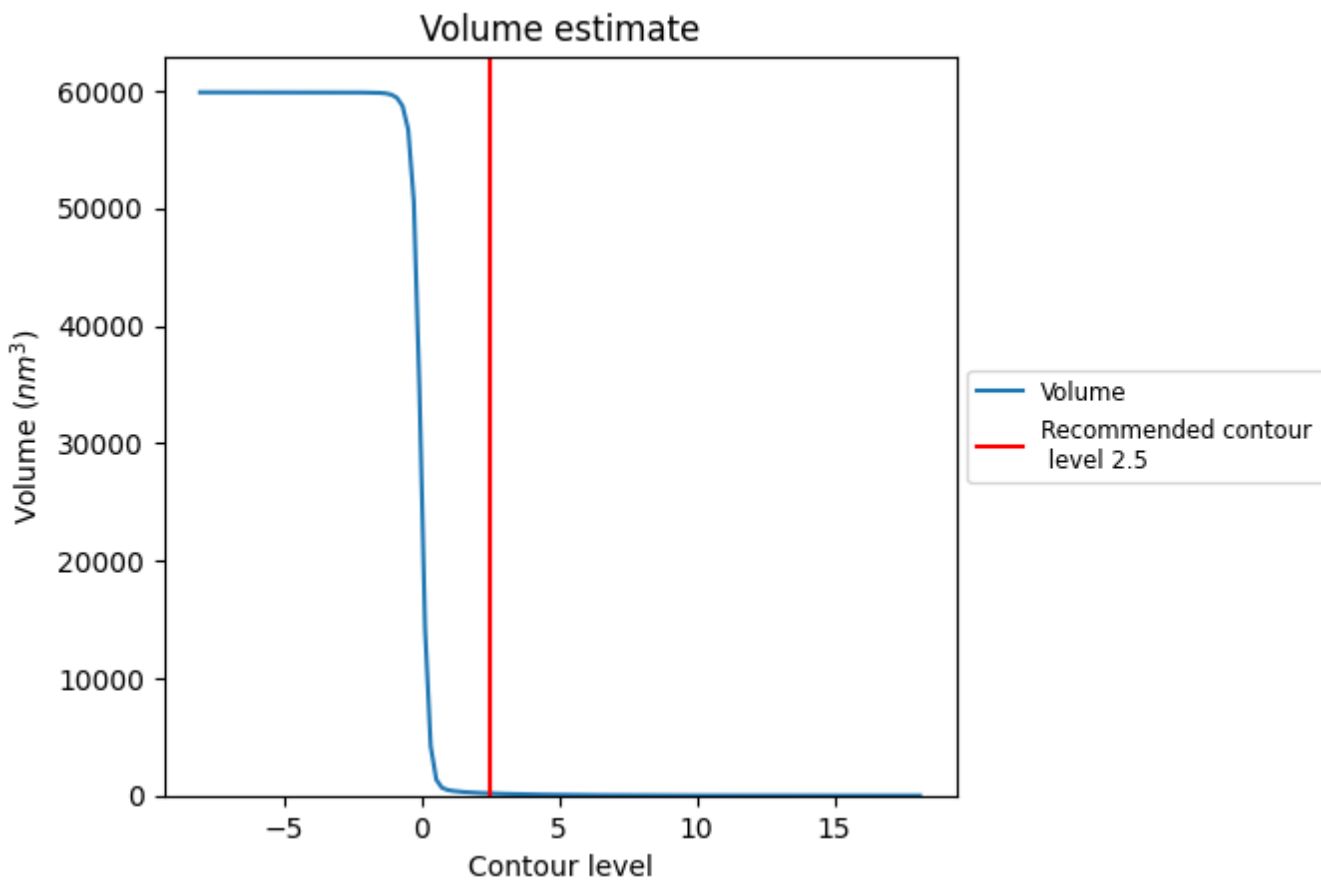
This section contains the results of statistical analysis of the map.

### 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](#)

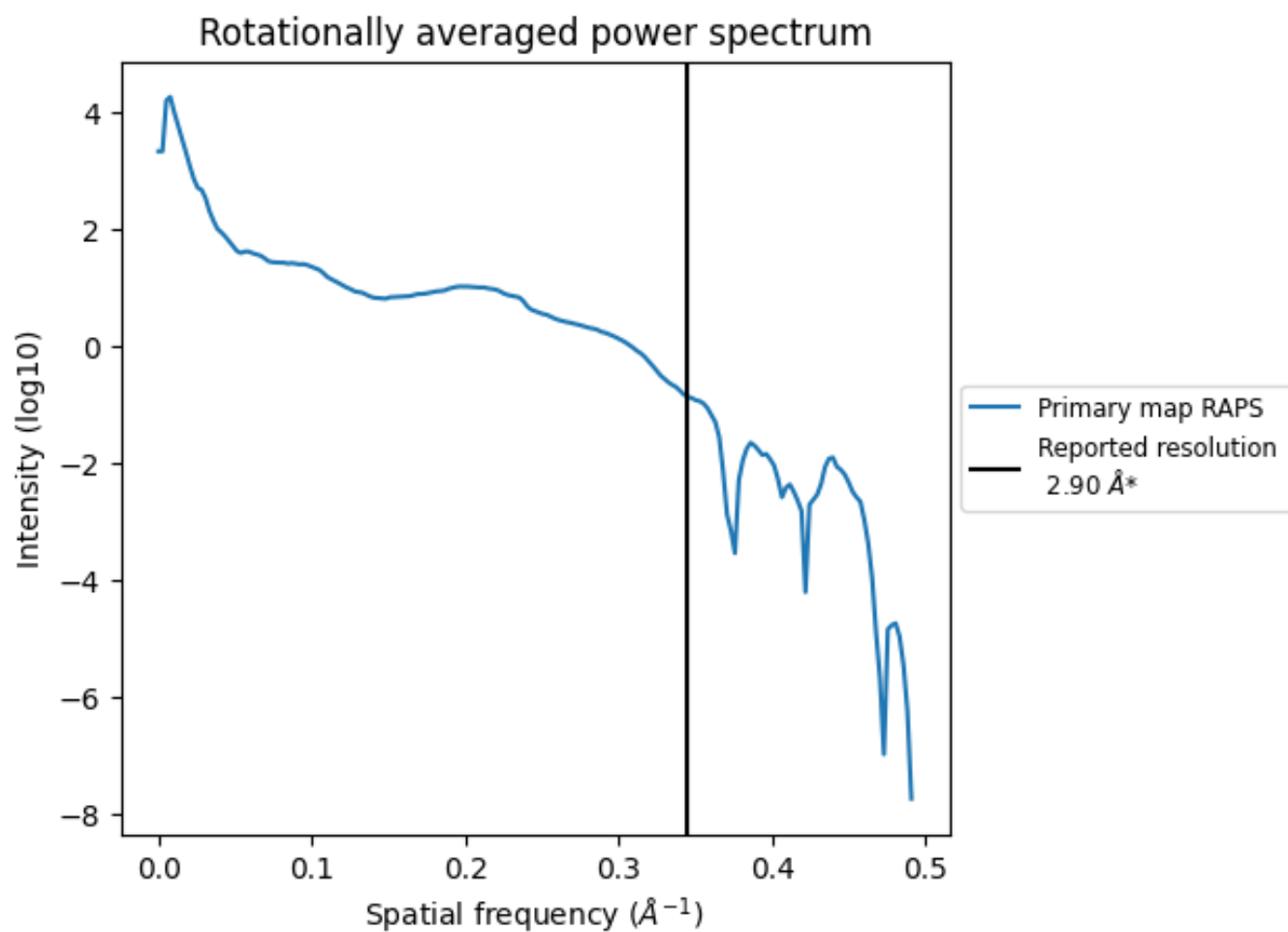


The volume at the recommended contour level is 184 nm<sup>3</sup>; this corresponds to an approximate mass of 166 kDa.

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  $0.345 \text{\AA}^{-1}$

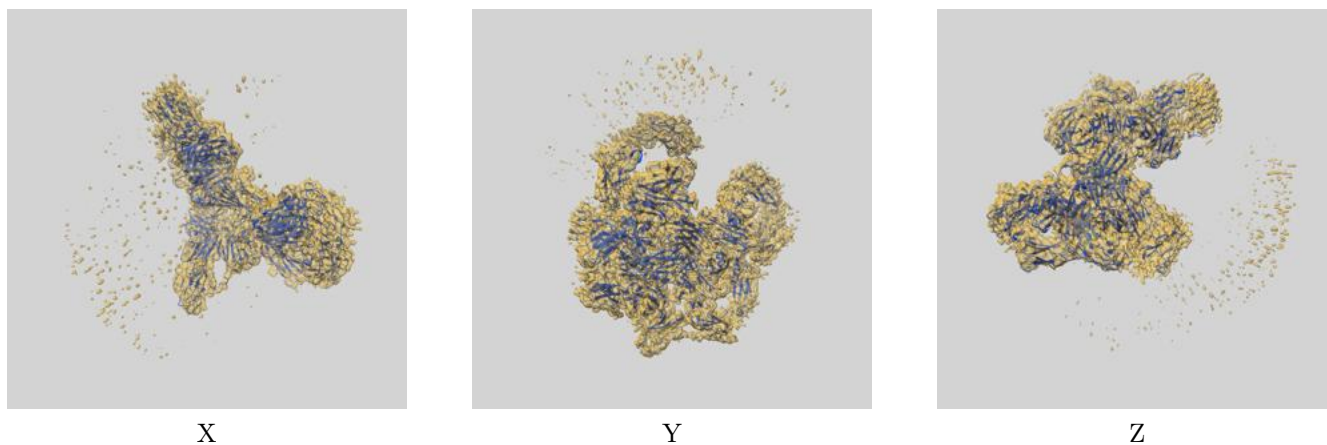
## 8 Fourier-Shell correlation

This section was not generated. No FSC curve or half-maps provided.

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

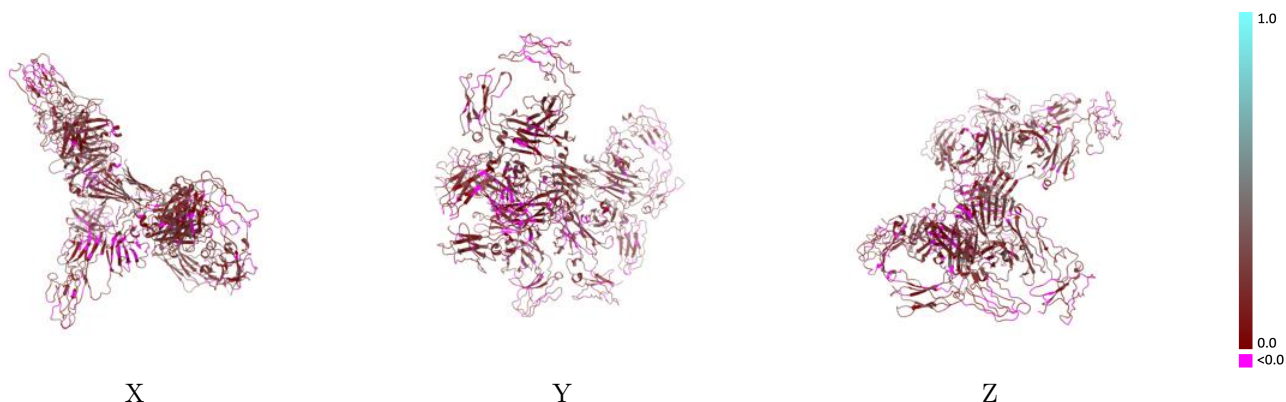
This section contains information regarding the fit between EMDB map EMD-20751 and PDB model 6UE9. Per-residue inclusion information can be found in section 3 on page 10.

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



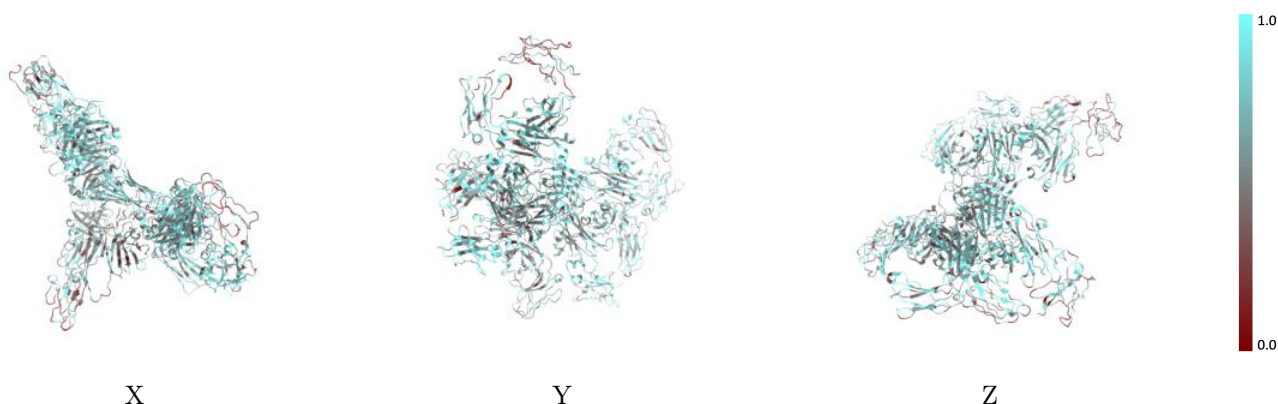
The images above show the 3D surface view of the map at the recommended contour level 2.5 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



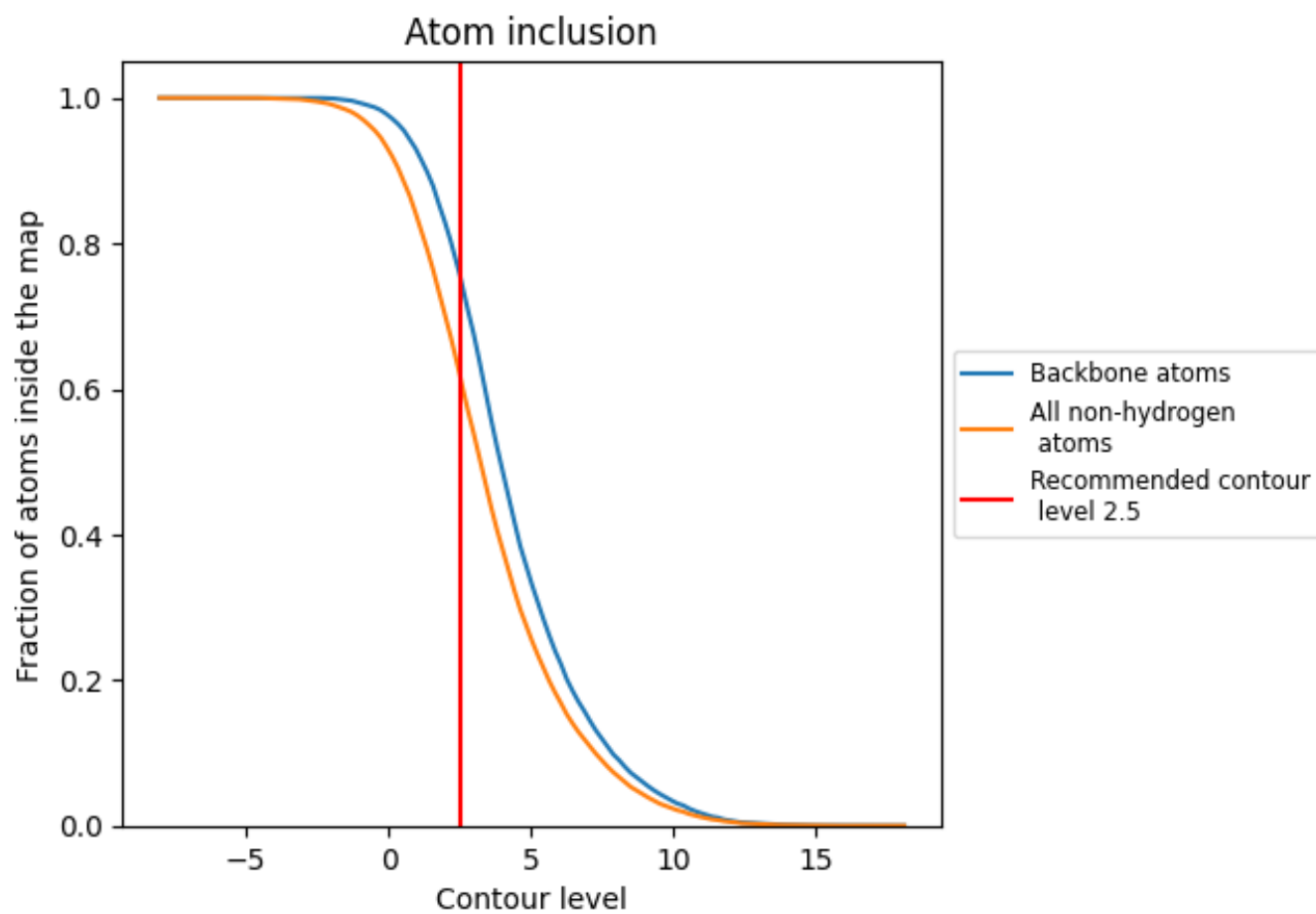
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (2.5).



























## 9.4 Atom inclusion [i](#)



At the recommended contour level, 76% of all backbone atoms, 62% of all non-hydrogen atoms, are inside the map.

## 9.5 Map-model fit summary [i](#)

The table lists the average atom inclusion at the recommended contour level (2.5) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.6208	 0.1580
A	 0.6760	 0.1920
B	 0.6458	 0.1560
C	 0.5521	 0.1170
D	 0.6294	 0.1790
E	 0.6302	 0.1740
F	 0.6495	 0.1390
G	 0.6564	 0.1840
H	 0.6686	 0.1730
I	 0.6786	 0.2230
J	 0.3846	 0.1050
K	 0.6517	 0.1810
L	 0.5604	 0.1590

