



## Full wwPDB EM Validation Report ⓘ

Nov 22, 2022 – 08:39 PM JST

PDB ID : 7EY4  
EMDB ID : EMD-31377  
Title : Local CryoEM of the SARS-CoV-2 S6PV2 in complex with BD-667  
Authors : Liu, P.L.  
Deposited on : 2021-05-29  
Resolution : 3.69 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:

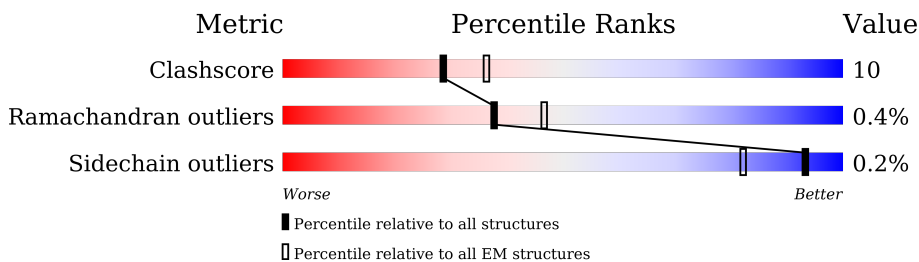
EMDB validation analysis : 0.0.1.dev43  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
MolProbity : 4.02b-467  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
MapQ : 1.9.9  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.31.3

# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:  
*ELECTRON MICROSCOPY*

The reported resolution of this entry is 3.69 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	L	215	37% 13% 50%
2	H	240	42% 11% 46%
3	R	1285	11% 86%
4	N	287	41% 16% 43%
5	A	3	67% 100% 33%

## 2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 4683 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 BD-667 L.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	L	108	835	527	145	160	3	0	0

- Molecule 2 is a protein called BD-667 H.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	H	129	985	617	167	196	5	0	0

- Molecule 3 is a protein called Spike glycoprotein.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	R	183	1465	941	243	274	7	0	0

There are 101 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
R	21	PHE	LEU	conflict	UNP P0DTC2
R	83	ALA	ASP	conflict	UNP P0DTC2
R	218	GLY	ASP	conflict	UNP P0DTC2
R	?	-	LEU	deletion	UNP P0DTC2
R	?	-	LEU	deletion	UNP P0DTC2
R	?	-	ALA	deletion	UNP P0DTC2
R	417	ASN	LYS	conflict	UNP P0DTC2
R	484	LYS	GLU	conflict	UNP P0DTC2
R	501	TYR	ASN	conflict	UNP P0DTC2
R	614	GLY	ASP	conflict	UNP P0DTC2
R	682	GLY	ARG	conflict	UNP P0DTC2
R	683	SER	ARG	conflict	UNP P0DTC2
R	685	SER	ARG	conflict	UNP P0DTC2
R	701	VAL	ALA	conflict	UNP P0DTC2
R	817	PRO	PHE	conflict	UNP P0DTC2

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Chain	Residue	Modelled	Actual	Comment	Reference
R	892	PRO	ALA	conflict	UNP P0DTC2
R	899	PRO	ALA	conflict	UNP P0DTC2
R	942	PRO	ALA	conflict	UNP P0DTC2
R	986	PRO	LYS	conflict	UNP P0DTC2
R	987	PRO	VAL	conflict	UNP P0DTC2
R	1208	GLN	-	expression tag	UNP P0DTC2
R	1209	GLY	-	expression tag	UNP P0DTC2
R	1210	SER	-	expression tag	UNP P0DTC2
R	1211	GLY	-	expression tag	UNP P0DTC2
R	1212	TYR	-	expression tag	UNP P0DTC2
R	1213	ILE	-	expression tag	UNP P0DTC2
R	1214	PRO	-	expression tag	UNP P0DTC2
R	1215	GLU	-	expression tag	UNP P0DTC2
R	1216	ALA	-	expression tag	UNP P0DTC2
R	1217	PRO	-	expression tag	UNP P0DTC2
R	1218	ARG	-	expression tag	UNP P0DTC2
R	1219	ASP	-	expression tag	UNP P0DTC2
R	1220	GLY	-	expression tag	UNP P0DTC2
R	1221	GLN	-	expression tag	UNP P0DTC2
R	1222	ALA	-	expression tag	UNP P0DTC2
R	1223	TYR	-	expression tag	UNP P0DTC2
R	1224	VAL	-	expression tag	UNP P0DTC2
R	1225	ARG	-	expression tag	UNP P0DTC2
R	1226	LYS	-	expression tag	UNP P0DTC2
R	1227	ASP	-	expression tag	UNP P0DTC2
R	1228	GLY	-	expression tag	UNP P0DTC2
R	1229	GLU	-	expression tag	UNP P0DTC2
R	1230	TRP	-	expression tag	UNP P0DTC2
R	1231	VAL	-	expression tag	UNP P0DTC2
R	1232	LEU	-	expression tag	UNP P0DTC2
R	1233	LEU	-	expression tag	UNP P0DTC2
R	1234	SER	-	expression tag	UNP P0DTC2
R	1235	THR	-	expression tag	UNP P0DTC2
R	1236	PHE	-	expression tag	UNP P0DTC2
R	1237	LEU	-	expression tag	UNP P0DTC2
R	1238	GLY	-	expression tag	UNP P0DTC2
R	1239	ARG	-	expression tag	UNP P0DTC2
R	1240	SER	-	expression tag	UNP P0DTC2
R	1241	LEU	-	expression tag	UNP P0DTC2
R	1242	GLU	-	expression tag	UNP P0DTC2
R	1243	VAL	-	expression tag	UNP P0DTC2
R	1244	LEU	-	expression tag	UNP P0DTC2

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Chain	Residue	Modelled	Actual	Comment	Reference
R	1245	PHE	-	expression tag	UNP P0DTC2
R	1246	GLN	-	expression tag	UNP P0DTC2
R	1247	GLY	-	expression tag	UNP P0DTC2
R	1248	PRO	-	expression tag	UNP P0DTC2
R	1249	GLY	-	expression tag	UNP P0DTC2
R	1250	HIS	-	expression tag	UNP P0DTC2
R	1251	HIS	-	expression tag	UNP P0DTC2
R	1252	HIS	-	expression tag	UNP P0DTC2
R	1253	HIS	-	expression tag	UNP P0DTC2
R	1254	HIS	-	expression tag	UNP P0DTC2
R	1255	HIS	-	expression tag	UNP P0DTC2
R	1256	HIS	-	expression tag	UNP P0DTC2
R	1257	HIS	-	expression tag	UNP P0DTC2
R	1258	SER	-	expression tag	UNP P0DTC2
R	1259	ALA	-	expression tag	UNP P0DTC2
R	1260	TRP	-	expression tag	UNP P0DTC2
R	1261	SER	-	expression tag	UNP P0DTC2
R	1262	HIS	-	expression tag	UNP P0DTC2
R	1263	PRO	-	expression tag	UNP P0DTC2
R	1264	GLN	-	expression tag	UNP P0DTC2
R	1265	PHE	-	expression tag	UNP P0DTC2
R	1266	GLU	-	expression tag	UNP P0DTC2
R	1267	LYS	-	expression tag	UNP P0DTC2
R	1268	GLY	-	expression tag	UNP P0DTC2
R	1269	GLY	-	expression tag	UNP P0DTC2
R	1270	GLY	-	expression tag	UNP P0DTC2
R	1271	SER	-	expression tag	UNP P0DTC2
R	1272	GLY	-	expression tag	UNP P0DTC2
R	1273	GLY	-	expression tag	UNP P0DTC2
R	1274	GLY	-	expression tag	UNP P0DTC2
R	1275	GLY	-	expression tag	UNP P0DTC2
R	1276	SER	-	expression tag	UNP P0DTC2
R	1277	GLY	-	expression tag	UNP P0DTC2
R	1278	GLY	-	expression tag	UNP P0DTC2
R	1279	SER	-	expression tag	UNP P0DTC2
R	1280	ALA	-	expression tag	UNP P0DTC2
R	1281	TRP	-	expression tag	UNP P0DTC2
R	1282	SER	-	expression tag	UNP P0DTC2
R	1283	HIS	-	expression tag	UNP P0DTC2
R	1284	PRO	-	expression tag	UNP P0DTC2
R	1285	GLN	-	expression tag	UNP P0DTC2
R	1286	PHE	-	expression tag	UNP P0DTC2

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Chain	Residue	Modelled	Actual	Comment	Reference
R	1287	GLU	-	expression tag	UNP P0DTC2
R	1288	LYS	-	expression tag	UNP P0DTC2

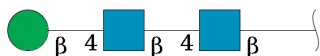
- Molecule 4 is a protein called Spike glycoprotein.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	N	165	1359	893	215	249	2	0	0

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
N	18	PHE	LEU	conflict	UNP P0DTC2
N	80	ALA	ASP	conflict	UNP P0DTC2
N	215	GLY	ASP	conflict	UNP P0DTC2
N	?	-	LEU	deletion	UNP P0DTC2
N	?	-	LEU	deletion	UNP P0DTC2
N	?	-	ALA	deletion	UNP P0DTC2

- 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.

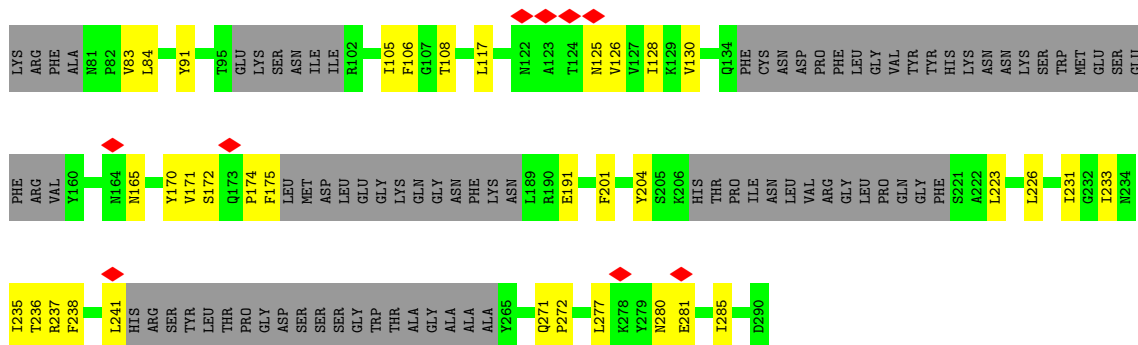


Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
5	A	3	39	22	2	15	0	0









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



## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	530214	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 ( $e^-/\text{\AA}^2$ )	54	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	2.368	Depositor
Minimum map value	-1.552	Depositor
Average map value	-0.000	Depositor
Map value standard deviation	0.023	Depositor
Recommended contour level	0.298	Depositor
Map size (Å)	436.0, 436.0, 436.0	wwPDB
Map dimensions	400, 400, 400	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.09, 1.09, 1.09	Depositor

## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

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	L	0.39	0/856	0.53	0/1165
2	H	0.47	0/1007	0.56	0/1362
3	R	0.42	0/1507	0.56	3/2049 (0.1%)
4	N	0.33	0/1394	0.54	0/1890
All	All	0.40	0/4764	0.55	3/6466 (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	L	0	1
3	R	0	2
All	All	0	3

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	R	379	CYS	CA-CB-SG	7.51	127.53	114.00
3	R	432	CYS	CA-CB-SG	7.32	127.18	114.00
3	R	405	ASP	CB-CG-OD2	5.02	122.82	118.30

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	L	7	SER	Peptide

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Mol	Chain	Res	Type	Group
3	R	379	CYS	Peptide
3	R	432	CYS	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	L	835	0	807	20	0
2	H	985	0	917	22	0
3	R	1465	0	1381	30	0
4	N	1359	0	1300	30	0
5	A	39	0	34	0	0
All	All	4683	0	4439	95	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 10.

All (95) 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)
4:N:28:TYR:HB2	4:N:64:TRP:HB3	1.63	0.81
1:L:30:SER:HA	1:L:68:GLY:H	1.51	0.75
4:N:83:VAL:HG11	4:N:237:ARG:HE	1.55	0.71
1:L:31:ARG:NH1	3:R:340:GLU:OE1	2.24	0.70
3:R:334:ASN:N	3:R:334:ASN:HD22	1.87	0.70
1:L:95:PRO:HB2	1:L:96:PRO:HD2	1.72	0.70
4:N:106:PHE:HB3	4:N:235:ILE:HD12	1.76	0.67
4:N:106:PHE:CD1	4:N:238:PHE:HB2	2.30	0.66
3:R:409:GLN:HA	3:R:414:GLN:HG2	1.79	0.63
3:R:393:THR:HB	3:R:516:GLU:HG3	1.81	0.62
4:N:126:VAL:HB	4:N:174:PRO:HA	1.81	0.62
4:N:57:PRO:HB2	4:N:60:SER:HB2	1.84	0.60
2:H:98:ARG:NH1	2:H:117:ASP:OD2	2.24	0.59
3:R:334:ASN:N	3:R:334:ASN:ND2	2.51	0.58
2:H:110:TYR:HD2	3:R:466:ARG:HH11	1.52	0.58
2:H:35:ASN:HD21	2:H:116:PHE:HE1	1.52	0.58

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:R:409:GLN:NE2	3:R:416:GLY:HA3	2.21	0.56
3:R:433:VAL:HG12	3:R:512:VAL:HG22	1.88	0.55
4:N:38:TYR:O	4:N:40:ASP:N	2.37	0.55
4:N:280:ASN:O	4:N:281:GLU:HG2	2.06	0.55
4:N:105:ILE:HD11	4:N:241:LEU:HD12	1.90	0.54
4:N:40:ASP:OD1	4:N:204:TYR:OH	2.20	0.53
4:N:277:LEU:HD13	4:N:285:ILE:HD13	1.91	0.53
4:N:37:TYR:OH	4:N:54:LEU:O	2.15	0.52
4:N:231:ILE:HG22	4:N:233:ILE:HG12	1.92	0.52
3:R:497:PHE:CE2	3:R:507:PRO:HB3	2.46	0.51
2:H:35:ASN:ND2	2:H:116:PHE:HE1	2.08	0.50
1:L:11:LEU:HD21	1:L:19:ALA:HB1	1.93	0.50
3:R:350:VAL:HG21	3:R:418:ILE:HD12	1.93	0.50
4:N:91:TYR:OH	4:N:191:GLU:OE1	2.22	0.50
1:L:30:SER:HB2	1:L:67:PHE:CE1	2.48	0.49
2:H:110:TYR:HB2	3:R:355:ARG:HB3	1.94	0.49
4:N:130:VAL:HG13	4:N:130:VAL:O	2.12	0.49
4:N:106:PHE:HB2	4:N:117:LEU:HB3	1.96	0.48
2:H:34:MET:O	2:H:51:ILE:HG22	2.14	0.48
1:L:21:LEU:HD22	1:L:103:THR:HG21	1.96	0.47
2:H:111:ARG:NE	2:H:113:ASP:OD1	2.45	0.47
4:N:83:VAL:HG11	4:N:237:ARG:HH21	1.80	0.47
4:N:125:ASN:HD21	4:N:171:VAL:HG13	1.79	0.47
1:L:95:PRO:HB2	1:L:96:PRO:CD	2.44	0.47
2:H:49:SER:OG	2:H:50:TYR:N	2.48	0.47
3:R:406:GLU:OE2	3:R:418:ILE:HG12	2.15	0.46
1:L:11:LEU:HB3	1:L:105:VAL:HG12	1.96	0.46
1:L:63:THR:O	1:L:73:LEU:HD12	2.16	0.46
2:H:52:GLY:HA3	2:H:57:ALA:HB3	1.96	0.46
2:H:28:ARG:NH2	3:R:469:SER:OG	2.48	0.46
4:N:84:LEU:HB2	4:N:238:PHE:CE1	2.51	0.46
1:L:33:LEU:HD11	1:L:88:CYS:HB2	1.97	0.46
2:H:110:TYR:HB3	3:R:466:ARG:NH1	2.31	0.46
3:R:377:PHE:CD1	3:R:434:ILE:HG22	2.51	0.46
3:R:409:GLN:HE22	3:R:416:GLY:HA3	1.80	0.46
1:L:39:ARG:HD2	1:L:81:GLU:OE1	2.15	0.46
3:R:405:ASP:OD2	3:R:408:ARG:NH1	2.48	0.46
1:L:34:ALA:O	1:L:88:CYS:HA	2.16	0.45
3:R:375:SER:O	3:R:375:SER:OG	2.31	0.45
2:H:118:ILE:HG13	2:H:118:ILE:O	2.16	0.45
3:R:461:LEU:HD22	3:R:465:GLU:OE1	2.17	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:N:83:VAL:CG1	4:N:237:ARG:HE	2.25	0.45
4:N:44:ARG:HG2	4:N:45:SER:N	2.32	0.45
3:R:342:PHE:CE1	3:R:434:ILE:HD11	2.52	0.44
3:R:380:TYR:C	3:R:382:VAL:H	2.21	0.44
3:R:398:ASP:OD2	3:R:423:TYR:OH	2.31	0.44
1:L:61:ARG:NH1	1:L:82:ASP:OD2	2.49	0.43
2:H:35:ASN:HB3	2:H:50:TYR:HA	1.99	0.43
1:L:83:PHE:CZ	1:L:107:ILE:HG12	2.54	0.43
3:R:403:ARG:HD3	3:R:505:TYR:CD1	2.53	0.43
4:N:175:PHE:CD2	4:N:226:LEU:HD21	2.53	0.43
4:N:126:VAL:HG12	4:N:172:SER:O	2.19	0.43
2:H:108:GLY:O	2:H:109:ASN:C	2.57	0.42
3:R:336:CYS:SG	3:R:363:ALA:HB2	2.59	0.42
1:L:18:ARG:HA	1:L:76:SER:HA	2.02	0.42
1:L:95:PRO:CB	1:L:96:PRO:HD2	2.47	0.42
4:N:108:THR:HG22	4:N:236:THR:HG23	2.01	0.42
1:L:83:PHE:HA	1:L:105:VAL:HG23	2.01	0.42
3:R:342:PHE:CD1	3:R:434:ILE:HD11	2.55	0.41
2:H:110:TYR:CD2	3:R:466:ARG:HD3	2.55	0.41
2:H:79:LEU:HD23	2:H:80:TYR:N	2.35	0.41
3:R:433:VAL:O	3:R:433:VAL:HG23	2.20	0.41
3:R:410:ILE:HD11	3:R:418:ILE:HG21	2.03	0.41
4:N:128:ILE:HB	4:N:170:TYR:HB3	2.03	0.41
1:L:24:ARG:HD3	1:L:70:GLU:OE1	2.21	0.41
1:L:44:PRO:HG2	2:H:45:LEU:HD11	2.02	0.41
2:H:4:LEU:HD12	2:H:96:CYS:SG	2.61	0.41
2:H:36:TRP:HE1	2:H:79:LEU:HD21	1.86	0.41
2:H:83:MET:HE2	2:H:83:MET:HB3	1.92	0.41
3:R:453:TYR:CD1	3:R:495:TYR:CE1	3.09	0.41
4:N:65:PHE:CE2	4:N:84:LEU:HD11	2.56	0.41
4:N:106:PHE:CE1	4:N:238:PHE:HB2	2.54	0.41
4:N:191:GLU:OE2	4:N:223:LEU:HD21	2.21	0.41
1:L:11:LEU:HD23	1:L:105:VAL:HG12	2.03	0.40
2:H:6:GLU:HG2	2:H:22:CYS:HB3	2.02	0.40
4:N:106:PHE:HE2	4:N:201:PHE:CZ	2.40	0.40
4:N:271:GLN:HA	4:N:272:PRO:HD3	1.92	0.40
2:H:13:LYS:HE2	2:H:13:LYS:HB3	1.97	0.40
3:R:466:ARG:HH21	3:R:468:ILE:HD11	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	L	106/215 (49%)	82 (77%)	24 (23%)	0	100	100
2	H	127/240 (53%)	108 (85%)	18 (14%)	1 (1%)	19	56
3	R	181/1285 (14%)	164 (91%)	17 (9%)	0	100	100
4	N	149/287 (52%)	131 (88%)	17 (11%)	1 (1%)	22	59
All	All	563/2027 (28%)	485 (86%)	76 (14%)	2 (0%)	38	69

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	H	109	ASN
4	N	165	ASN

### 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	L	88/184 (48%)	88 (100%)	0	100	100
2	H	101/200 (50%)	101 (100%)	0	100	100
3	R	159/1112 (14%)	158 (99%)	1 (1%)	86	93
4	N	152/257 (59%)	152 (100%)	0	100	100
All	All	500/1753 (28%)	499 (100%)	1 (0%)	93	97

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

Mol	Chain	Res	Type
3	R	334	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

### 5.3.3 RNA [i](#)

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](#)

3 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	$\# Z  > 2$
5	NAG	A	1	5,4	14,14,15	0.43	0	17,19,21	1.37	2 (11%)
5	NAG	A	2	5	14,14,15	0.39	0	17,19,21	0.60	0
5	BMA	A	3	5	11,11,12	0.39	0	15,15,17	0.53	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	1	5,4	-	4/6/23/26	0/1/1/1
5	NAG	A	2	5	-	2/6/23/26	0/1/1/1
5	BMA	A	3	5	-	2/2/19/22	0/1/1/1



There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	1	NAG	O5-C1-C2	-3.66	105.50	111.29
5	A	1	NAG	C3-C4-C5	3.07	115.71	110.24

There are no chirality outliers.

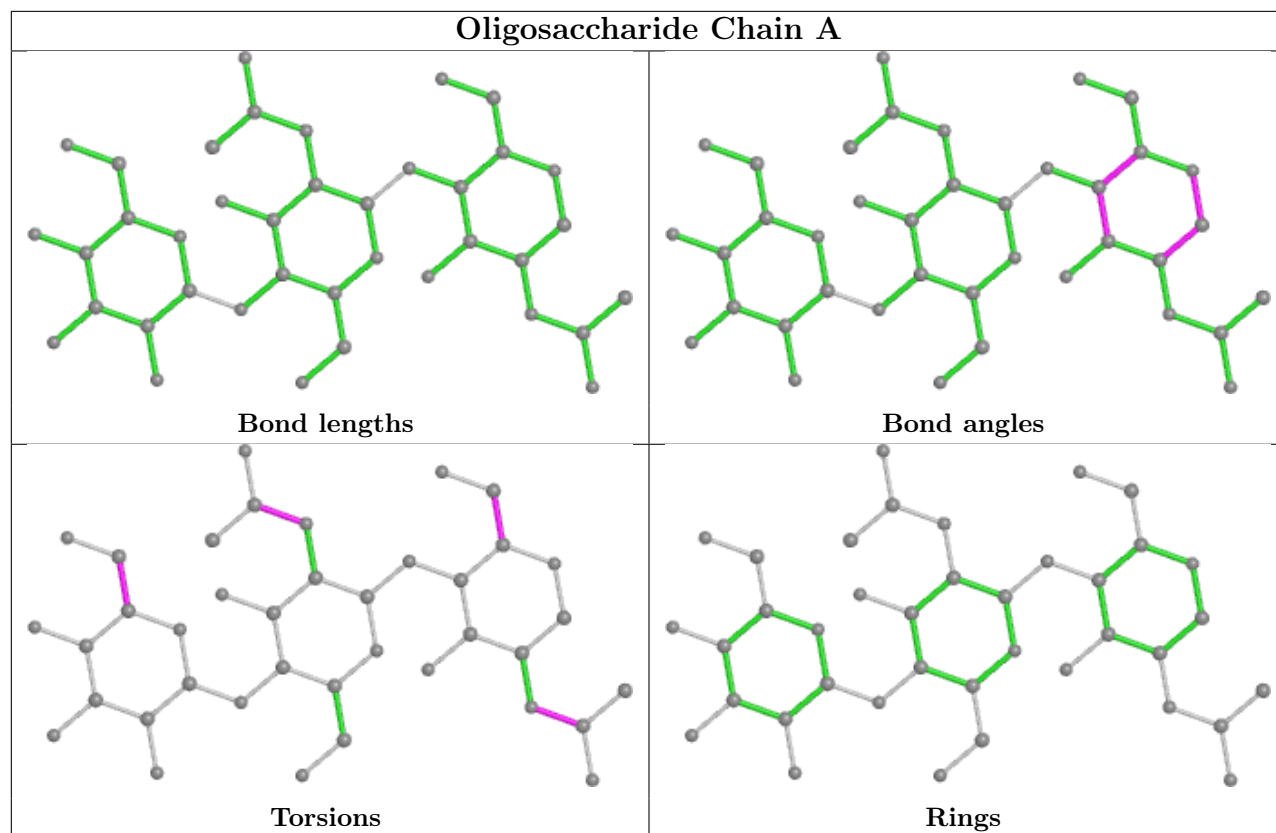
All (8) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	1	NAG	C8-C7-N2-C2
5	A	1	NAG	O7-C7-N2-C2
5	A	2	NAG	C8-C7-N2-C2
5	A	2	NAG	O7-C7-N2-C2
5	A	1	NAG	C4-C5-C6-O6
5	A	3	BMA	O5-C5-C6-O6
5	A	3	BMA	C4-C5-C6-O6
5	A	1	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](#)

There are no ligands in this entry.

## 5.7 Other polymers [i](#)

There are no such residues in this entry.

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

There are no chain breaks in this entry.

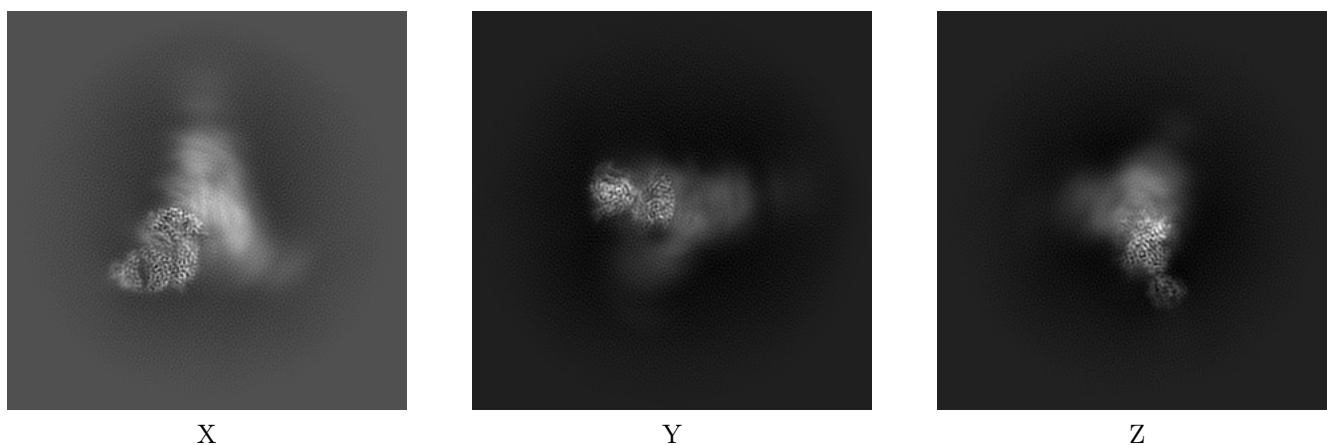
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-31377. 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](#)

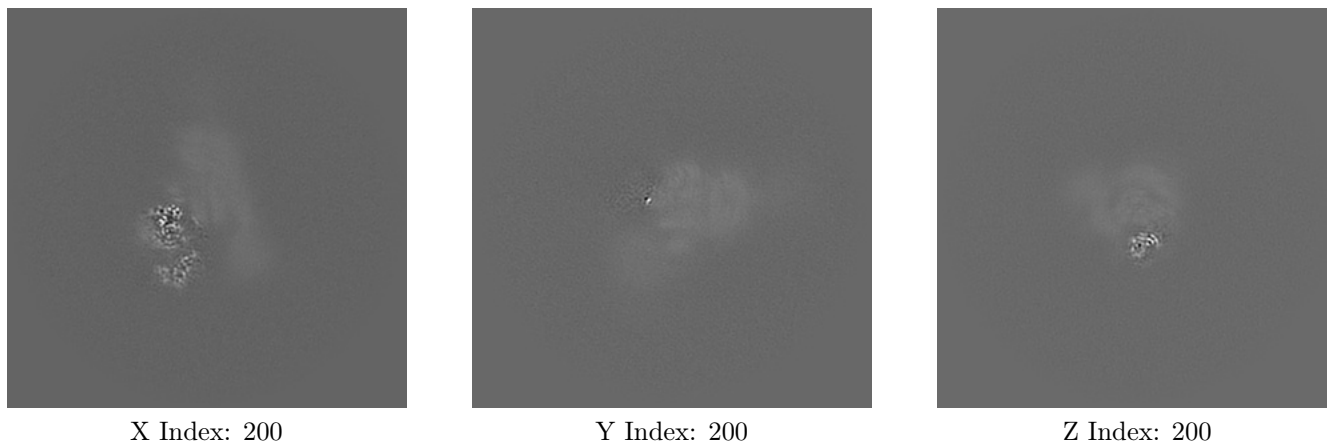
#### 6.1.1 Primary map



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

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

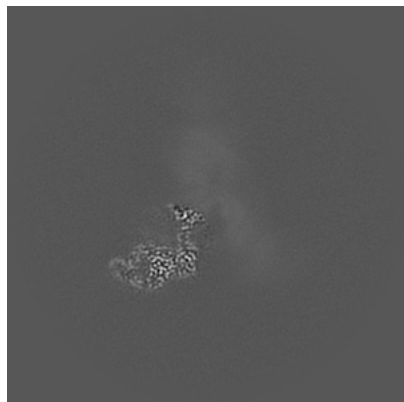
#### 6.2.1 Primary map



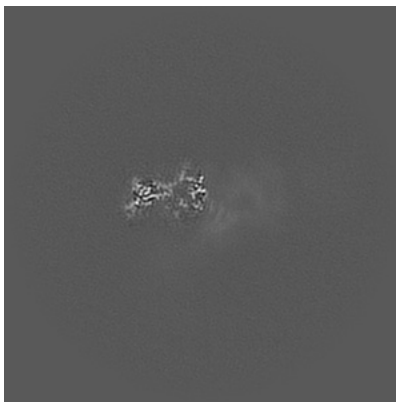
The images above show central slices of the map in three orthogonal directions.

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

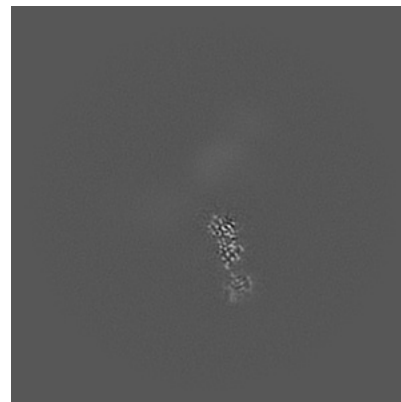
### 6.3.1 Primary map



X Index: 221



Y Index: 172



Z Index: 145

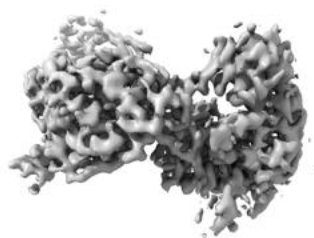
The images above show the largest variance slices of the map in three orthogonal directions.

## 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 0.298. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

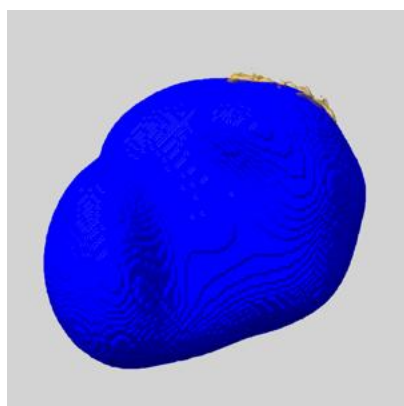
## 6.5 Mask visualisation [i](#)

This section shows the 3D surface view of the primary map at 50% transparency overlaid with the specified mask at 0% transparency

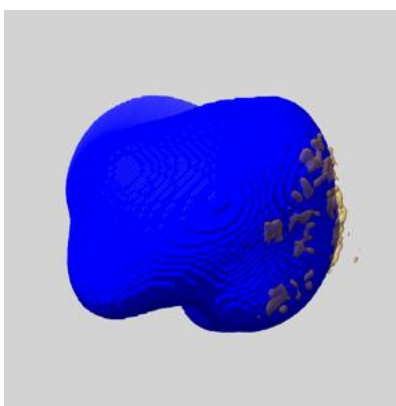
A mask typically either:

- Encompasses the whole structure
- Separates out a domain, a functional unit, a monomer or an area of interest from a larger structure

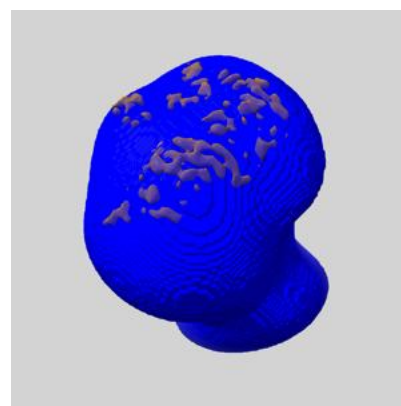
### 6.5.1 emd\_31377\_msk\_1.map [i](#)



X



Y

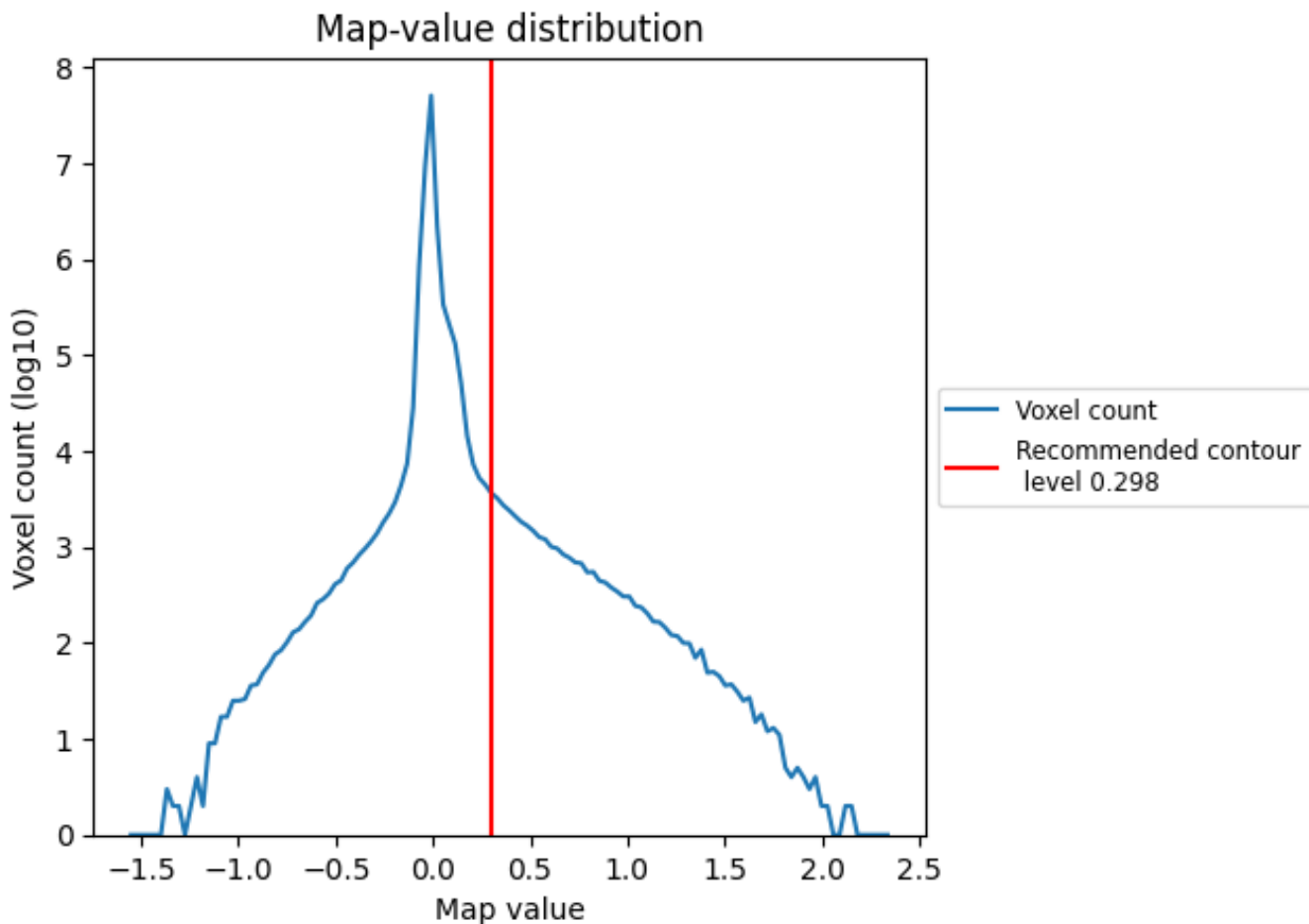


Z

## 7 Map analysis [i](#)

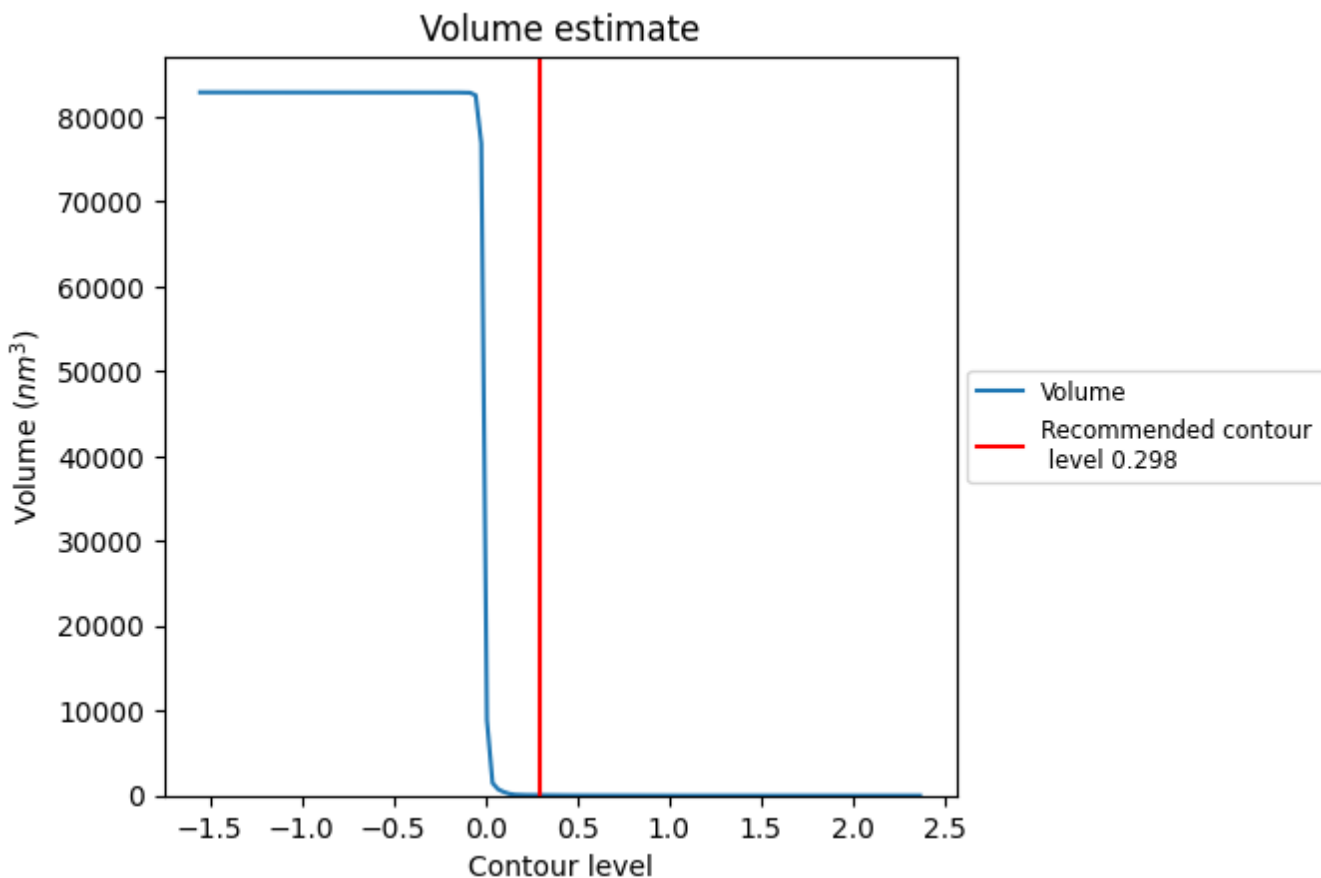
This section contains the results of statistical analysis of the map.

### 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.

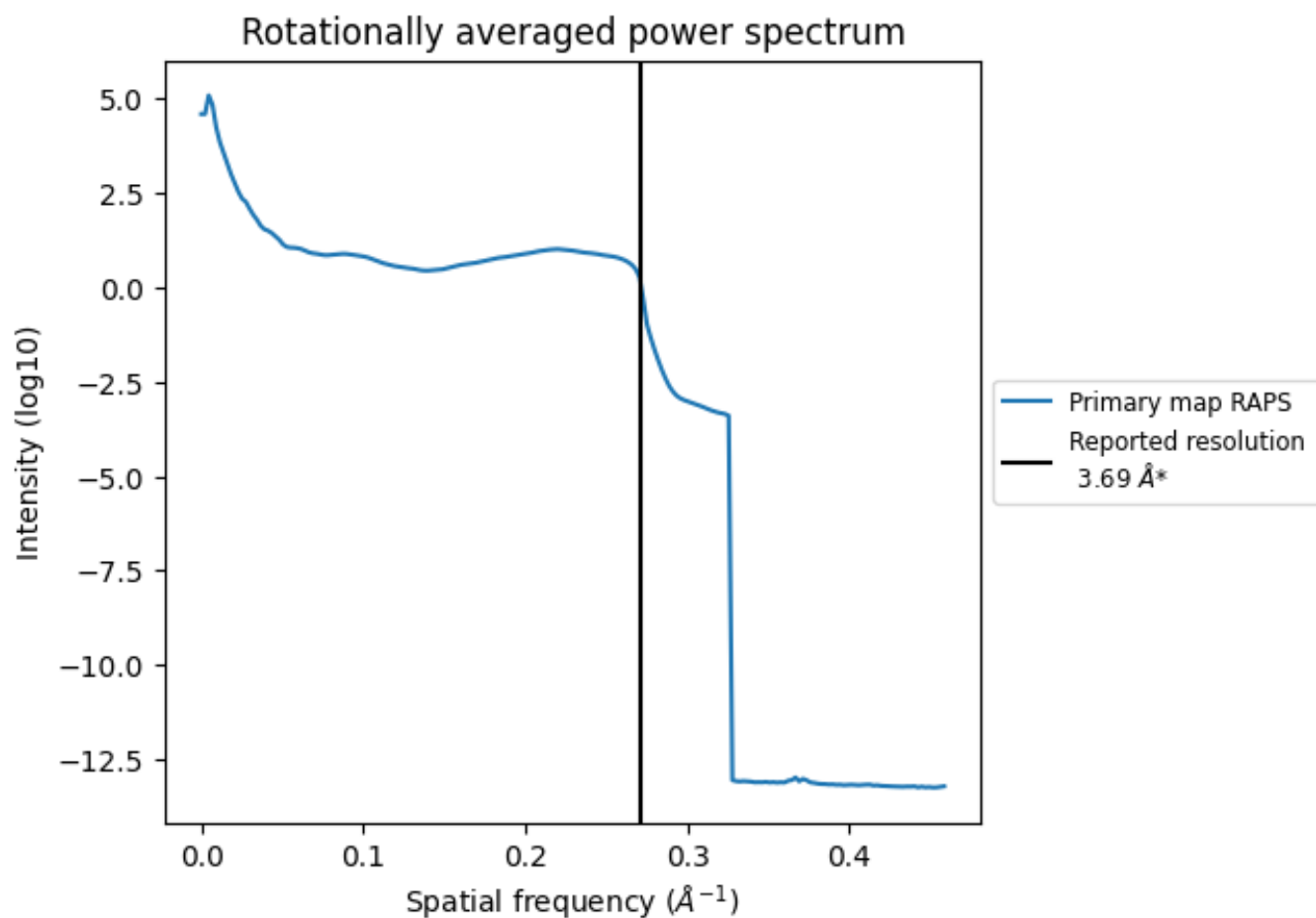
## 7.2 Volume estimate [i](#)



The volume at the recommended contour level is 42 nm<sup>3</sup>; this corresponds to an approximate mass of 38 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 0.271 Å<sup>-1</sup>



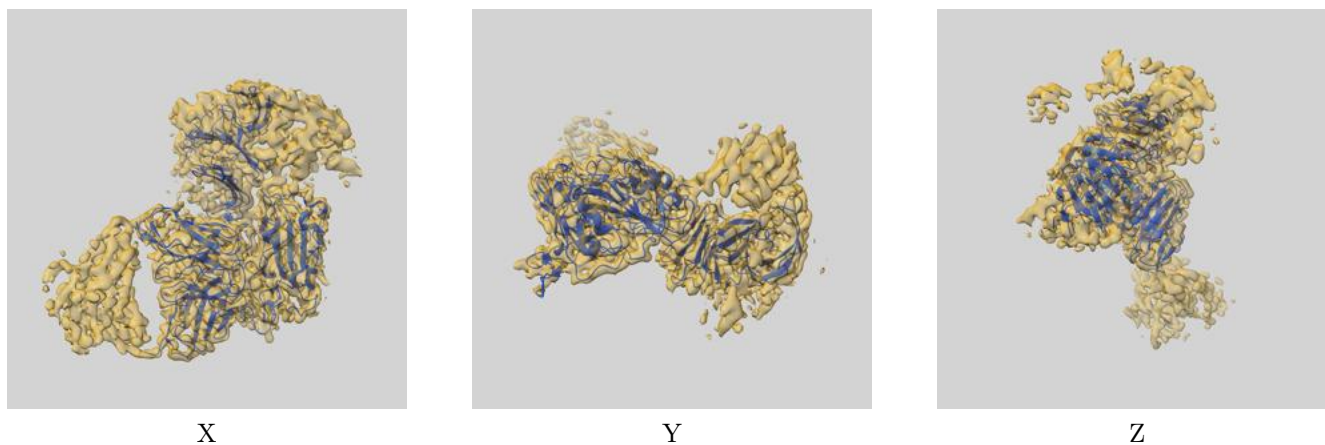
## 8 Fourier-Shell correlation

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

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

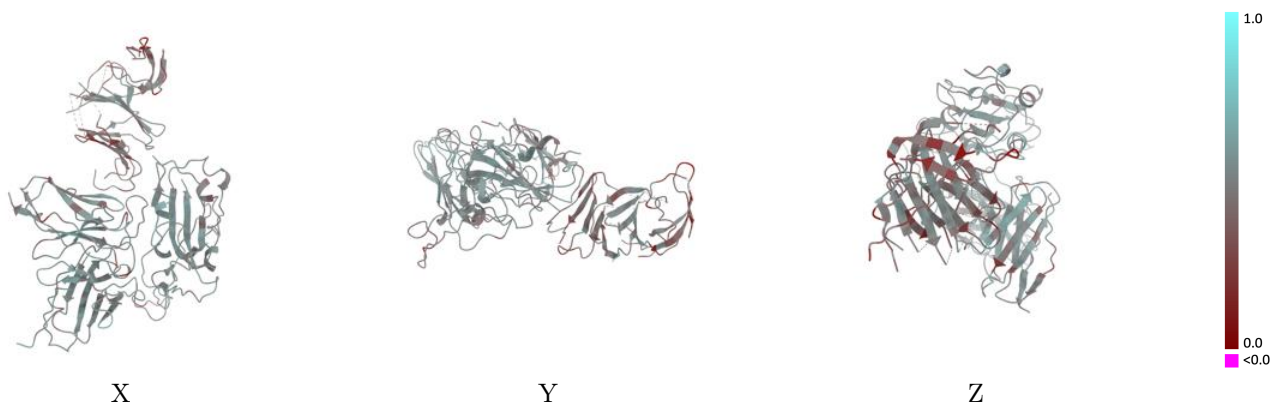
This section contains information regarding the fit between EMDB map EMD-31377 and PDB model 7EY4. Per-residue inclusion information can be found in section 3 on page 7.

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



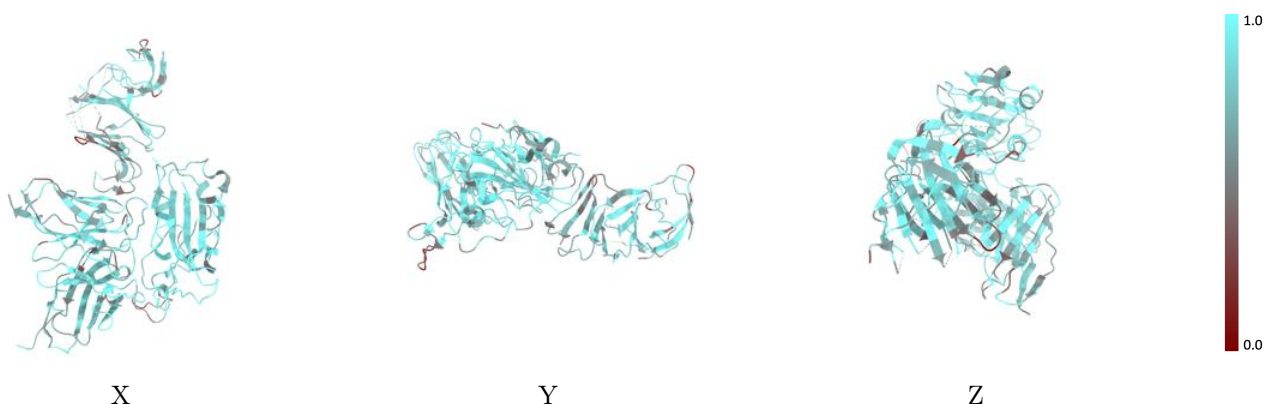
The images above show the 3D surface view of the map at the recommended contour level 0.298 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



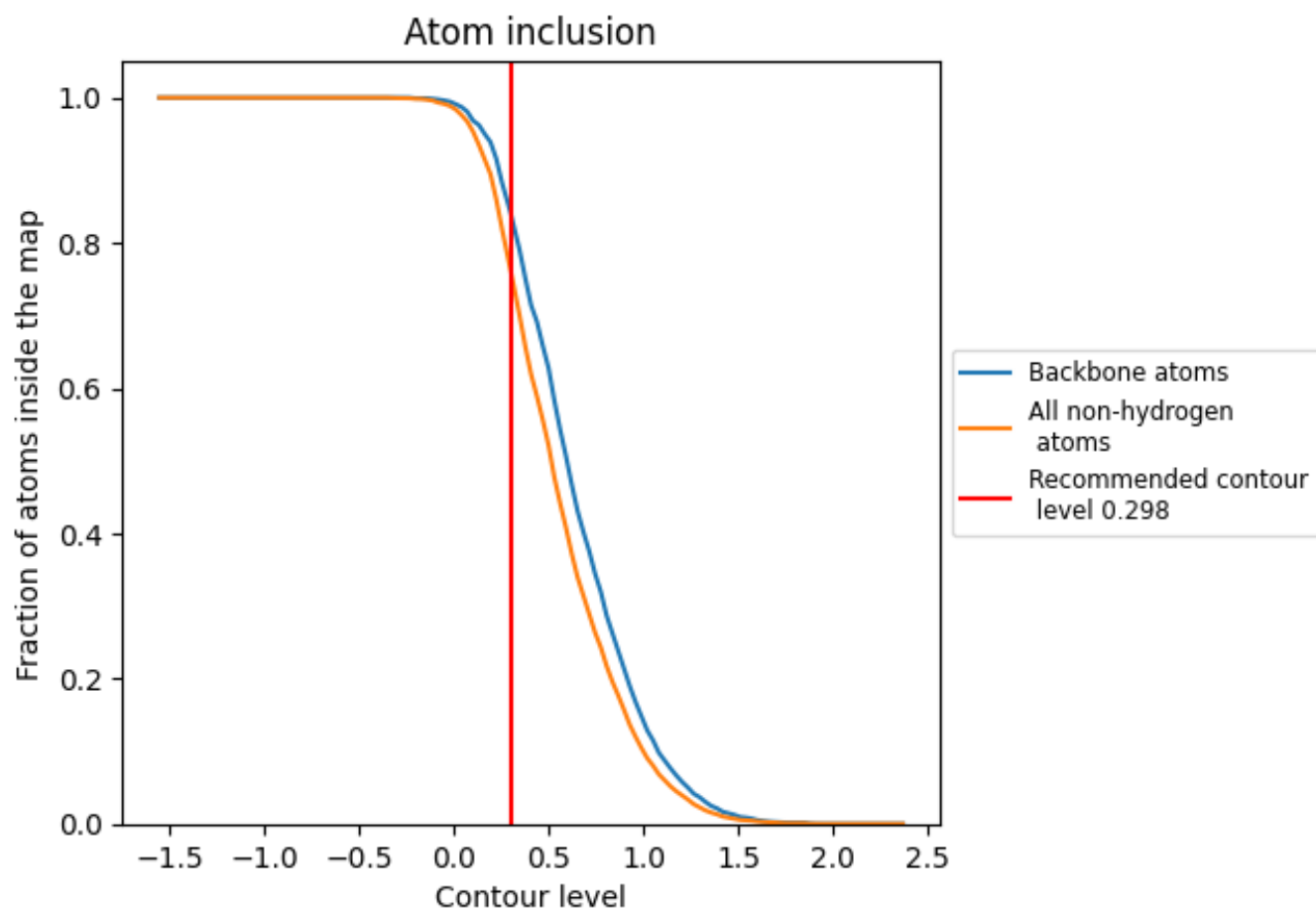
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.298).













## 9.4 Atom inclusion [i](#)



At the recommended contour level, 84% of all backbone atoms, 76% 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 (0.298) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.7641	 0.4780
A	 0.2564	 0.4220
H	 0.8002	 0.5200
L	 0.7638	 0.5020
N	 0.7119	 0.4050
R	 0.8027	 0.5070

