Full wwPDB EM Validation Report ⓘ

Nov 16, 2026 – 08:15 PM JST

PDB ID	:	24ZU / pdb_000024zu
EMDB ID	:	EMD-69947
Title	:	Structure of MCD4 from Candida albicans with GPI
Authors	:	Li, Y.; Fan, S.; Li, D.
Deposited on	:	2026-03-25
Resolution	:	2.75 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*
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:

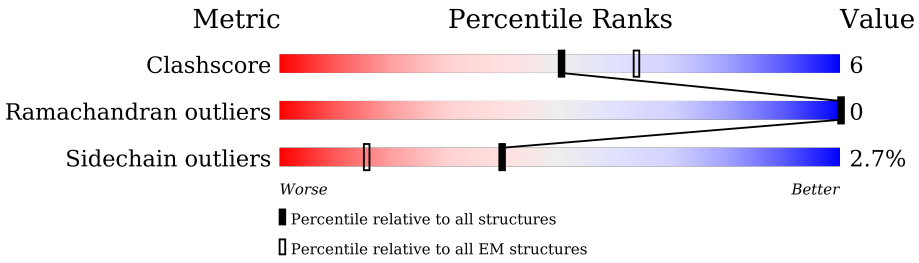
EMDB validation analysis	:	0.0.1.dev133
Mogul	:	1.8.5 (274361), CSD as541be (2020)
MolProbity	:	4-5-2 with Phenix2.2
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics	:	202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ	:	1.9.13
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.51

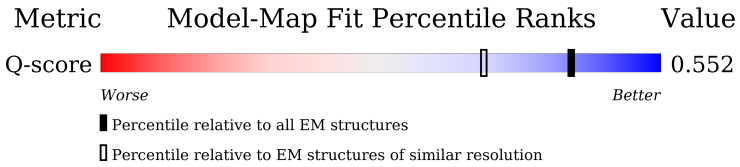
1 Overall quality at a glance (i)

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

The reported resolution of this entry is 2.75 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)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	229148	23984	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
Q-score	-	25397	10570 (2.25 - 3.25)

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

Mol	Chain	Length	Quality of chain
1	A	1034	78% 14% 8%
2	B	2	100%
2	E	2	50% 100%
3	C	5	20% 20% 80%

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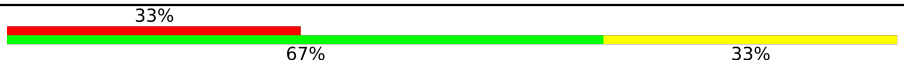
Mol	Chain	Length	Quality of chain
4	D	3	
5	F	2	

2 Entry composition (i)

There are 13 unique types of molecules in this entry. The entry contains 8089 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 GPI ethanolamine phosphate transferase 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	950	7654	5066	1197	1367	24	0	0

There are 65 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-18	MET	-	initiating methionine	UNP Q5A3M6
A	-17	GLY	-	expression tag	UNP Q5A3M6
A	-16	SER	-	expression tag	UNP Q5A3M6
A	-15	LEU	-	expression tag	UNP Q5A3M6
A	-14	TRP	-	expression tag	UNP Q5A3M6
A	-13	ASN	-	expression tag	UNP Q5A3M6
A	-12	TRP	-	expression tag	UNP Q5A3M6
A	-11	PHE	-	expression tag	UNP Q5A3M6
A	-10	ASP	-	expression tag	UNP Q5A3M6
A	-9	ILE	-	expression tag	UNP Q5A3M6
A	-8	THR	-	expression tag	UNP Q5A3M6
A	-7	ASN	-	expression tag	UNP Q5A3M6
A	-6	TRP	-	expression tag	UNP Q5A3M6
A	-5	LEU	-	expression tag	UNP Q5A3M6
A	-4	TRP	-	expression tag	UNP Q5A3M6
A	-3	TYR	-	expression tag	UNP Q5A3M6
A	-2	ILE	-	expression tag	UNP Q5A3M6
A	-1	LYS	-	expression tag	UNP Q5A3M6
A	0	SER	-	expression tag	UNP Q5A3M6
A	1	LEU	-	expression tag	UNP Q5A3M6
A	2	LEU	-	expression tag	UNP Q5A3M6
A	972	GLY	-	expression tag	UNP Q5A3M6
A	973	THR	-	expression tag	UNP Q5A3M6
A	974	LEU	-	expression tag	UNP Q5A3M6
A	975	GLU	-	expression tag	UNP Q5A3M6
A	976	VAL	-	expression tag	UNP Q5A3M6
A	977	LEU	-	expression tag	UNP Q5A3M6
A	978	PHE	-	expression tag	UNP Q5A3M6

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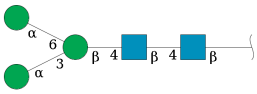
Chain	Residue	Modelled	Actual	Comment	Reference
A	979	GLN	-	expression tag	UNP Q5A3M6
A	980	GLY	-	expression tag	UNP Q5A3M6
A	981	PRO	-	expression tag	UNP Q5A3M6
A	982	LYS	-	expression tag	UNP Q5A3M6
A	983	LEU	-	expression tag	UNP Q5A3M6
A	984	GLU	-	expression tag	UNP Q5A3M6
A	985	PHE	-	expression tag	UNP Q5A3M6
A	986	SER	-	expression tag	UNP Q5A3M6
A	987	ALA	-	expression tag	UNP Q5A3M6
A	988	TRP	-	expression tag	UNP Q5A3M6
A	989	SER	-	expression tag	UNP Q5A3M6
A	990	HIS	-	expression tag	UNP Q5A3M6
A	991	PRO	-	expression tag	UNP Q5A3M6
A	992	GLN	-	expression tag	UNP Q5A3M6
A	993	PHE	-	expression tag	UNP Q5A3M6
A	994	GLU	-	expression tag	UNP Q5A3M6
A	995	LYS	-	expression tag	UNP Q5A3M6
A	996	GLY	-	expression tag	UNP Q5A3M6
A	997	GLY	-	expression tag	UNP Q5A3M6
A	998	GLY	-	expression tag	UNP Q5A3M6
A	999	SER	-	expression tag	UNP Q5A3M6
A	1000	GLY	-	expression tag	UNP Q5A3M6
A	1001	GLY	-	expression tag	UNP Q5A3M6
A	1002	GLY	-	expression tag	UNP Q5A3M6
A	1003	SER	-	expression tag	UNP Q5A3M6
A	1004	GLY	-	expression tag	UNP Q5A3M6
A	1005	GLY	-	expression tag	UNP Q5A3M6
A	1006	SER	-	expression tag	UNP Q5A3M6
A	1007	ALA	-	expression tag	UNP Q5A3M6
A	1008	TRP	-	expression tag	UNP Q5A3M6
A	1009	SER	-	expression tag	UNP Q5A3M6
A	1010	HIS	-	expression tag	UNP Q5A3M6
A	1011	PRO	-	expression tag	UNP Q5A3M6
A	1012	GLN	-	expression tag	UNP Q5A3M6
A	1013	PHE	-	expression tag	UNP Q5A3M6
A	1014	GLU	-	expression tag	UNP Q5A3M6
A	1015	LYS	-	expression tag	UNP Q5A3M6

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



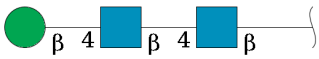
Mol	Chain	Residues	Atoms				AltConf	Trace
2	B	2	Total	C	N	O	0	0
			28	16	2	10		
2	E	2	Total	C	N	O	0	0
			28	16	2	10		

- Molecule 3 is an oligosaccharide called alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-6)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



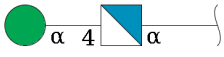
Mol	Chain	Residues	Atoms				AltConf	Trace
3	C	5	Total	C	N	O	0	0
			61	34	2	25		

- Molecule 4 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.



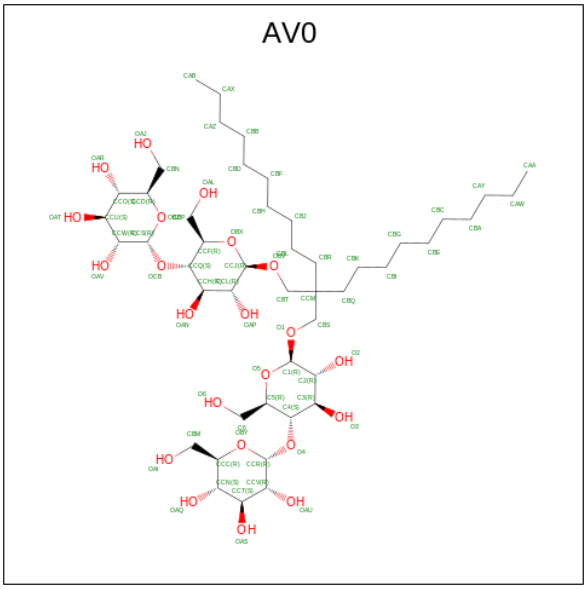
Mol	Chain	Residues	Atoms				AltConf	Trace
4	D	3	Total	C	N	O	0	0
			39	22	2	15		

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



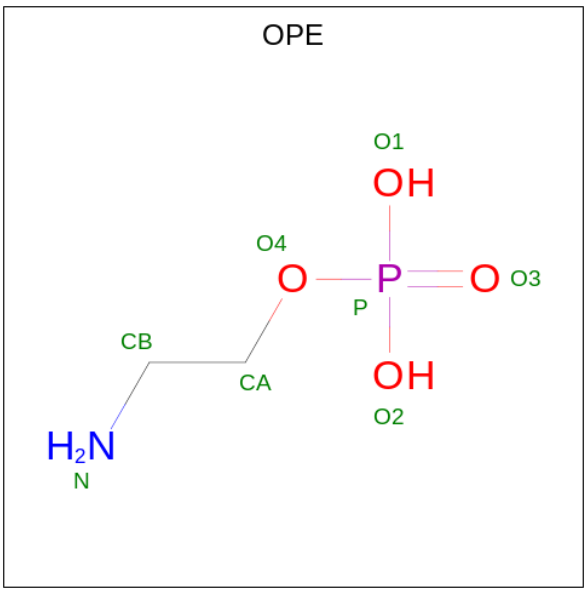
Mol	Chain	Residues	Atoms				AltConf	Trace
5	F	2	Total	C	N	O	0	0
			22	12	1	9		

- Molecule 6 is Lauryl Maltose Neopentyl Glycol (CCD ID: AV0) (formula: $C_{47}H_{88}O_{22}$).



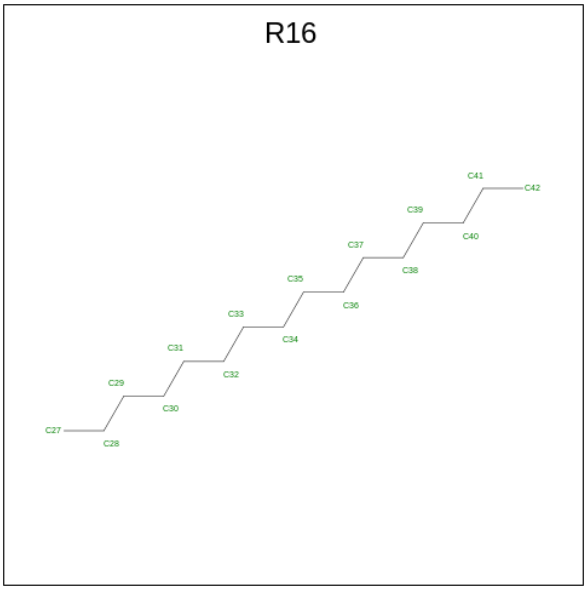
Mol	Chain	Residues	Atoms			AltConf
6	A	1	Total	C	O	0
			69	47	22	

- Molecule 7 is PHOSPHORIC ACID MONO-(2-AMINO-ETHYL) ESTER (CCD ID: OPE) (formula: $C_2H_8NO_4P$) (labeled as "Ligand of Interest" by depositor).



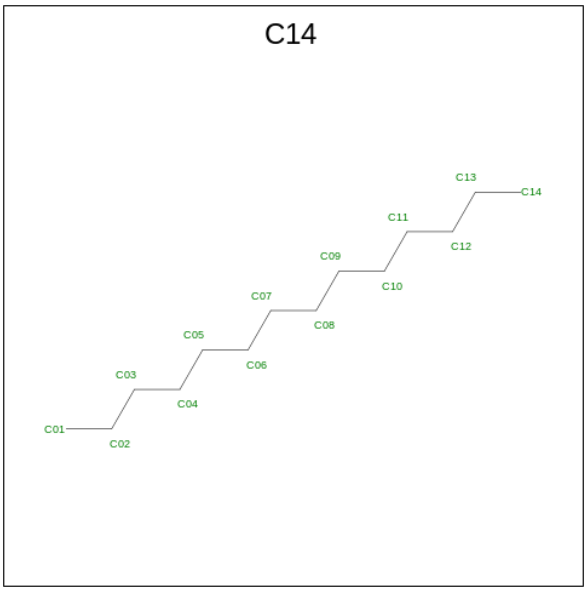
Mol	Chain	Residues	Atoms					AltConf
7	A	1	Total	C	N	O	P	0
			8	2	1	4	1	

- Molecule 8 is HEXADECANE (CCD ID: R16) (formula: $C_{16}H_{34}$) (labeled as "Ligand of Interest" by depositor).



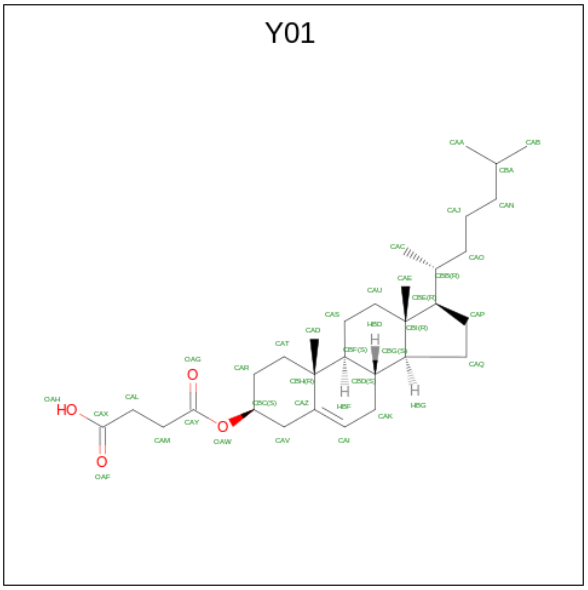
Mol	Chain	Residues	Atoms		AltConf
8	A	1	Total	C	0
			16	16	
8	A	1	Total	C	0
			16	16	
8	A	1	Total	C	0
			16	16	
8	A	1	Total	C	0
			16	16	

- Molecule 9 is TETRADECANE (CCD ID: C14) (formula: $C_{14}H_{30}$).



Mol	Chain	Residues	Atoms	AltConf
9	A	1	Total C 14 14	0
9	A	1	Total C 14 14	0

- Molecule 10 is CHOLESTEROL HEMISUCCINATE (CCD ID: Y01) (formula: $C_{31}H_{50}O_4$).

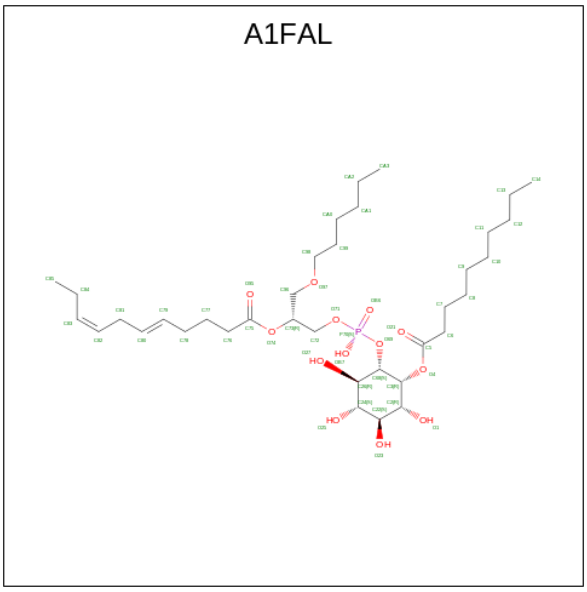


Mol	Chain	Residues	Atoms	AltConf
10	A	1	Total C O 35 31 4	0

- Molecule 11 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms	AltConf
11	A	2	Total Zn 2 2	0

- Molecule 12 is [(2 {R})-1-[[(1 {S},2 {R},3 {R},4 {S},5 {S},6 {R})-2-decanoyloxy-3,4,5,6-tetrakis(oxidanyl)cyclohexyl]oxy-oxidanyl-phosphoryl]oxy-3-hexoxy-propan-2-yl] (5 {E},8 {Z})-undeca-5,8-dienoate (CCD ID: A1FAL) (formula: $C_{36}H_{65}O_{13}P$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms	AltConf
12	A	1	Total C O P 50 36 13 1	0

- Molecule 13 is water.

Mol	Chain	Residues	Atoms	AltConf
13	A	1	Total O 1 1	0

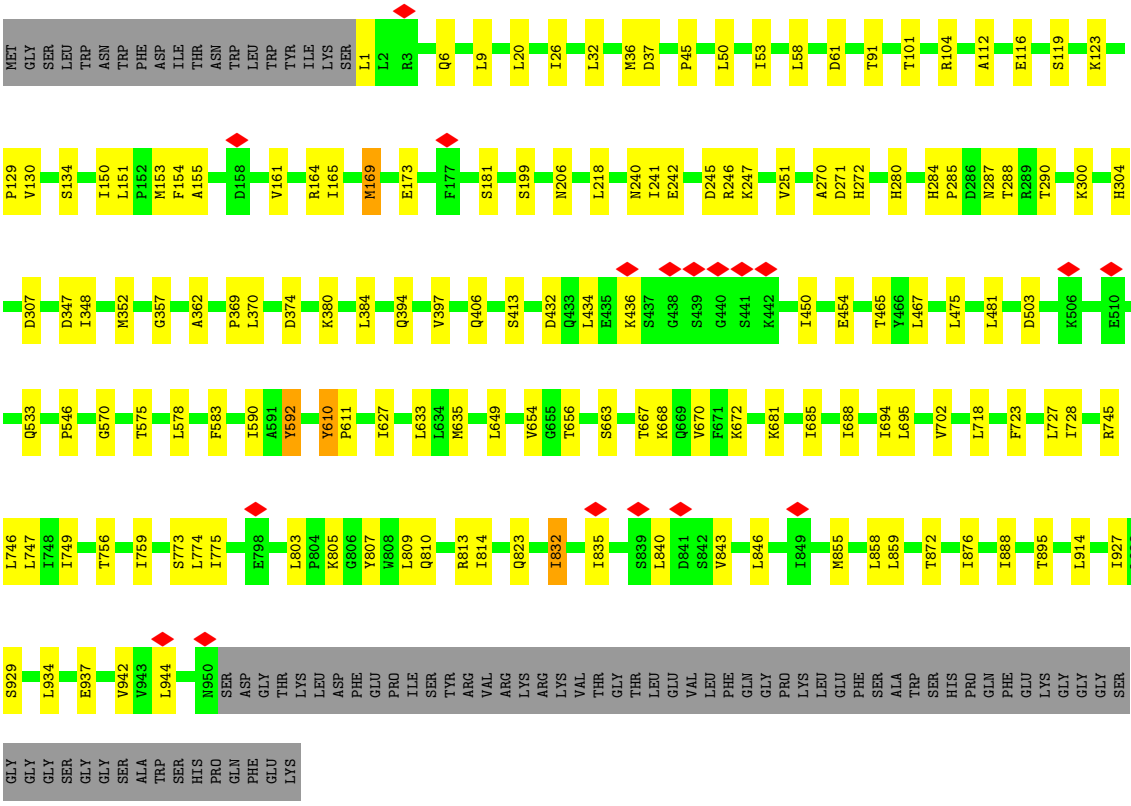
3 Residue-property plots (i)

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

• Molecule 1: GPI ethanolamine phosphate transferase 1

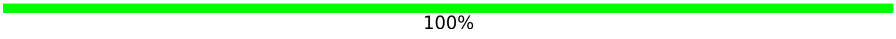
Chain A:





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

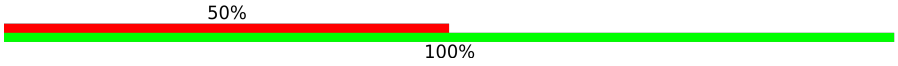
Chain B:





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

Chain E:

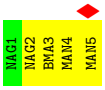




• Molecule 3: alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-6)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain C:





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

Chain D:





• Molecule 5: alpha-D-mannopyranose-(1-4)-2-amino-2-deoxy-alpha-D-glucopyranose

Chain F:





4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	144879	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/Å^2$)	50	Depositor
Minimum defocus (nm)	1200	Depositor
Maximum defocus (nm)	2200	Depositor
Magnification	Not provided	
Image detector	FEI FALCON IV (4k x 4k)	Depositor
Maximum map value	0.666	Depositor
Minimum map value	-0.437	Depositor
Average map value	-0.000	Depositor
Map value standard deviation	0.015	Depositor
Recommended contour level	0.0586	Depositor
Map size (Å)	239.104, 239.104, 239.104	wwPDB
Map dimensions	256, 256, 256	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.934, 0.934, 0.934	Depositor

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: MAN, NAG, AV0, R16, A1FAL, OPE, Y01, ZN, PA1, BMA, C14

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	0.12	0/7865	0.29	0/10692

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

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	7654	0	7669	87	0
2	B	28	0	25	0	0
2	E	28	0	25	0	0
3	C	61	0	52	0	0
4	D	39	0	34	0	0
5	F	22	0	20	1	0
6	A	69	0	0	0	0
7	A	8	0	6	3	0
8	A	64	0	136	8	0
9	A	28	0	60	3	0
10	A	35	0	49	1	0
11	A	2	0	0	0	0
12	A	50	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
13	A	1	0	0	1	0
All	All	8089	0	8076	90	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.

All (90) 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:649:LEU:HD21	1:A:702:VAL:HG11	1.66	0.78
1:A:774:LEU:HD13	8:A:1106:R16:H371	1.66	0.76
1:A:663:SER:O	1:A:667:THR:HG23	1.92	0.68
1:A:36:MET:HE3	1:A:394:GLN:HG2	1.76	0.67
1:A:53:ILE:HG12	1:A:218:LEU:HD12	1.76	0.67
1:A:681:LYS:O	1:A:685:ILE:HG12	1.94	0.67
1:A:271:ASP:OD1	1:A:272:HIS:HD2	1.67	0.65
1:A:280:HIS:CE1	7:A:1102:OPE:O3	2.48	0.65
1:A:810:GLN:HG3	1:A:813:ARG:HH21	1.66	0.60
1:A:747:LEU:HD13	8:A:1107:R16:H341	1.83	0.59
1:A:667:THR:HG22	1:A:747:LEU:HD21	1.85	0.58
1:A:746:LEU:HG	8:A:1107:R16:H402	1.86	0.58
1:A:727:LEU:HB3	1:A:728:ILE:HD12	1.85	0.57
1:A:667:THR:HA	1:A:670:VAL:HG22	1.87	0.57
1:A:814:ILE:HG21	1:A:888:ILE:HD13	1.87	0.56
1:A:749:ILE:HG13	1:A:872:THR:HG21	1.88	0.56
1:A:101:THR:HG21	1:A:288:THR:HG22	1.88	0.55
1:A:627:ILE:HG23	8:A:1106:R16:H422	1.88	0.53
1:A:20:LEU:HB2	1:A:927:ILE:HG21	1.90	0.53
1:A:284:HIS:ND1	1:A:285:PRO:HD2	2.23	0.53
8:A:1106:R16:H372	9:A:1108:C14:H082	1.92	0.52
1:A:656:THR:HG21	1:A:695:LEU:HD22	1.92	0.52
1:A:280:HIS:HE1	7:A:1102:OPE:O3	1.93	0.51
1:A:668:LYS:O	1:A:672:LYS:HG3	2.09	0.51
1:A:432:ASP:O	1:A:436:LYS:HG2	2.11	0.51
1:A:370:LEU:HD11	1:A:384:LEU:HD22	1.93	0.51
1:A:150:ILE:HG22	1:A:151:LEU:HD23	1.94	0.50
1:A:570:GLY:HA3	1:A:805:LYS:HB3	1.92	0.50
1:A:58:LEU:HD11	1:A:241:ILE:HG12	1.92	0.50
1:A:242:GLU:O	1:A:246:ARG:HG3	2.12	0.49
1:A:45:PRO:HG3	1:A:357:GLY:HA3	1.93	0.49
1:A:347:ASP:HB3	1:A:369:PRO:HG3	1.93	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
7:A:1102:OPE:O1	13:A:1201:HOH:O	2.20	0.48
1:A:546:PRO:HB2	9:A:1105:C14:H052	1.95	0.48
1:A:119:SER:HB2	1:A:129:PRO:HG3	1.94	0.48
1:A:406:GLN:HA	1:A:533:GLN:HG2	1.96	0.48
1:A:36:MET:HG3	1:A:397:VAL:HG21	1.96	0.47
1:A:481:LEU:HD13	9:A:1105:C14:H051	1.95	0.47
1:A:746:LEU:HD13	1:A:876:ILE:HD12	1.97	0.47
1:A:723:PHE:HE1	1:A:756:THR:HG23	1.81	0.46
1:A:151:LEU:HD12	1:A:169:MET:HG2	1.97	0.46
1:A:843:VAL:HG13	1:A:858:LEU:HD12	1.98	0.46
1:A:370:LEU:HD22	1:A:380:LYS:HB3	1.96	0.46
1:A:745:ARG:HE	1:A:745:ARG:HB2	1.54	0.45
1:A:872:THR:HG23	1:A:944:LEU:HD21	1.97	0.45
1:A:155:ALA:HA	1:A:165:ILE:HD13	1.98	0.45
1:A:835:ILE:HD11	1:A:859:LEU:HD21	1.98	0.45
1:A:245:ASP:OD2	1:A:245:ASP:C	2.59	0.45
1:A:304:HIS:HB2	1:A:307:ASP:OD1	2.17	0.45
1:A:575:THR:HG23	10:A:1109:Y01:HAV2	1.98	0.45
1:A:627:ILE:HG21	8:A:1106:R16:H352	1.98	0.45
1:A:583:PHE:HZ	1:A:895:THR:HB	1.82	0.44
1:A:199:SER:HB2	1:A:206:ASN:HA	1.98	0.44
1:A:270:ALA:HB3	1:A:290:THR:HB	1.98	0.44
1:A:300:LYS:HA	1:A:374:ASP:HB2	1.99	0.44
1:A:694:ILE:HD11	1:A:759:ILE:HD12	2.00	0.44
1:A:1:LEU:HA	1:A:6:GLN:HB3	2.00	0.44
1:A:153:MET:HE3	1:A:154:PHE:CE2	2.53	0.43
1:A:592:TYR:HD1	1:A:592:TYR:HA	1.70	0.43
1:A:835:ILE:HD12	1:A:835:ILE:HA	1.82	0.43
8:A:1106:R16:H272	8:A:1107:R16:H281	2.01	0.43
1:A:123:LYS:HE3	1:A:129:PRO:HA	2.00	0.43
1:A:805:LYS:HB3	1:A:805:LYS:HE3	1.87	0.43
1:A:247:LYS:HA	1:A:247:LYS:HD3	1.84	0.43
1:A:104:ARG:HG3	1:A:153:MET:SD	2.59	0.42
1:A:280:HIS:HA	1:A:287:ASN:ND2	2.34	0.42
1:A:161:VAL:HB	1:A:164:ARG:HD2	2.02	0.42
1:A:635:MET:HG3	1:A:775:ILE:HD12	2.01	0.42
1:A:773:SER:HB3	8:A:1107:R16:H392	2.01	0.42
1:A:846:LEU:HD23	1:A:846:LEU:HA	1.89	0.42
1:A:32:LEU:HD12	1:A:130:VAL:HG23	2.02	0.42
1:A:610:TYR:CD2	1:A:611:PRO:HD3	2.55	0.42
1:A:522:LEU:HD12	1:A:522:LEU:HA	1.83	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:590:ILE:HG21	1:A:823:GLN:HG3	2.01	0.42
1:A:667:THR:HG21	1:A:688:ILE:HD11	2.02	0.42
1:A:832:ILE:HD13	1:A:832:ILE:HA	1.84	0.42
1:A:503:ASP:OD2	1:A:503:ASP:C	2.62	0.41
1:A:9:LEU:HD23	1:A:934:LEU:HD23	2.03	0.41
1:A:348:ILE:O	1:A:352:MET:HG3	2.20	0.41
1:A:840:LEU:H	1:A:855:MET:CE	2.33	0.41
1:A:26:ILE:HG12	1:A:475:LEU:HD13	2.02	0.41
1:A:112:ALA:HA	1:A:134:SER:HA	2.03	0.41
1:A:746:LEU:HD12	1:A:746:LEU:HA	1.92	0.41
1:A:914:LEU:H	5:F:2:MAN:H61	1.86	0.41
1:A:150:ILE:O	1:A:153:MET:HG2	2.21	0.40
1:A:450:ILE:O	1:A:454:GLU:HG3	2.20	0.40
1:A:803:LEU:HD23	1:A:807:TYR:CD2	2.56	0.40
1:A:36:MET:HE2	1:A:362:ALA:HB1	2.03	0.40
1:A:575:THR:HG21	1:A:809:LEU:HD11	2.03	0.40
1:A:718:LEU:HD23	1:A:718:LEU:HA	1.93	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	948/1034 (92%)	930 (98%)	18 (2%)	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	842/916 (92%)	819 (97%)	23 (3%)	39 62

All (23) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	37	ASP
1	A	50	LEU
1	A	61	ASP
1	A	91	THR
1	A	116	GLU
1	A	169	MET
1	A	173	GLU
1	A	181	SER
1	A	240	ASN
1	A	251	VAL
1	A	413	SER
1	A	434	LEU
1	A	465	THR
1	A	467	LEU
1	A	578	LEU
1	A	592	TYR
1	A	610	TYR
1	A	633	LEU
1	A	654	VAL
1	A	832	ILE
1	A	929	SER
1	A	937	GLU
1	A	942	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	263	GLN
1	A	501	ASN
1	A	651	GLN
1	A	687	GLN
1	A	879	HIS

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)

14 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	$\#\|Z\| > 2$
2	NAG	B	1	1,2	14,14,15	0.77	0	17,19,21	0.83	0
2	NAG	B	2	2	14,14,15	0.73	0	17,19,21	0.83	0
3	NAG	C	1	3,1	14,14,15	0.76	0	17,19,21	0.86	0
3	NAG	C	2	3	14,14,15	0.74	0	17,19,21	0.85	1 (5%)
3	BMA	C	3	3	11,11,12	0.82	0	15,15,17	2.46	6 (40%)
3	MAN	C	4	3	11,11,12	0.61	0	15,15,17	1.85	1 (6%)
3	MAN	C	5	3	11,11,12	0.74	0	15,15,17	1.10	1 (6%)
4	NAG	D	1	1,4	14,14,15	0.76	0	17,19,21	0.94	0
4	NAG	D	2	4	14,14,15	0.73	0	17,19,21	0.84	0
4	BMA	D	3	4	11,11,12	0.87	0	15,15,17	2.06	3 (20%)
2	NAG	E	1	1,2	14,14,15	0.74	0	17,19,21	0.88	0
2	NAG	E	2	2	14,14,15	0.73	0	17,19,21	0.85	0
5	PA1	F	1	12,5	11,11,12	0.54	0	12,15,17	0.87	0
5	MAN	F	2	5	11,11,12	0.42	0	15,15,17	0.46	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
2	NAG	B	1	1,2	-	0/6/23/26	0/1/1/1
2	NAG	B	2	2	-	0/6/23/26	0/1/1/1
3	NAG	C	1	3,1	-	0/6/23/26	0/1/1/1
3	NAG	C	2	3	-	0/6/23/26	0/1/1/1
3	BMA	C	3	3	-	1/2/19/22	0/1/1/1
3	MAN	C	4	3	-	1/2/19/22	0/1/1/1
3	MAN	C	5	3	-	0/2/19/22	0/1/1/1
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	BMA	D	3	4	-	0/2/19/22	0/1/1/1
2	NAG	E	1	1,2	-	2/6/23/26	0/1/1/1
2	NAG	E	2	2	-	0/6/23/26	0/1/1/1
5	PA1	F	1	12,5	-	0/2/19/22	0/1/1/1
5	MAN	F	2	5	-	1/2/19/22	1/1/1/1

There are no bond length outliers.

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	C	3	BMA	C1-O5-C5	7.34	122.13	112.19
3	C	4	MAN	C1-O5-C5	6.40	120.87	112.19
4	D	3	BMA	C1-O5-C5	6.02	120.35	112.19
3	C	3	BMA	C3-C4-C5	3.03	115.65	110.24
3	C	5	MAN	C1-O5-C5	2.89	116.11	112.19
4	D	3	BMA	C3-C4-C5	2.34	114.42	110.24
3	C	3	BMA	O4-C4-C3	-2.34	104.94	110.35
3	C	3	BMA	O3-C3-C2	-2.28	105.64	109.99
4	D	3	BMA	C2-C3-C4	2.21	114.73	110.89
3	C	3	BMA	C2-C3-C4	2.10	114.53	110.89
3	C	2	NAG	O5-C1-C2	-2.03	108.08	111.29
3	C	3	BMA	O3-C3-C4	2.01	115.00	110.35

There are no chirality outliers.

All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	E	1	NAG	C8-C7-N2-C2
2	E	1	NAG	O7-C7-N2-C2
5	F	2	MAN	O5-C5-C6-O6
3	C	4	MAN	O5-C5-C6-O6
3	C	3	BMA	O5-C5-C6-O6

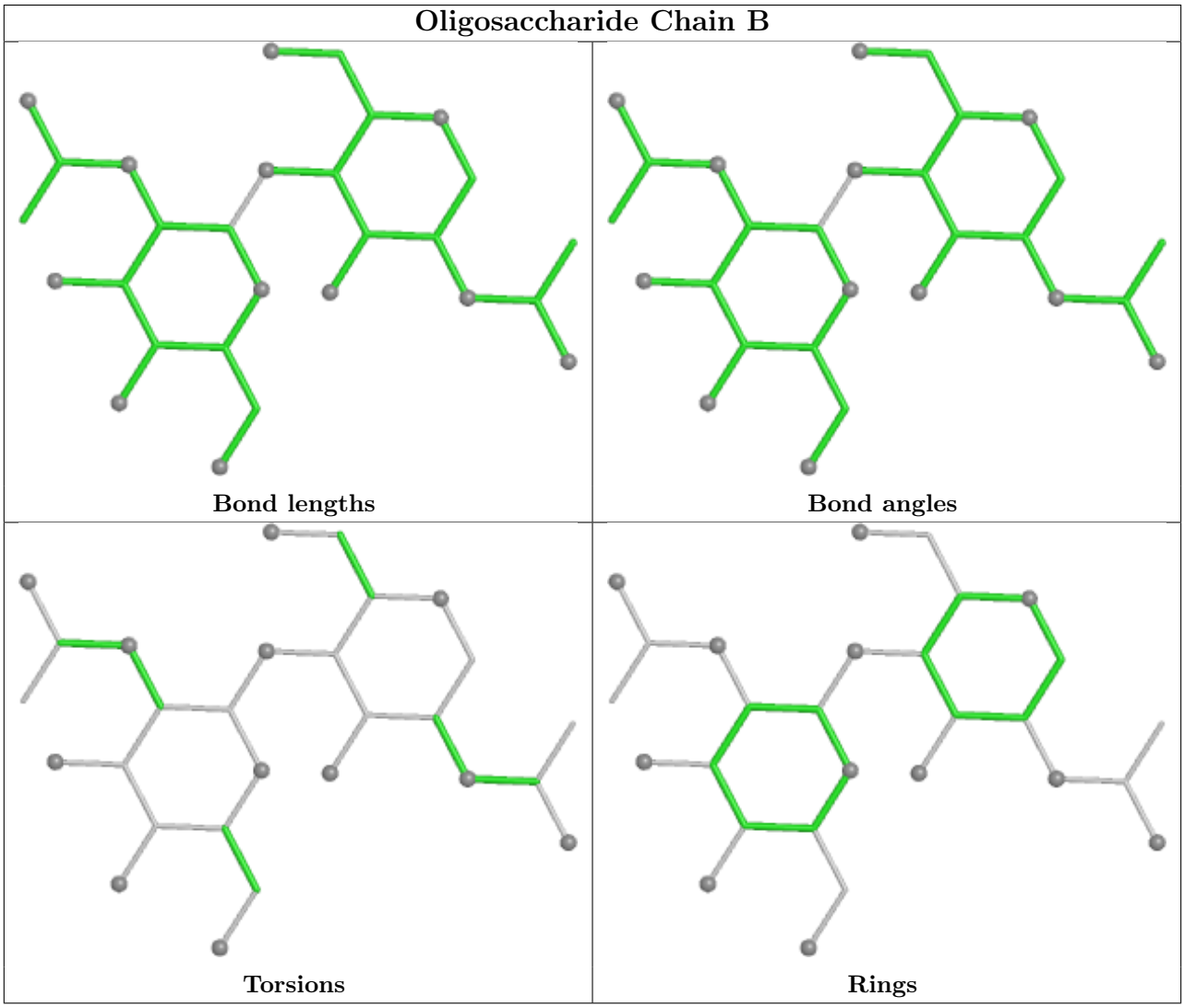
All (1) ring outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	F	2	MAN	C1-C2-C3-C4-C5-O5

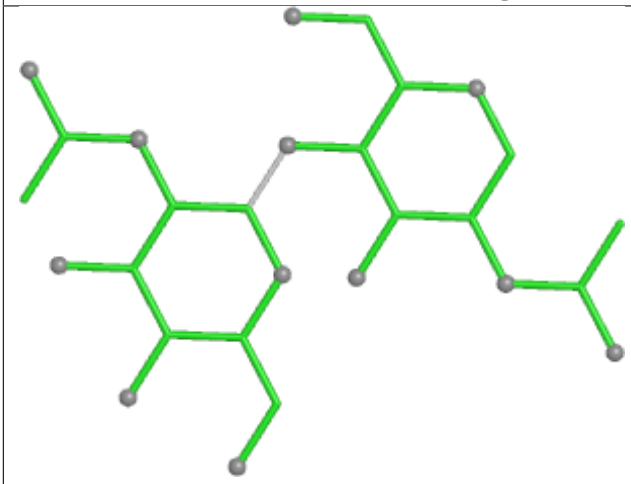
1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	F	2	MAN	1	0

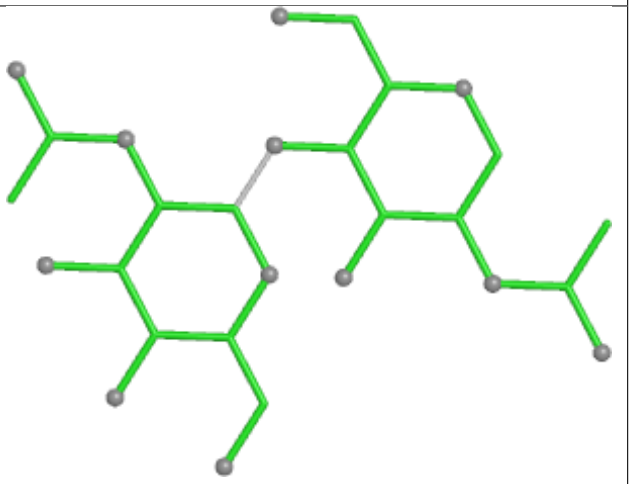
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.



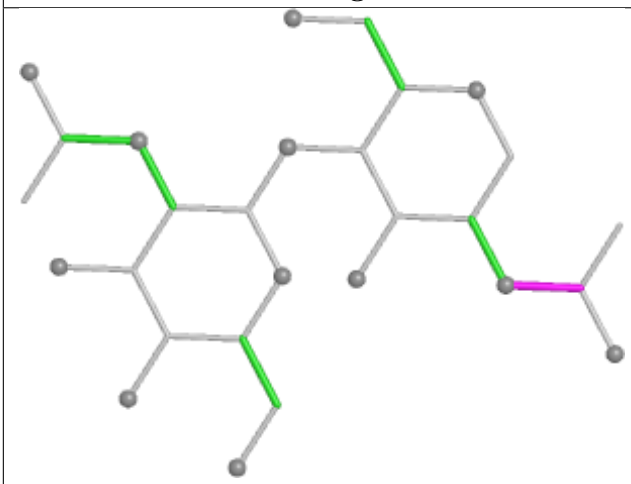
Oligosaccharide Chain E



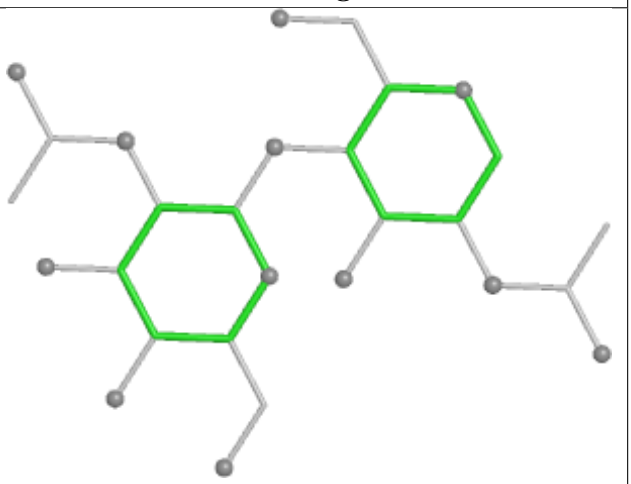
Bond lengths



Bond angles

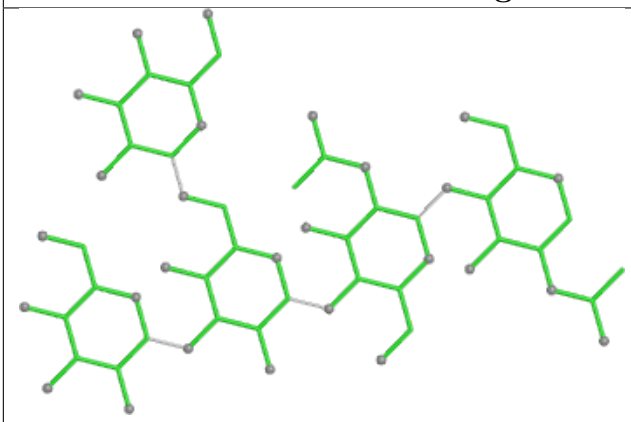


Torsions

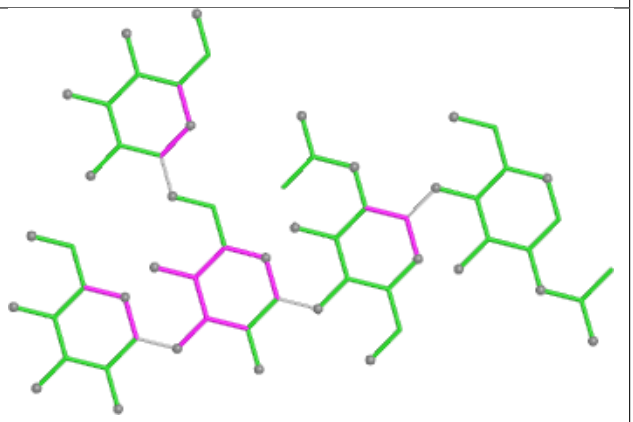


Rings

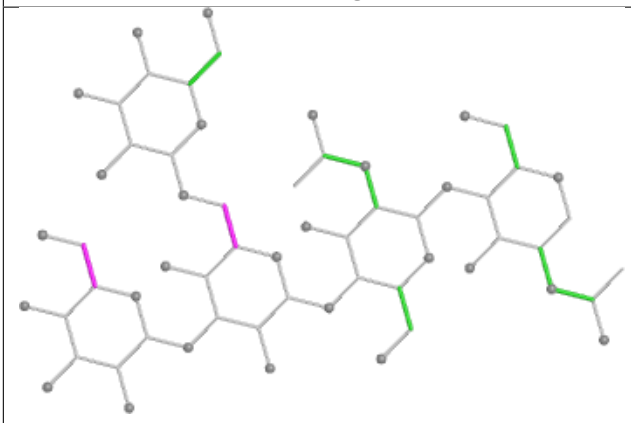
Oligosaccharide Chain C



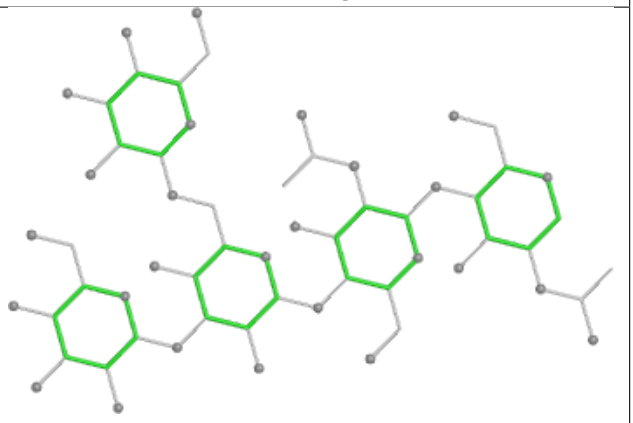
Bond lengths



Bond angles

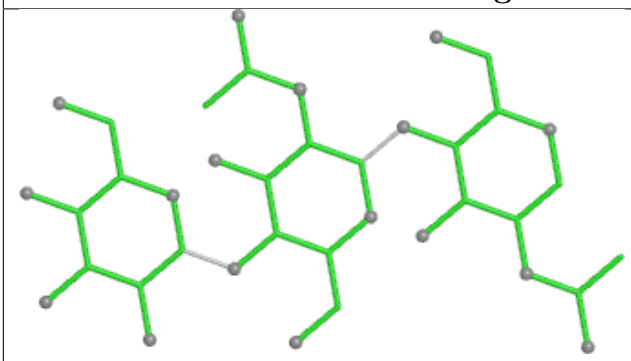


Torsions

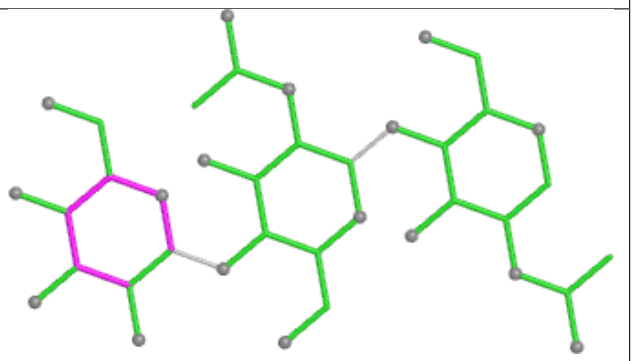


Rings

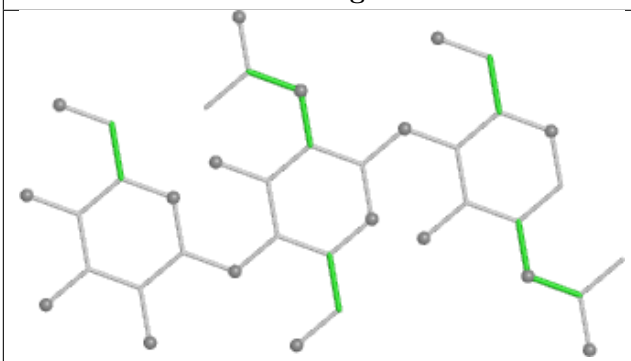
Oligosaccharide Chain D



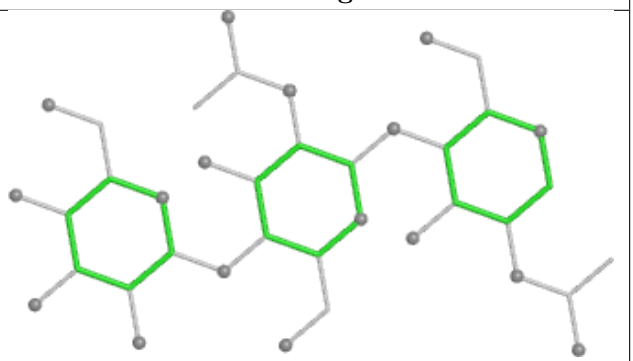
Bond lengths



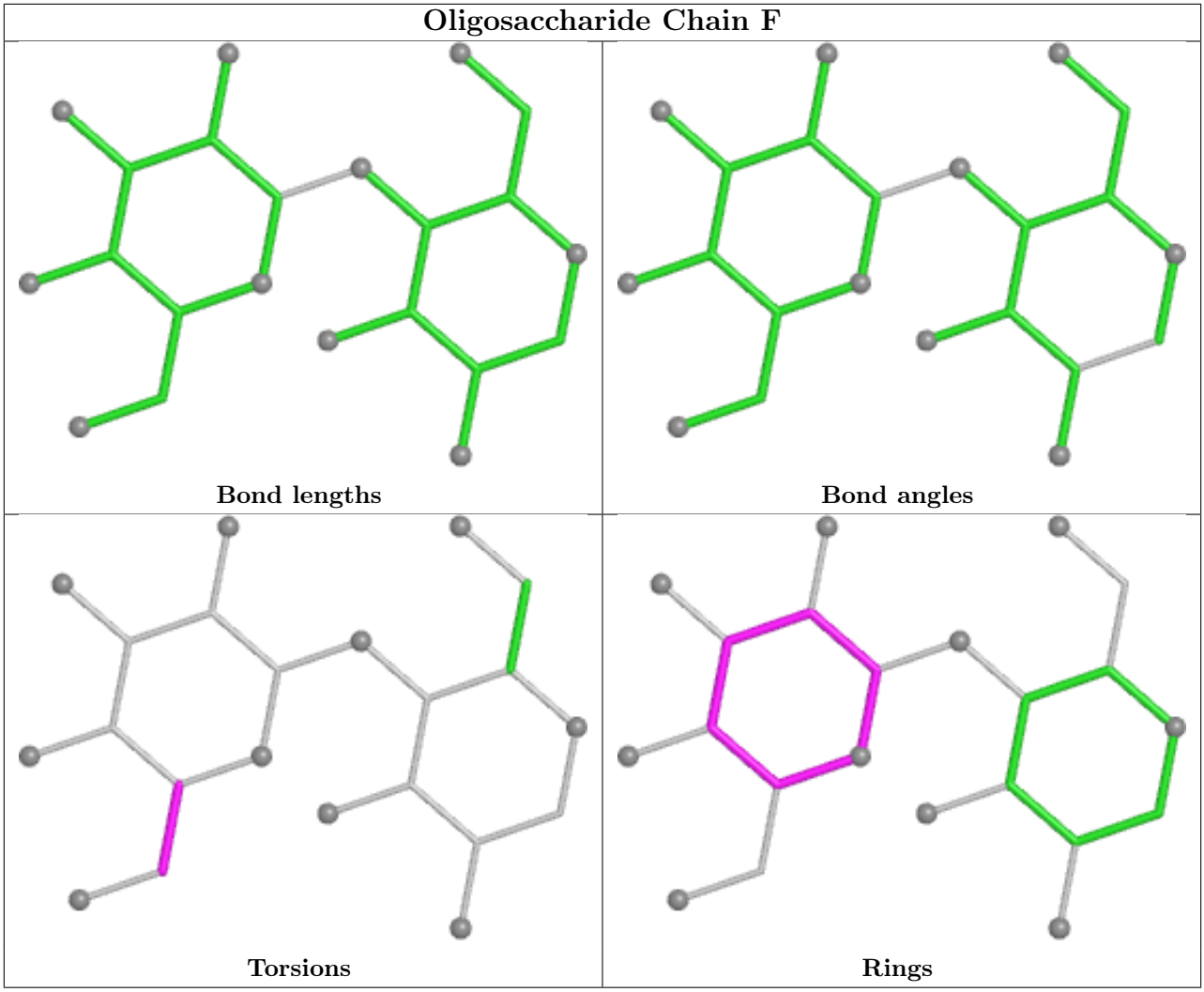
Bond angles



Torsions



Rings



5.6 Ligand geometry

Of 12 ligands modelled in this entry, 2 are monoatomic - leaving 10 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
7	OPE	A	1102	11	7,7,7	0.63	0	9,9,9	1.09	0
8	R16	A	1104	-	15,15,15	0.14	0	14,14,14	0.16	0
8	R16	A	1106	-	15,15,15	0.15	0	14,14,14	0.13	0
12	A1FAL	A	1112	5	50,50,50	0.33	0	59,62,62	0.51	1 (1%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
8	R16	A	1103	-	15,15,15	0.17	0	14,14,14	0.13	0
9	C14	A	1105	-	13,13,13	0.15	0	12,12,12	0.12	0
9	C14	A	1108	-	13,13,13	0.16	0	12,12,12	0.10	0
10	Y01	A	1109	-	38,38,38	0.16	0	57,57,57	0.21	0
6	AV0	A	1101	-	72,72,72	0.12	0	96,98,98	0.28	0
8	R16	A	1107	-	15,15,15	0.13	0	14,14,14	0.16	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
7	OPE	A	1102	11	-	3/5/5/5	-
8	R16	A	1104	-	-	0/13/13/13	-
8	R16	A	1106	-	-	3/13/13/13	-
12	A1FAL	A	1112	5	-	25/46/70/70	0/1/1/1
8	R16	A	1103	-	-	6/13/13/13	-
9	C14	A	1105	-	-	1/11/11/11	-
9	C14	A	1108	-	-	1/11/11/11	-
10	Y01	A	1109	-	-	7/19/77/77	0/4/4/4
6	AV0	A	1101	-	-	5/50/130/130	0/4/4/4
8	R16	A	1107	-	-	4/13/13/13	-

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
12	A	1112	A1FAL	C24-C26-C68	2.19	114.67	109.68

There are no chirality outliers.

All (55) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
7	A	1102	OPE	CA-O4-P-O1
7	A	1102	OPE	CA-O4-P-O2
7	A	1102	OPE	CA-O4-P-O3
10	A	1109	Y01	CAV-CBC-OAW-CAY
10	A	1109	Y01	OAG-CAY-OAW-CBC

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Mol	Chain	Res	Type	Atoms
10	A	1109	Y01	CAM-CAY-OAW-CBC
12	A	1112	A1FAL	O71-C72-C73-O74
12	A	1112	A1FAL	C68-O69-P70-OB7
12	A	1112	A1FAL	C99-C98-O97-C96
12	A	1112	A1FAL	C98-C99-CA0-CA1
12	A	1112	A1FAL	C7-C8-C9-C10
6	A	1101	AV0	CBI-CBK-CBQ-CCM
12	A	1112	A1FAL	C75-C76-C77-C78
12	A	1112	A1FAL	O97-C98-C99-CA0
8	A	1107	R16	C35-C36-C37-C38
12	A	1112	A1FAL	C76-C77-C78-C79
10	A	1109	Y01	CAN-CAJ-CAO-CBB
9	A	1105	C14	C05-C06-C07-C08
12	A	1112	A1FAL	C10-C11-C12-C13
9	A	1108	C14	C08-C09-C10-C11
12	A	1112	A1FAL	C99-CA0-CA1-CA2
8	A	1106	R16	C28-C29-C30-C31
8	A	1107	R16	C34-C35-C36-C37
12	A	1112	A1FAL	C6-C7-C8-C9
6	A	1101	AV0	OAJ-CBN-CCD-OBZ
6	A	1101	AV0	OAI-CBM-CCC-OBY
12	A	1112	A1FAL	C5-C6-C7-C8
8	A	1103	R16	C35-C36-C37-C38
12	A	1112	A1FAL	C68-O69-P70-OB6
12	A	1112	A1FAL	C80-C81-C82-C83
12	A	1112	A1FAL	C9-C10-C11-C12
12	A	1112	A1FAL	C73-C72-O71-P70
12	A	1112	A1FAL	O74-C75-C76-C77
12	A	1112	A1FAL	C82-C83-C84-C85
12	A	1112	A1FAL	C68-O69-P70-O71
12	A	1112	A1FAL	C11-C10-C9-C8
8	A	1103	R16	C27-C28-C29-C30
8	A	1107	R16	C37-C38-C39-C40
12	A	1112	A1FAL	C11-C12-C13-C14
12	A	1112	A1FAL	O71-C72-C73-C96
8	A	1103	R16	C33-C34-C35-C36
8	A	1103	R16	C31-C32-C33-C34
12	A	1112	A1FAL	C72-O71-P70-O69
10	A	1109	Y01	CAR-CBC-OAW-CAY
8	A	1103	R16	C38-C39-C40-C41
12	A	1112	A1FAL	O74-C73-C96-O97
8	A	1103	R16	C37-C38-C39-C40

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Mol	Chain	Res	Type	Atoms
6	A	1101	AV0	CCF-CCQ-OCB-CCS
8	A	1106	R16	C34-C35-C36-C37
8	A	1106	R16	C37-C38-C39-C40
6	A	1101	AV0	CCH-CCQ-OCB-CCS
8	A	1107	R16	C36-C37-C38-C39
12	A	1112	A1FAL	O95-C75-C76-C77
10	A	1109	Y01	CAM-CAL-CAX-OAH
10	A	1109	Y01	CAM-CAL-CAX-OAF

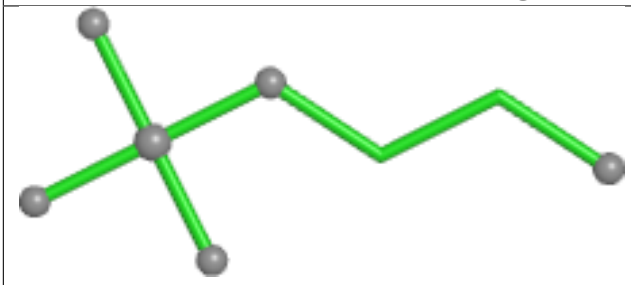
There are no ring outliers.

6 monomers are involved in 14 short contacts:

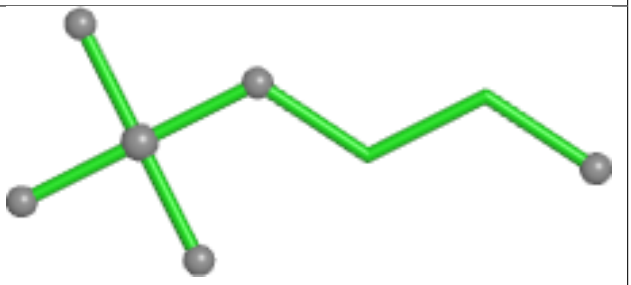
Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	A	1102	OPE	3	0
8	A	1106	R16	5	0
9	A	1105	C14	2	0
9	A	1108	C14	1	0
10	A	1109	Y01	1	0
8	A	1107	R16	4	0

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

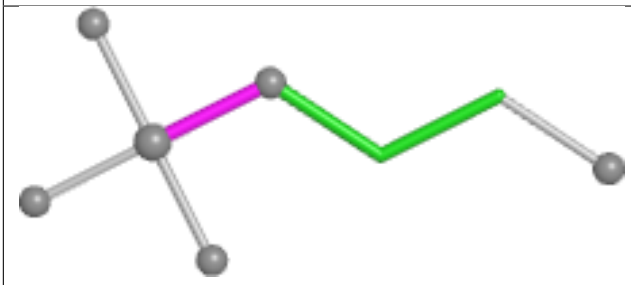
Ligand OPE A 1102



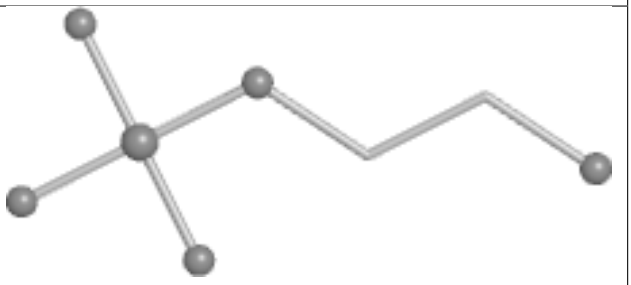
Bond lengths



Bond angles

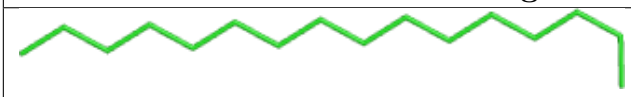


Torsions

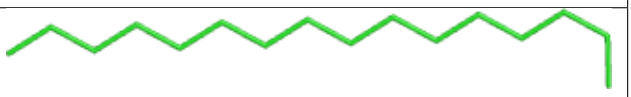


Rings

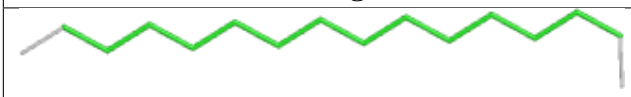
Ligand R16 A 1104



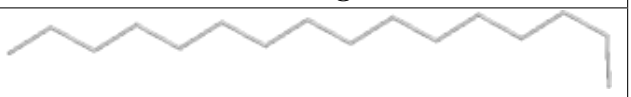
Bond lengths



Bond angles

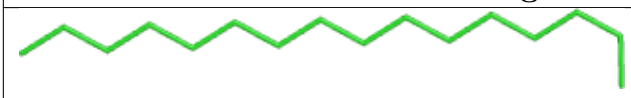


Torsions

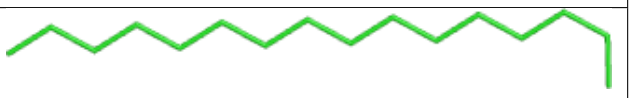


Rings

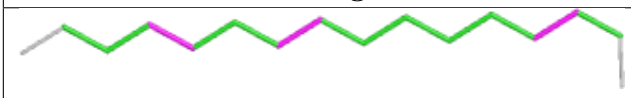
Ligand R16 A 1106



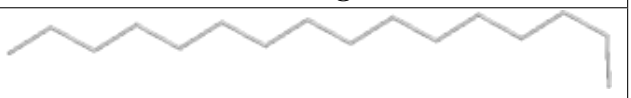
Bond lengths



Bond angles

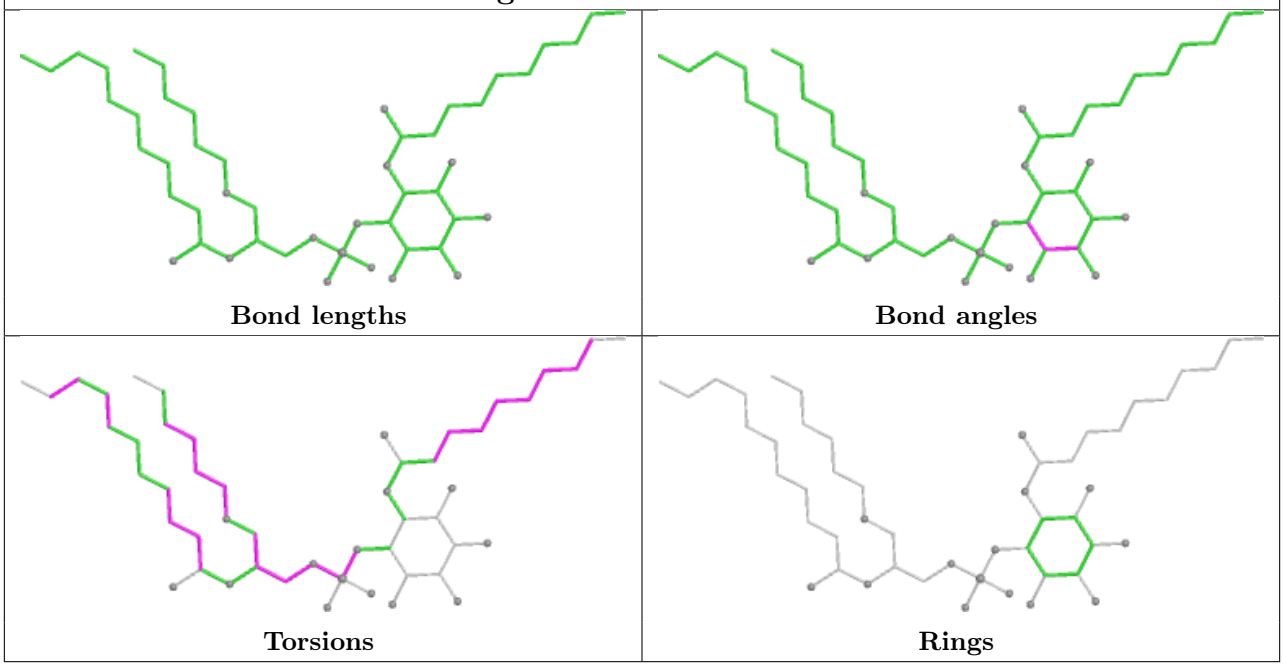


Torsions

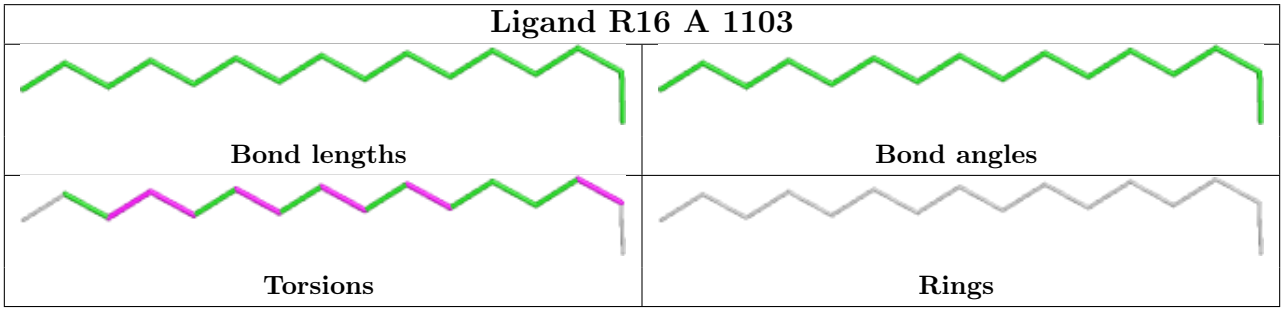


Rings

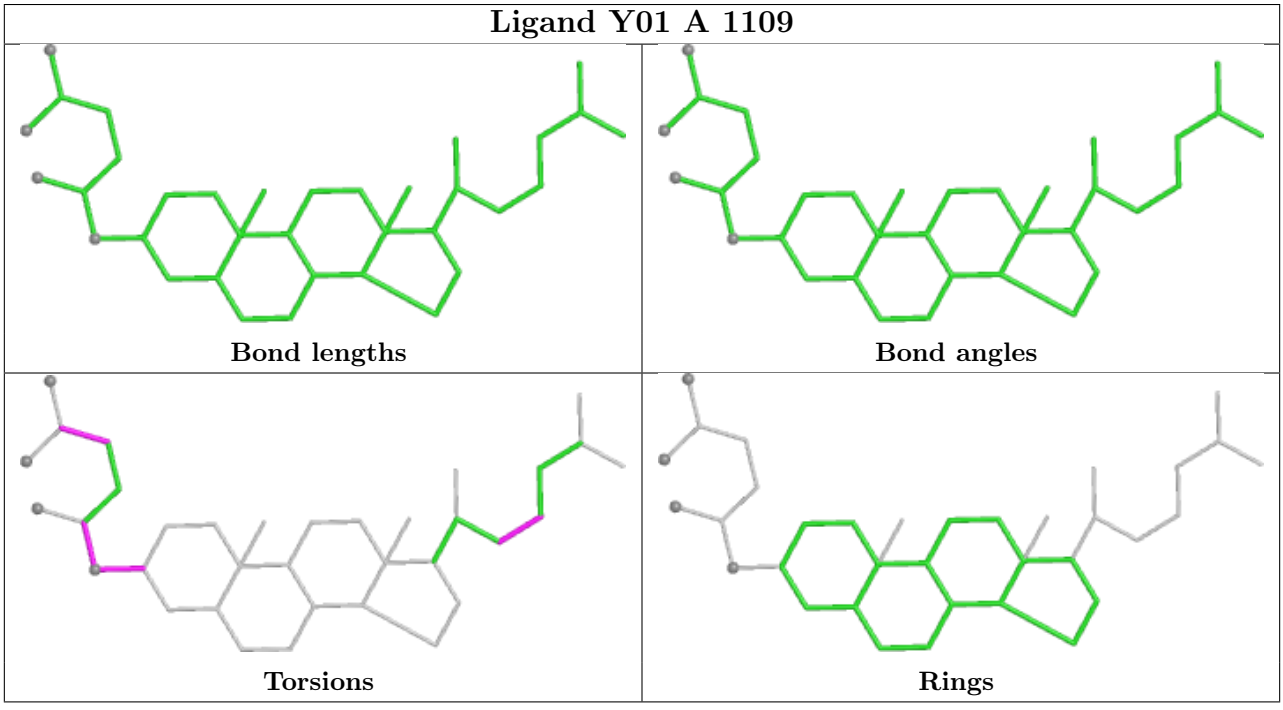
Ligand A1FAL A 1112



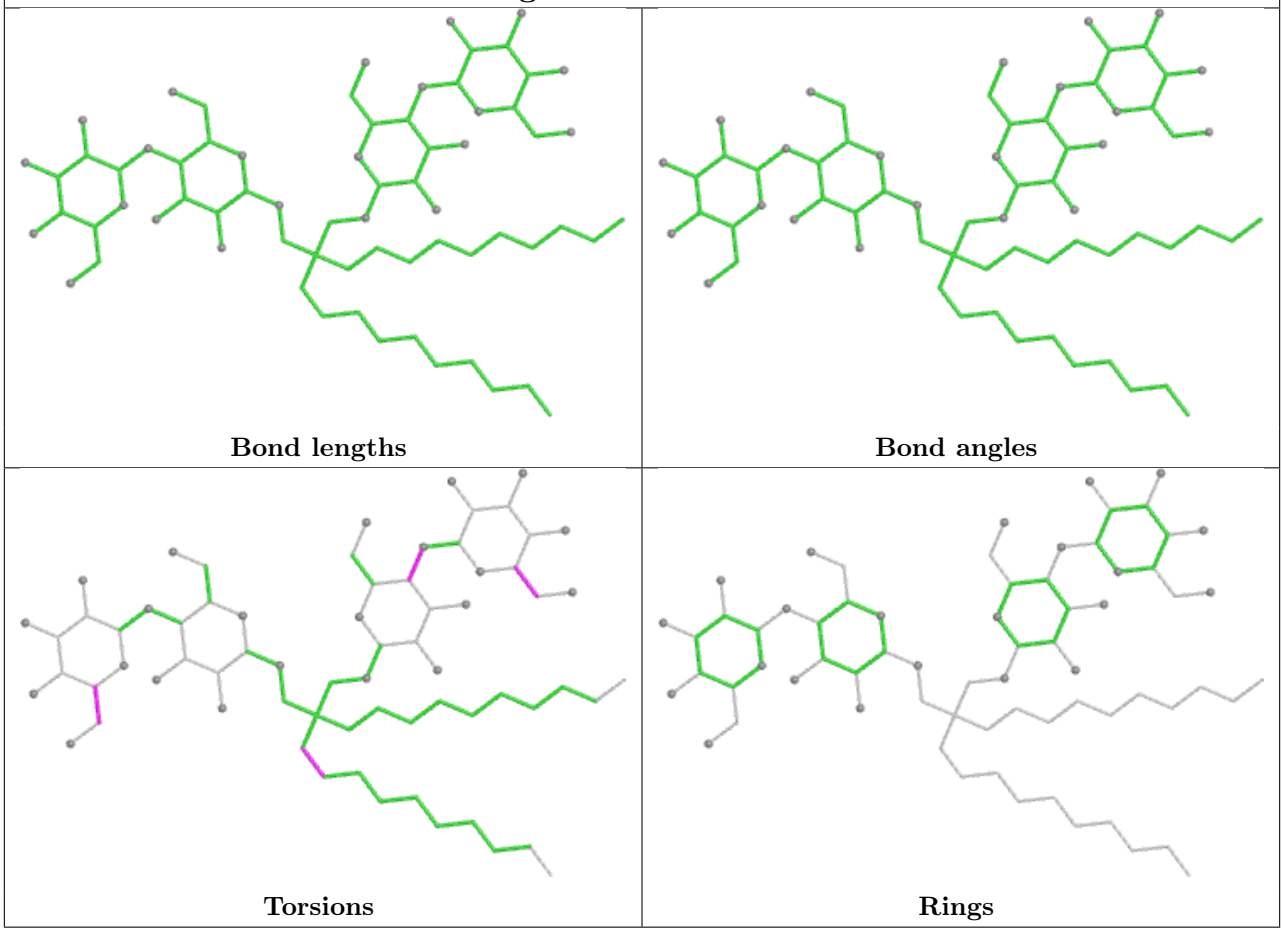
Ligand R16 A 1103



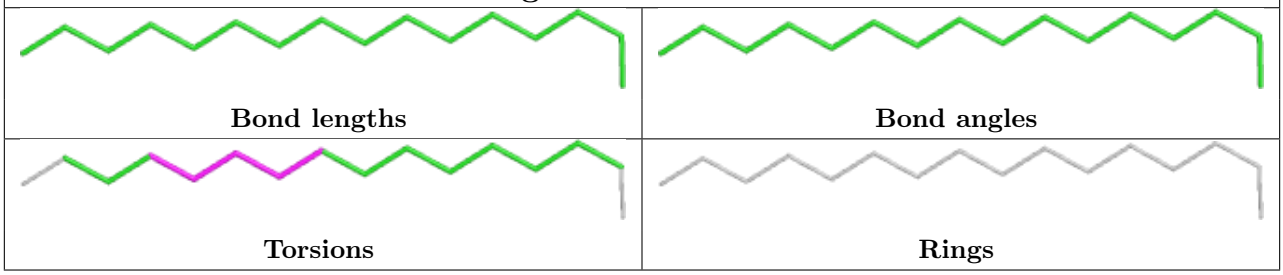
Ligand Y01 A 1109



Ligand AV0 A 1101



Ligand R16 A 1107



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.

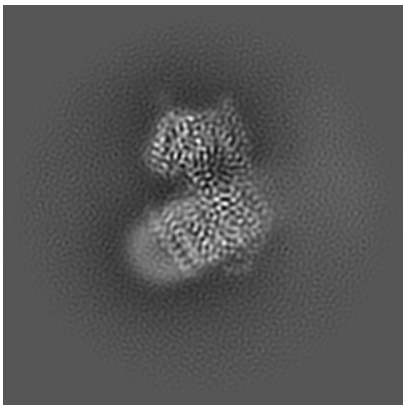
6 Map visualisation

This section contains visualisations of the EMDB entry EMD-69947. These allow visual inspection of the internal detail of the map and identification of artifacts.

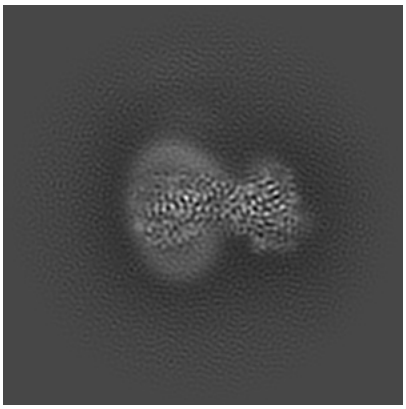
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections

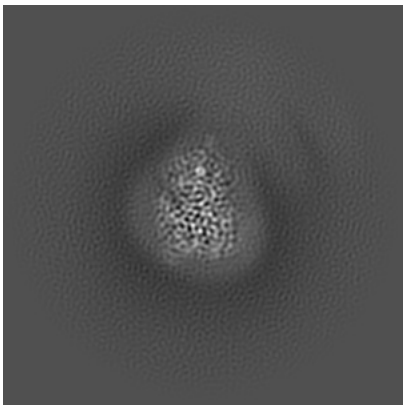
6.1.1 Primary map



X

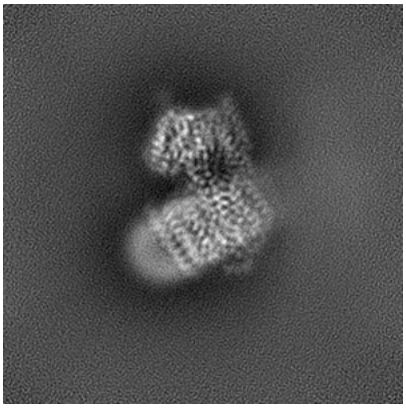


Y

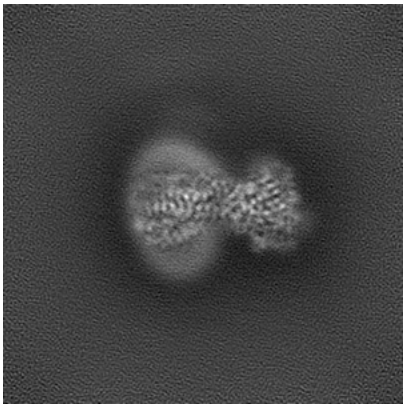


Z

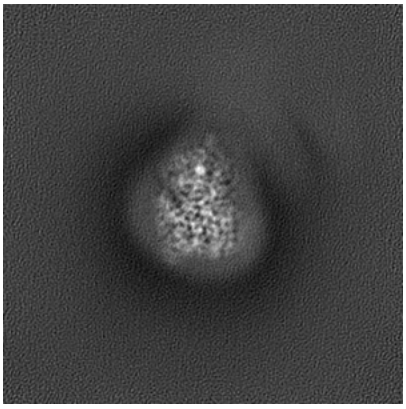
6.1.2 Raw map



X



Y

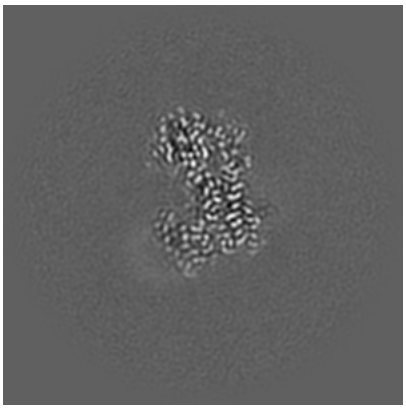


Z

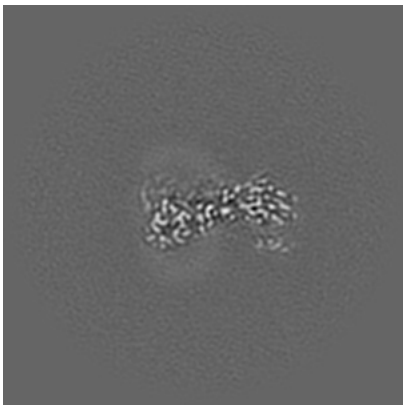
The images above show the map projected in three orthogonal directions.

6.2 Central slices (i)

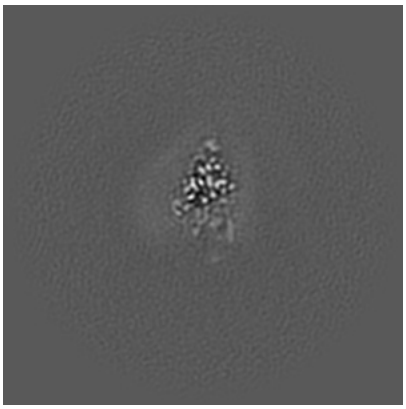
6.2.1 Primary map



X Index: 128

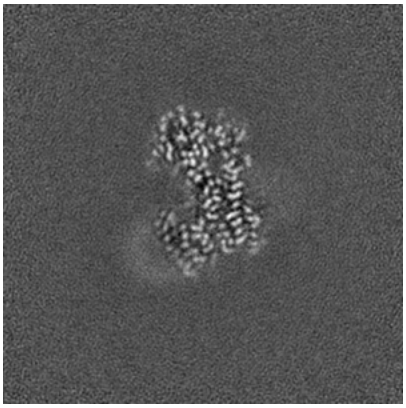


Y Index: 128

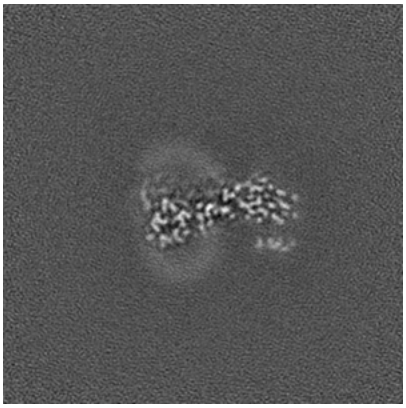


Z Index: 128

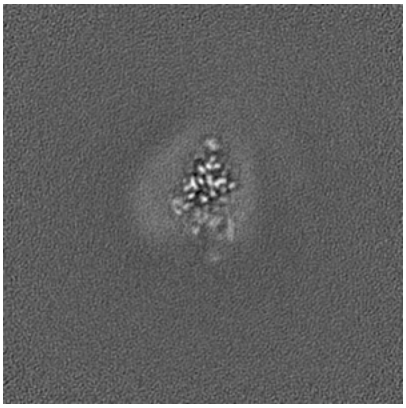
6.2.2 Raw map



X Index: 128



Y Index: 128

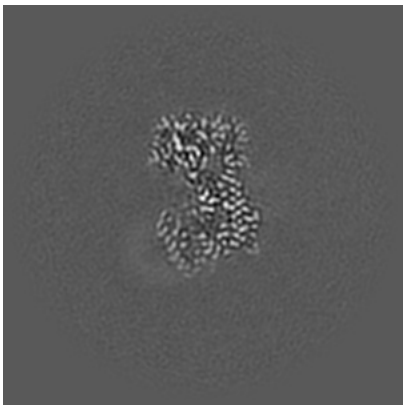


Z Index: 128

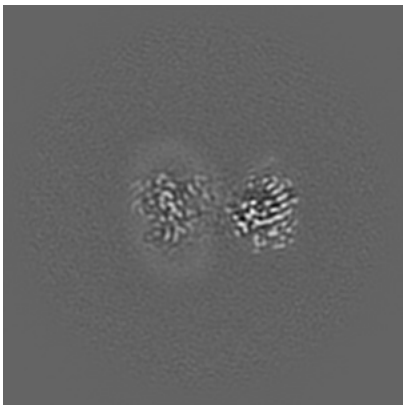
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices (i)

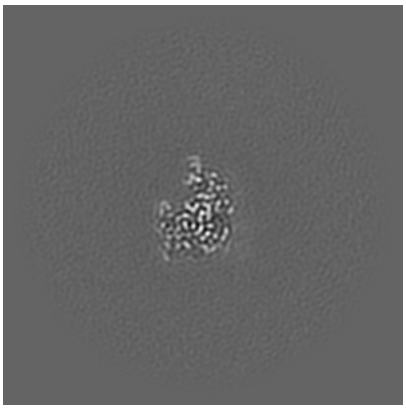
6.3.1 Primary map



X Index: 126

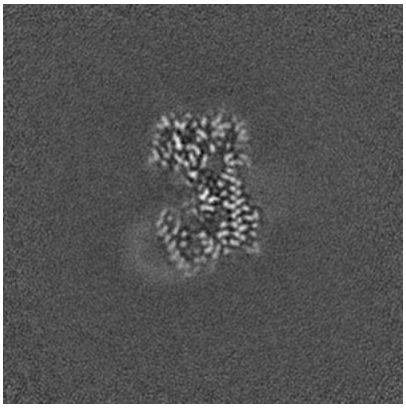


Y Index: 116

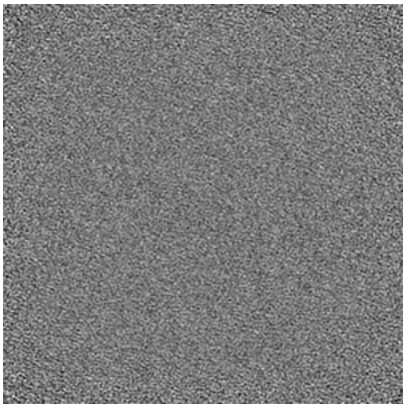


Z Index: 164

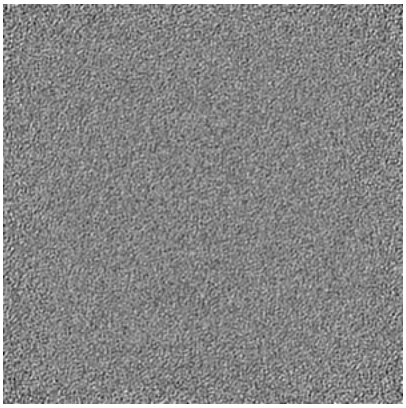
6.3.2 Raw map



X Index: 126



Y Index: 0

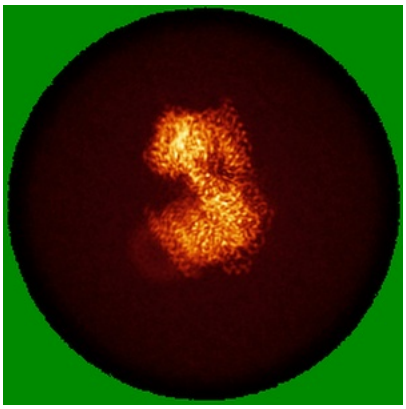


Z Index: 0

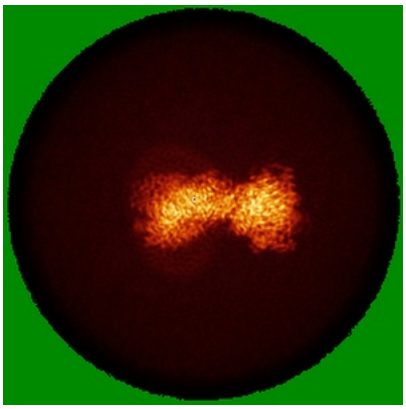
The images above show the largest variance slices of the map in three orthogonal directions.

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

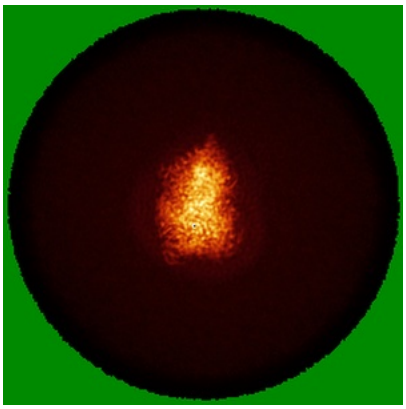
6.4.1 Primary map



X

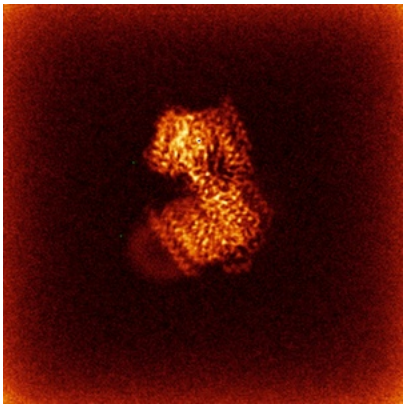


Y

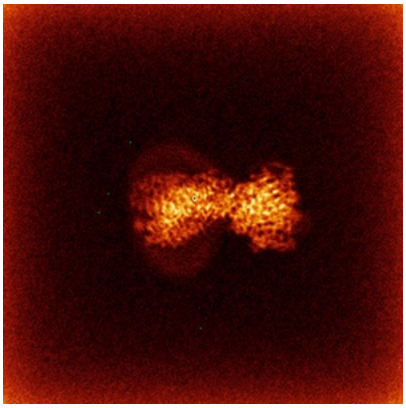


Z

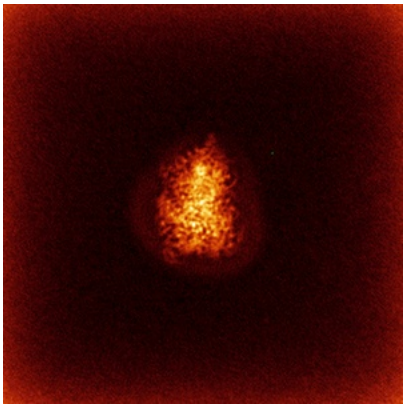
6.4.2 Raw map



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



X Y Z

The images above show the 3D surface view of the map at the recommended contour level 0.0586. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 Raw map



X Y Z

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

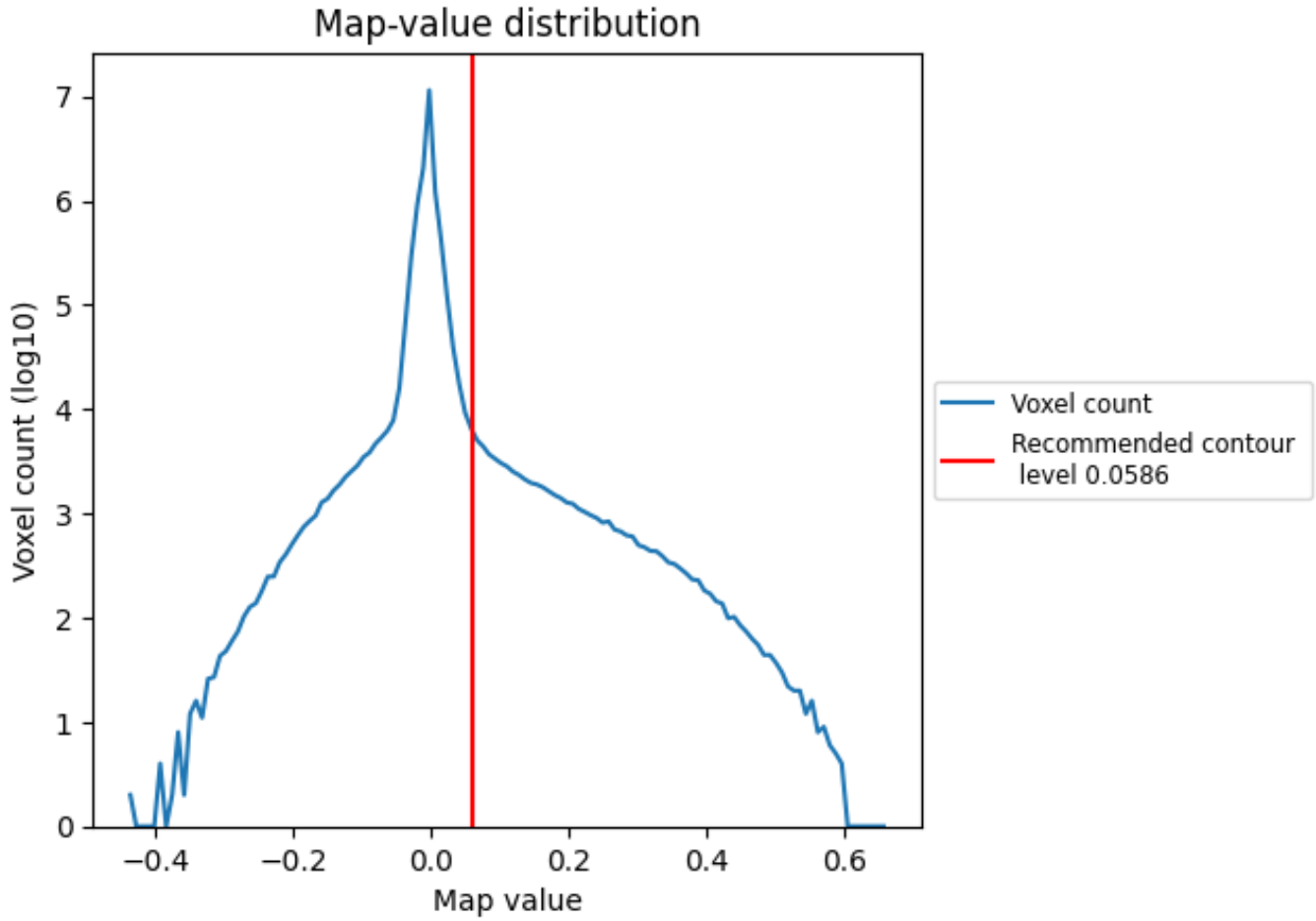
6.6 Mask visualisation (i)

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

7 Map analysis

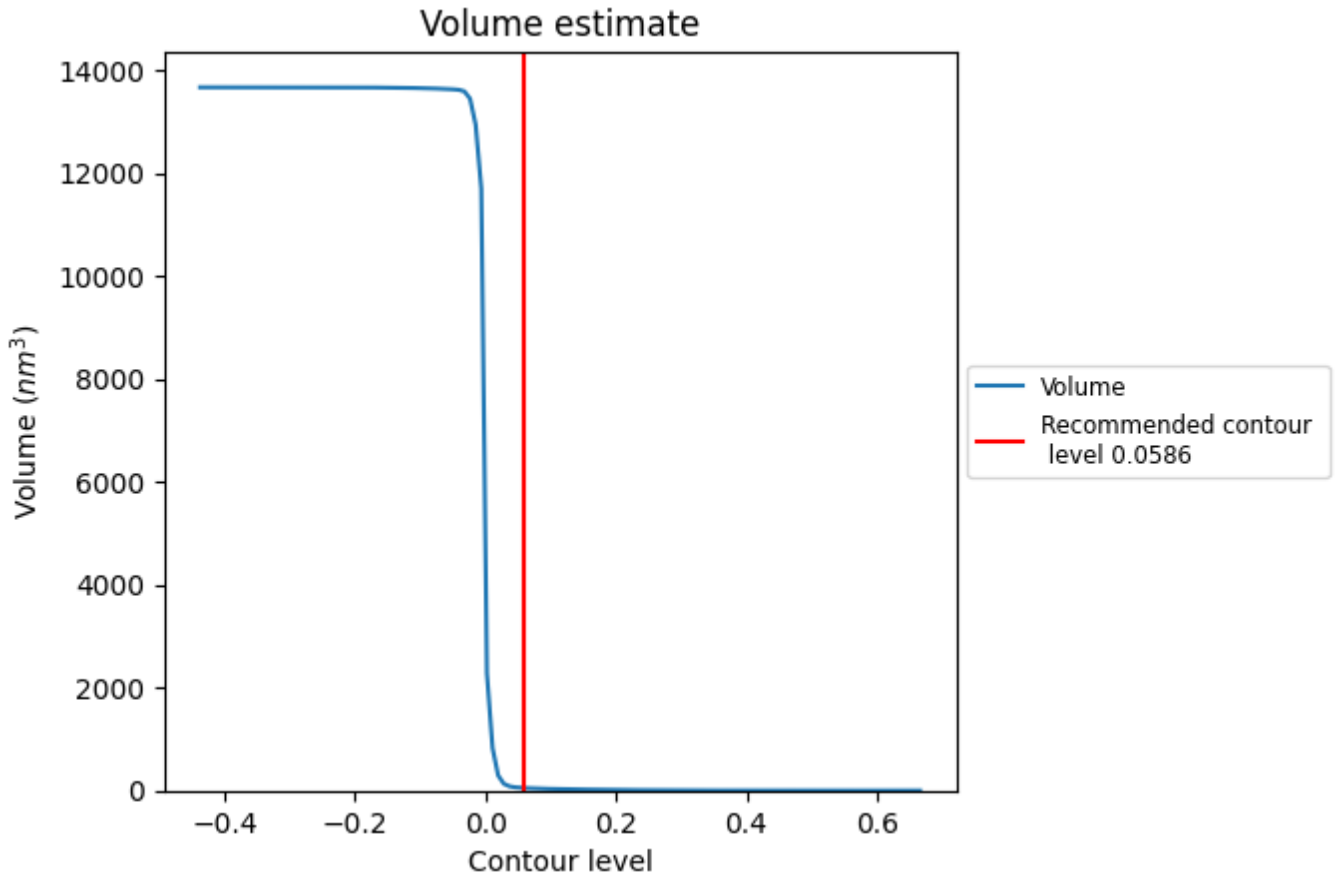
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution



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

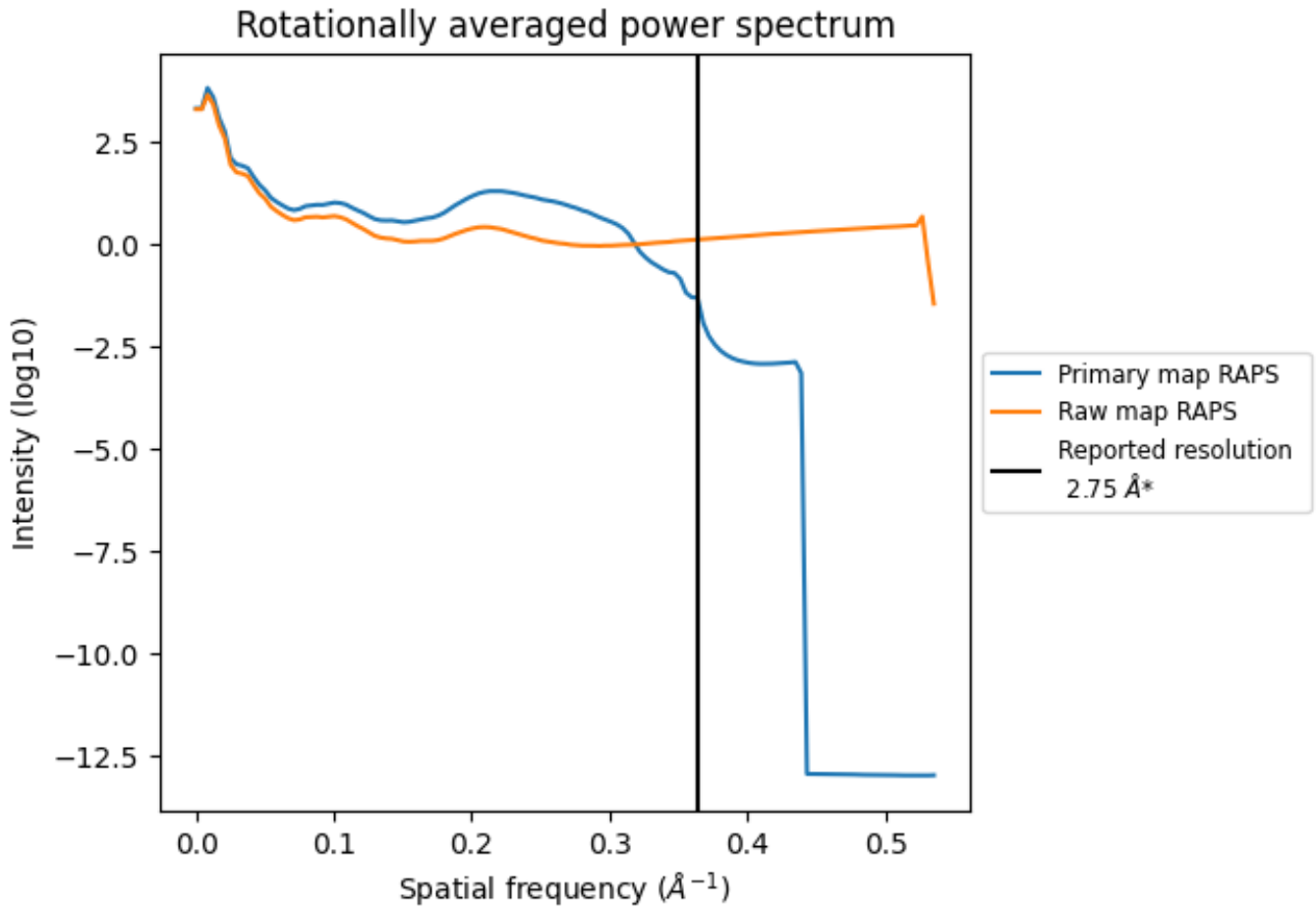
7.2 Volume estimate (i)



The volume at the recommended contour level is 51 nm^3; this corresponds to an approximate mass of 46 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)

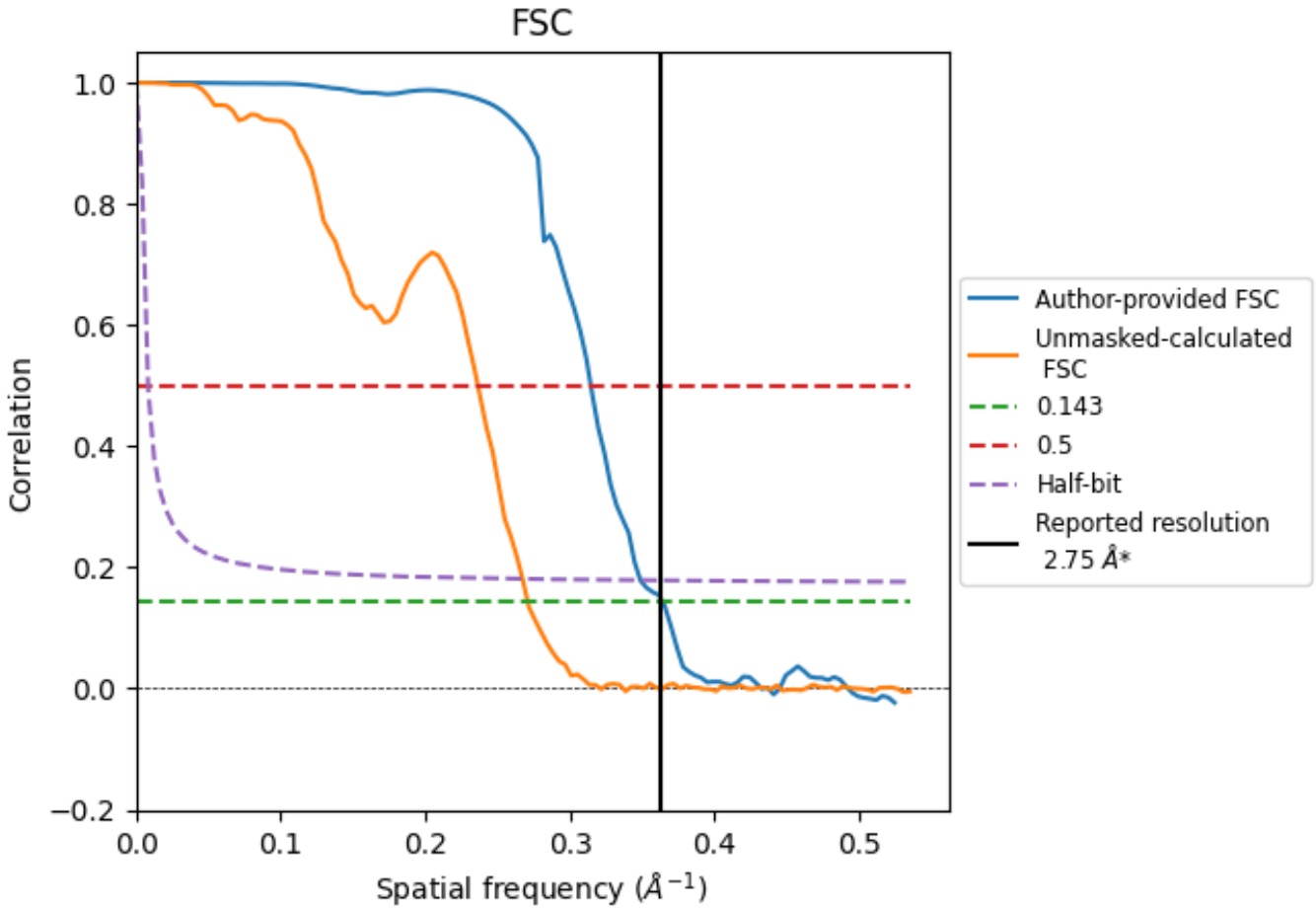


*Reported resolution corresponds to spatial frequency of 0.364 $Å^{-1}$

8 Fourier-Shell correlation

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



*Reported resolution corresponds to spatial frequency of 0.364 Å^{-1}

8.2 Resolution estimates (i)

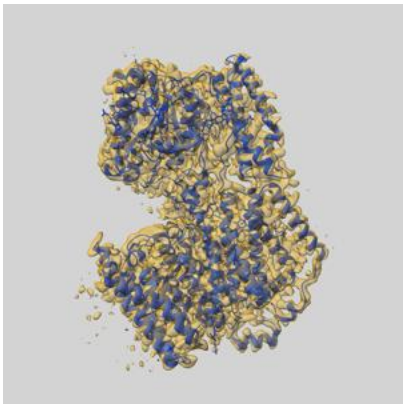
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.75	-	-
Author-provided FSC curve	2.74	3.18	2.86
Unmasked-calculated*	3.69	4.23	3.74

*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 3.69 differs from the reported value 2.75 by more than 10 %

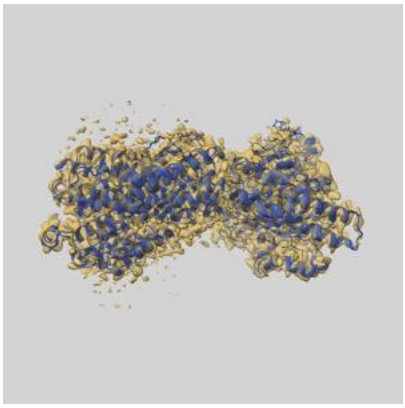
9 Map-model fit

This section contains information regarding the fit between EMDB map EMD-69947 and PDB model 24ZU. Per-residue inclusion information can be found in section 3 on page 11.

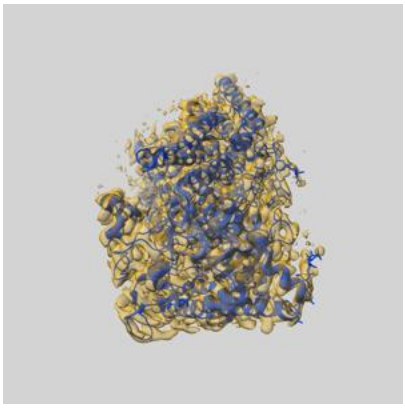
9.1 Map-model overlay



X



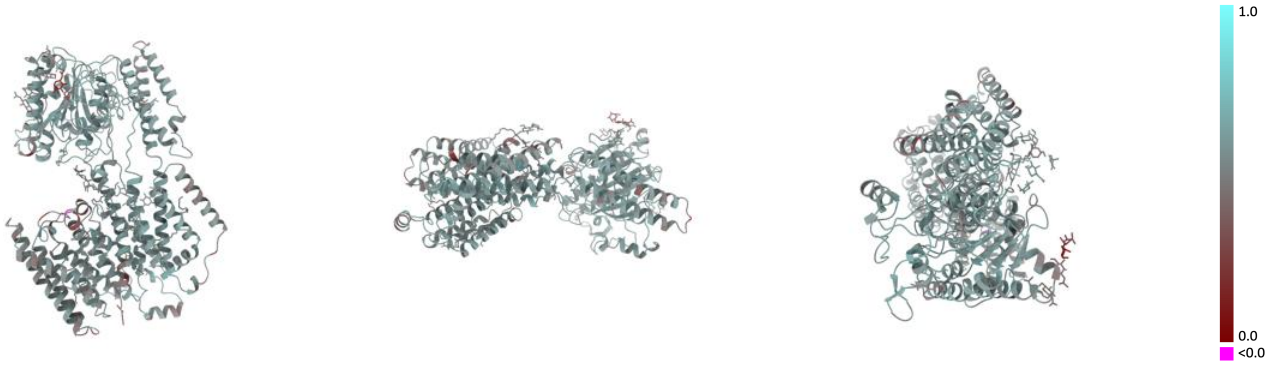
Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.0586 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.

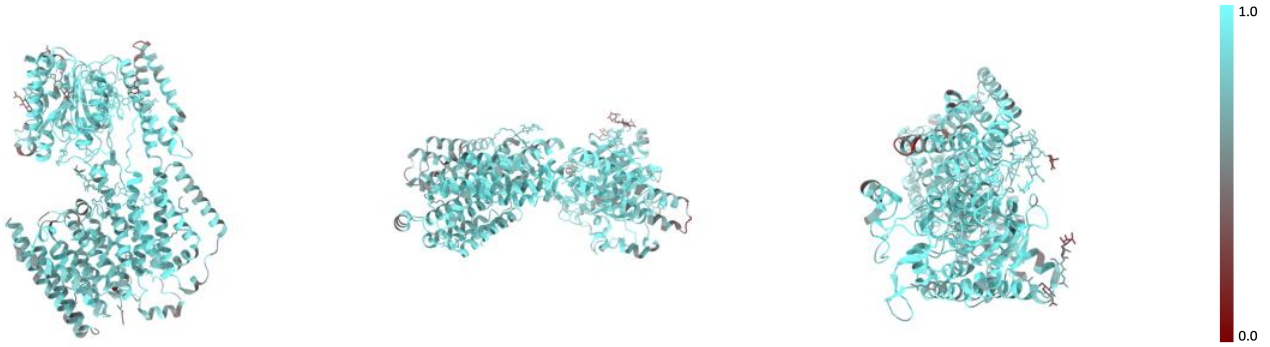
9.2 Q-score mapped to coordinate model (i)



X Y Z

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

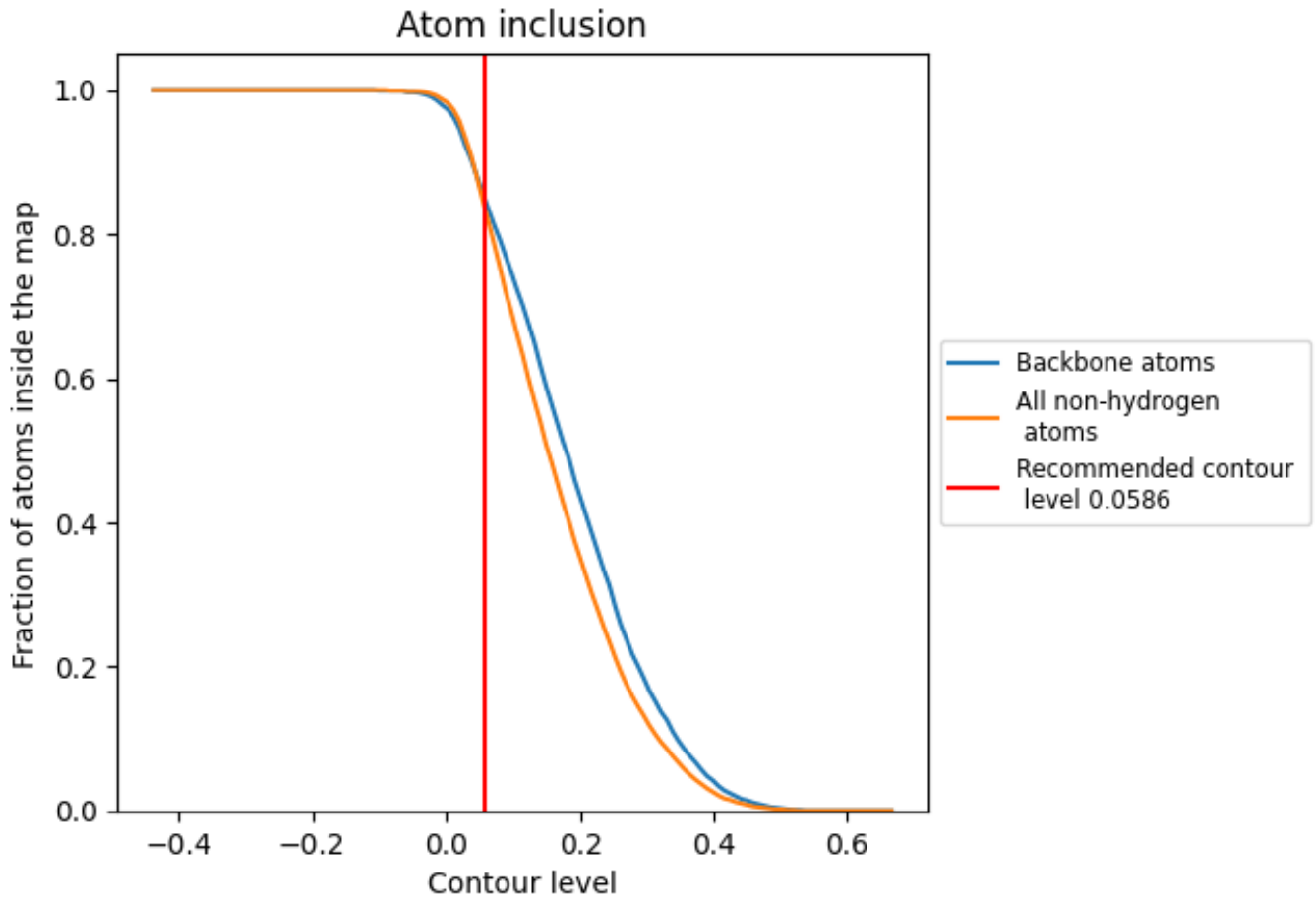
9.3 Atom inclusion mapped to coordinate model (i)



X Y Z

The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.0586).

9.4 Atom inclusion (i)



At the recommended contour level, 85% of all backbone atoms, 83% 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 (0.0586) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.8320	0.5520
A	0.8370	0.5540
B	0.6430	0.5080
C	0.7210	0.5330
D	0.4620	0.2680
E	0.5360	0.4530
F	0.6820	0.4670

