



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 17, 2026 – 10:31 AM UTC

PDB ID : 3SEY / pdb_00003sey
Title : Zn-mediated Polymer of Maltose-binding Protein A216H/K220H by Synthetic Symmetrization (Form II)
Authors : Zhao, M.; Soriaga, A.B.; Laganowsky, A.; Sawaya, M.R.; Cascio, D.; Yeates, T.O.
Deposited on : 2011-06-11
Resolution : 1.85 Å(reported)

This is a Full wwPDB X-ray Structure 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/XrayValidationReportHelp>

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:

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

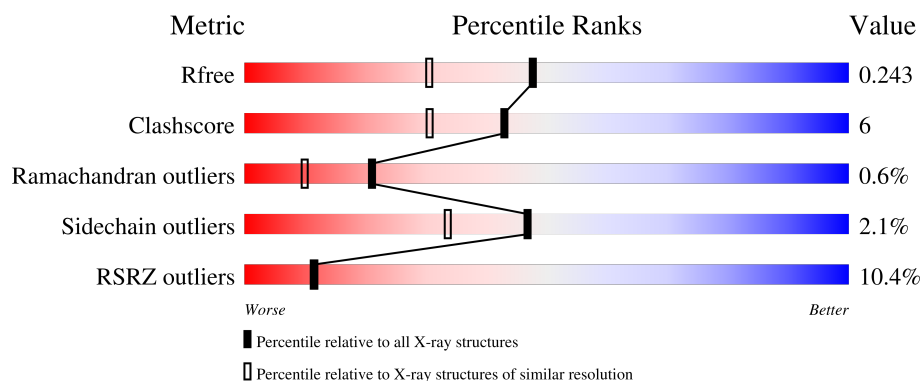
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.85 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)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	3428 (1.86-1.86)
Clashscore	190562	3579 (1.86-1.86)
Ramachandran outliers	187476	3553 (1.86-1.86)
Sidechain outliers	187428	3553 (1.86-1.86)
RSRZ outliers	180081	3429 (1.86-1.86)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower 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 $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	372	5% 89% 9% .
1	C	372	6% 86% 13% .
1	E	372	20% 85% 14% ..
2	B	2	50% 50%
2	D	2	50% 50%

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Mol	Chain	Length	Quality of chain
2	F	2	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	ZN	E	378	-	-	-	X

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 9260 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, 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 Maltose-binding periplasmic protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	371	Total	C	N	O	S	0	4	0
			2879	1852	470	550	7			
1	C	371	Total	C	N	O	S	0	5	0
			2879	1856	470	546	7			
1	E	370	Total	C	N	O	S	0	1	0
			2845	1831	465	543	6			

There are 48 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	MET	-	initiating methionine	UNP P0AEX9
A	216	HIS	ALA	engineered mutation	UNP P0AEX9
A	220	HIS	LYS	engineered mutation	UNP P0AEX9
A	360	ALA	-	expression tag	UNP P0AEX9
A	361	ALA	-	expression tag	UNP P0AEX9
A	362	LEU	-	expression tag	UNP P0AEX9
A	363	ALA	-	expression tag	UNP P0AEX9
A	364	ALA	-	expression tag	UNP P0AEX9
A	365	ALA	-	expression tag	UNP P0AEX9
A	366	GLN	-	expression tag	UNP P0AEX9
A	367	THR	-	expression tag	UNP P0AEX9
A	368	ASN	-	expression tag	UNP P0AEX9
A	369	ALA	-	expression tag	UNP P0AEX9
A	370	ALA	-	expression tag	UNP P0AEX9
A	371	ALA	-	expression tag	UNP P0AEX9
A	372	ALA	-	expression tag	UNP P0AEX9
C	1	MET	-	initiating methionine	UNP P0AEX9
C	216	HIS	ALA	engineered mutation	UNP P0AEX9
C	220	HIS	LYS	engineered mutation	UNP P0AEX9
C	360	ALA	-	expression tag	UNP P0AEX9
C	361	ALA	-	expression tag	UNP P0AEX9
C	362	LEU	-	expression tag	UNP P0AEX9
C	363	ALA	-	expression tag	UNP P0AEX9

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Chain	Residue	Modelled	Actual	Comment	Reference
C	364	ALA	-	expression tag	UNP P0AEX9
C	365	ALA	-	expression tag	UNP P0AEX9
C	366	GLN	-	expression tag	UNP P0AEX9
C	367	THR	-	expression tag	UNP P0AEX9
C	368	ASN	-	expression tag	UNP P0AEX9
C	369	ALA	-	expression tag	UNP P0AEX9
C	370	ALA	-	expression tag	UNP P0AEX9
C	371	ALA	-	expression tag	UNP P0AEX9
C	372	ALA	-	expression tag	UNP P0AEX9
E	1	MET	-	initiating methionine	UNP P0AEX9
E	216	HIS	ALA	engineered mutation	UNP P0AEX9
E	220	HIS	LYS	engineered mutation	UNP P0AEX9
E	360	ALA	-	expression tag	UNP P0AEX9
E	361	ALA	-	expression tag	UNP P0AEX9
E	362	LEU	-	expression tag	UNP P0AEX9
E	363	ALA	-	expression tag	UNP P0AEX9
E	364	ALA	-	expression tag	UNP P0AEX9
E	365	ALA	-	expression tag	UNP P0AEX9
E	366	GLN	-	expression tag	UNP P0AEX9
E	367	THR	-	expression tag	UNP P0AEX9
E	368	ASN	-	expression tag	UNP P0AEX9
E	369	ALA	-	expression tag	UNP P0AEX9
E	370	ALA	-	expression tag	UNP P0AEX9
E	371	ALA	-	expression tag	UNP P0AEX9
E	372	ALA	-	expression tag	UNP P0AEX9

- Molecule 2 is an oligosaccharide called alpha-D-glucopyranose-(1-4)-alpha-D-glucopyranose.

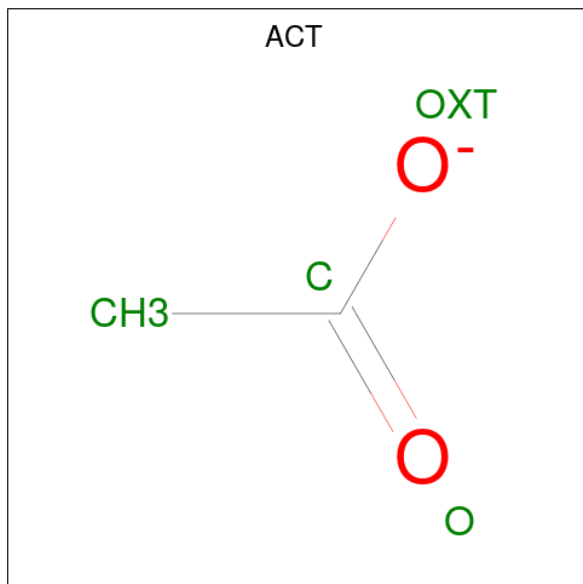


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace
2	B	2	Total	C	O	0	2	0
			23	12	11			
2	D	2	Total	C	O	0	2	0
			23	12	11			
2	F	2	Total	C	O	0	2	0
			46	24	22			

- Molecule 3 is ZINC ION (CCD ID: ZN) (formula: Zn).

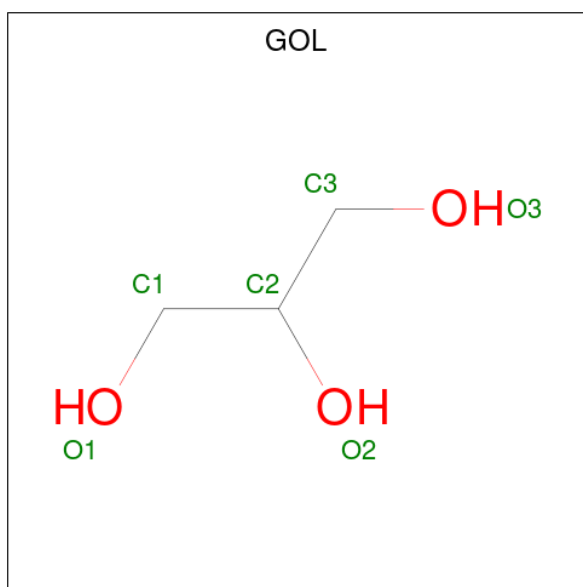
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	10	Total	Zn	0	0
			10	10		
3	C	7	Total	Zn	0	0
			7	7		
3	E	6	Total	Zn	0	0
			6	6		

- Molecule 4 is ACETATE ION (CCD ID: ACT) (formula: $C_2H_3O_2$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			4	2	2		
4	A	1	Total	C	O	0	0
			4	2	2		
4	A	1	Total	C	O	0	0
			4	2	2		
4	C	1	Total	C	O	0	0
			4	2	2		
4	C	1	Total	C	O	0	0
			4	2	2		
4	C	1	Total	C	O	0	0
			4	2	2		
4	C	1	Total	C	O	0	0
			4	2	2		
4	E	1	Total	C	O	0	0
			4	2	2		

- Molecule 5 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	O	0	0
			6	3	3		
5	A	1	Total	C	O	0	0
			6	3	3		
5	A	1	Total	C	O	0	0
			6	3	3		
5	C	1	Total	C	O	0	0
			6	3	3		
5	C	1	Total	C	O	0	0
			6	3	3		

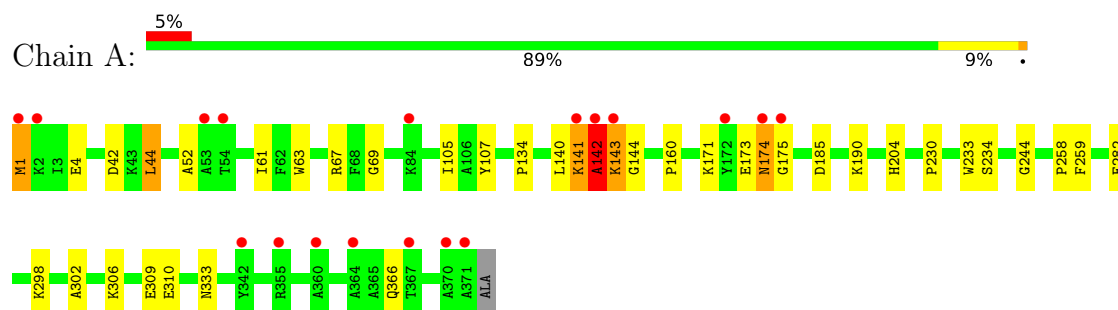
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	220	Total	O	0	0
			220	220		
6	C	200	Total	O	0	0
			200	200		
6	E	60	Total	O	0	0
			60	60		

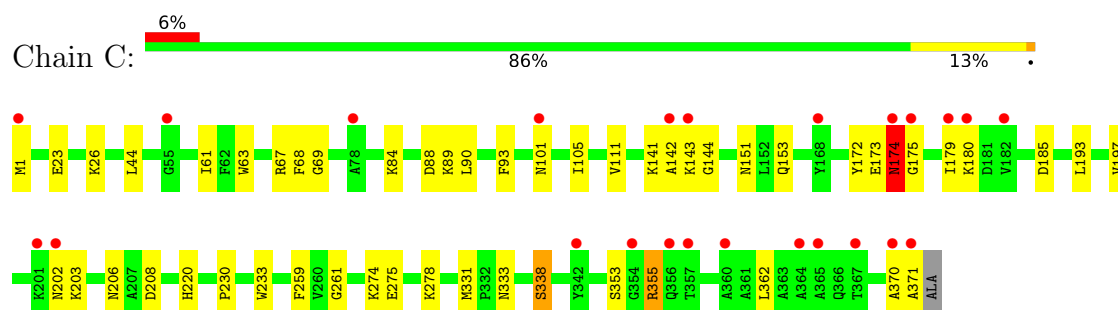
3 Residue-property plots [i](#)

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 electron 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 dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). 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.

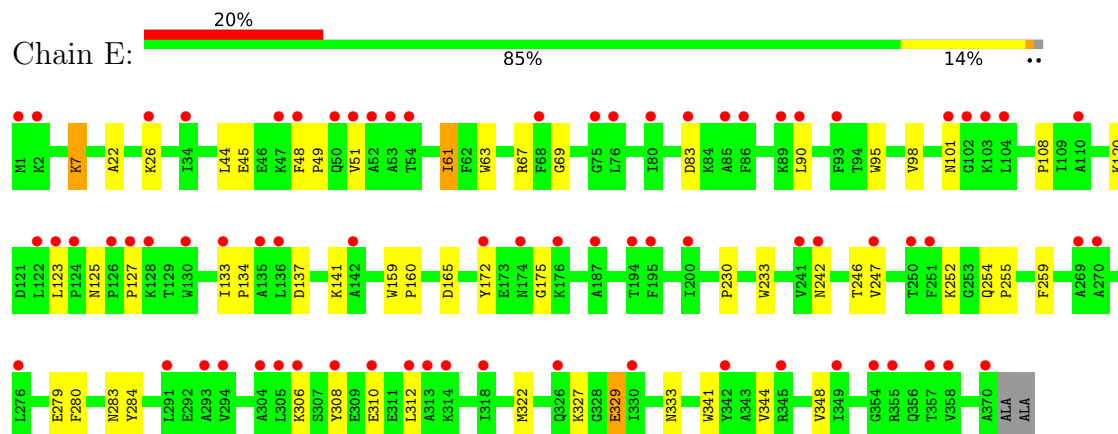
- Molecule 1: Maltose-binding periplasmic protein



- Molecule 1: Maltose-binding periplasmic protein



- Molecule 1: Maltose-binding periplasmic protein



- Molecule 2: alpha-D-glucopyranose-(1-4)-alpha-D-glucopyranose

Chain B:  50% 50%



- Molecule 2: alpha-D-glucopyranose-(1-4)-alpha-D-glucopyranose

Chain D:  50% 50%



- Molecule 2: alpha-D-glucopyranose-(1-4)-alpha-D-glucopyranose

Chain F:  50% 50%



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	100.66Å 63.65Å 221.83Å 90.00° 90.06° 90.00°	Depositor
Resolution (Å)	49.09 – 1.85 49.09 – 1.85	Depositor EDS
% Data completeness (in resolution range)	99.8 (49.09-1.85) 99.8 (49.09-1.85)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.54 (at 1.84Å)	Xtriage
Refinement program	PHENIX 1.7.1_743	Depositor
R, R_{free}	0.208 , 0.247 0.206 , 0.243	Depositor DCC
R_{free} test set	5993 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	22.3	Xtriage
Anisotropy	0.170	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 44.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	0.018 for -h,-k,l	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	9260	wwPDB-VP
Average B, all atoms (Å ²)	31.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.58% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

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: GLC, ZN, ACT, GOL

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	0.51	0/2963	0.77	3/4030 (0.1%)
1	C	0.53	0/2966	0.75	1/4033 (0.0%)
1	E	0.35	0/2919	0.70	2/3973 (0.1%)
All	All	0.47	0/8848	0.74	6/12036 (0.0%)

There are no bond length outliers.

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	E	125	ASN	CA-C-N	6.28	124.18	119.66
1	E	125	ASN	C-N-CA	6.28	124.18	119.66
1	C	174	ASN	N-CA-C	5.63	122.80	110.80
1	A	143	LYS	N-CA-C	5.22	125.62	111.00
1	A	142	ALA	CA-C-N	5.02	130.74	121.70
1	A	142	ALA	C-N-CA	5.02	130.74	121.70

There are no chirality outliers.

There are no planarity outliers.

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	2879	0	2821	38	0
1	C	2879	0	2827	38	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	E	2845	0	2774	32	0
2	B	23	0	21	0	0
2	D	23	0	21	0	0
2	F	46	0	42	1	0
3	A	10	0	0	0	1
3	C	7	0	0	0	1
3	E	6	0	0	0	0
4	A	12	0	9	2	0
4	C	16	0	12	0	1
4	E	4	0	3	1	0
5	A	18	0	24	4	0
5	C	12	0	16	4	0
6	A	220	0	0	6	1
6	C	200	0	0	5	0
6	E	60	0	0	2	0
All	All	9260	0	8570	108	2

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 (108) 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:142:ALA:HA	1:A:144:GLY:H	1.10	1.12
1:A:142:ALA:HA	1:A:144:GLY:N	1.66	1.10
1:A:302:ALA:HB1	5:A:386:GOL:H32	1.43	1.01
1:A:142:ALA:CA	1:A:144:GLY:H	1.80	0.94
1:E:69:GLY:HA3	1:E:333:ASN:O	1.79	0.83
1:E:322:MET:HA	1:E:322:MET:HE2	1.60	0.82
1:A:44:LEU:CD1	1:A:61:ILE:HD11	2.10	0.81
1:C:274:LYS:O	1:C:278[B]:LYS:HG2	1.81	0.80
1:C:174:ASN:N	1:C:175:GLY:HA2	1.97	0.78
1:A:44:LEU:HD13	1:A:61:ILE:HD11	1.65	0.78
1:A:173:GLU:OE1	6:A:402:HOH:O	2.01	0.78
1:C:173:GLU:C	1:C:175:GLY:HA2	2.11	0.76
1:C:278[B]:LYS:HD3	6:C:523:HOH:O	1.84	0.76
1:C:185[B]:ASP:OD2	6:C:476:HOH:O	2.04	0.74
5:C:384:GOL:O2	6:C:559:HOH:O	2.04	0.74
1:A:244:GLY:HA2	5:A:387:GOL:H2	1.71	0.73
1:A:173:GLU:OE2	6:A:401:HOH:O	2.07	0.73
1:C:179:ILE:HG13	1:C:180:LYS:HD2	1.70	0.71

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:44:LEU:CD1	1:C:61:ILE:HD11	2.22	0.69
1:C:69:GLY:HA3	1:C:333:ASN:O	1.92	0.68
1:A:302:ALA:CB	5:A:386:GOL:H32	2.23	0.67
1:A:185:ASP:OD2	1:A:366:GLN:HG3	1.95	0.66
1:A:173:GLU:O	1:A:175:GLY:N	2.28	0.65
1:E:83:ASP:OD2	6:E:388:HOH:O	2.15	0.64
1:E:279:GLU:HG3	1:E:283:ASN:HD22	1.62	0.62
1:C:274:LYS:O	1:C:278[B]:LYS:CG	2.47	0.61
1:E:230:PRO:HA	1:E:233:TRP:CE2	2.35	0.61
1:A:69:GLY:HA3	1:A:333:ASN:O	2.00	0.60
1:A:140:LEU:O	1:A:142:ALA:N	2.33	0.60
1:A:185:ASP:O	1:A:190:LYS:HE2	2.02	0.60
1:A:185:ASP:CG	1:A:366:GLN:HG3	2.28	0.59
1:E:308:TYR:CE2	1:E:312:LEU:HD11	2.37	0.58
1:C:44:LEU:HD12	1:C:44:LEU:C	2.28	0.58
1:A:44:LEU:HD13	1:A:61:ILE:CD1	2.35	0.57
1:A:140:LEU:C	1:A:142:ALA:H	2.13	0.56
1:E:165:ASP:OD1	1:E:254:GLN:NE2	2.38	0.56
1:A:44:LEU:C	1:A:44:LEU:HD12	2.30	0.56
1:A:141:LYS:O	1:A:142:ALA:HB2	2.05	0.56
1:A:142:ALA:N	1:A:144:GLY:H	2.03	0.55
1:E:22:ALA:O	1:E:26:LYS:HG2	2.07	0.53
1:E:322:MET:HA	1:E:322:MET:CE	2.37	0.53
1:C:353:SER:OG	1:C:355:ARG:HB2	2.08	0.53
1:C:202:ASN:C	1:C:203:LYS:HG2	2.33	0.53
1:E:279:GLU:HG3	1:E:283:ASN:ND2	2.23	0.53
1:A:309:GLU:HG2	5:A:386:GOL:H31	1.91	0.53
1:A:141:LYS:HD3	6:A:515:HOH:O	2.09	0.52
1:C:142:ALA:C	1:C:144:GLY:H	2.17	0.52
1:C:26:LYS:CE	6:C:584:HOH:O	2.57	0.52
1:A:105:ILE:C	1:A:105:ILE:HD12	2.35	0.52
1:C:44:LEU:HD13	1:C:61:ILE:HD11	1.91	0.52
1:A:1:MET:HG2	6:A:540:HOH:O	2.10	0.51
1:C:44:LEU:HD13	1:C:61:ILE:CD1	2.40	0.51
1:A:4:GLU:OE1	1:C:220[A]:HIS:NE2	2.35	0.51
1:C:370:ALA:O	1:C:371:ALA:C	2.53	0.50
1:E:61:ILE:C	1:E:61:ILE:HD13	2.36	0.50
1:C:63:TRP:CD1	1:C:67[A]:ARG:HG3	2.47	0.49
1:A:204:HIS:HD2	4:A:383:ACT:OXT	1.95	0.49
1:C:172:TYR:CZ	1:C:175:GLY:HA3	2.48	0.48
1:E:67[A]:ARG:NH2	6:E:419:HOH:O	2.26	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:120:LYS:HB2	1:E:242:ASN:ND2	2.28	0.48
1:E:280:PHE:O	1:E:284:TYR:HB2	2.13	0.48
1:A:63:TRP:CD1	1:A:67[B]:ARG:HG3	2.47	0.48
1:C:23:GLU:OE1	6:C:563:HOH:O	2.20	0.47
1:A:230:PRO:HA	1:A:233:TRP:CE2	2.49	0.47
1:A:160:PRO:HG3	1:A:258:PRO:HA	1.96	0.47
1:E:90:LEU:HD12	1:E:95:TRP:CZ2	2.50	0.47
1:E:45:GLU:OE1	1:E:45:GLU:N	2.41	0.46
1:E:255:PRO:HB3	1:E:327:LYS:HD3	1.97	0.46
1:E:172:TYR:OH	1:E:175:GLY:HA2	2.16	0.46
1:E:306:LYS:O	1:E:310:GLU:HG3	2.16	0.46
1:A:141:LYS:O	1:A:142:ALA:CB	2.64	0.46
1:A:298:LYS:NZ	6:A:415:HOH:O	2.49	0.46
1:A:52:ALA:O	6:A:553:HOH:O	2.20	0.45
1:C:153:GLN:HB2	5:C:383:GOL:H12	1.98	0.45
1:C:151:ASN:HD21	5:C:383:GOL:H2	1.82	0.45
1:E:341:TRP:CD1	2:F:2[A]:GLC:H4	2.52	0.45
1:C:230:PRO:HA	1:C:233:TRP:CE2	2.52	0.45
1:E:123:LEU:HD21	1:E:127:PRO:HD3	1.98	0.45
1:E:329:GLU:OE1	4:E:379:ACT:C	2.65	0.45
1:C:89:LYS:C	1:C:90:LEU:HD23	2.42	0.44
1:C:142:ALA:C	1:C:144:GLY:N	2.75	0.44
1:A:107:TYR:OH	1:A:282:GLU:OE2	2.24	0.44
1:E:44:LEU:C	1:E:44:LEU:HD12	2.42	0.44
1:E:63:TRP:CD1	1:E:67[B]:ARG:HG3	2.53	0.44
1:E:159:TRP:N	1:E:160:PRO:CD	2.81	0.44
1:C:206[A]:ASN:OD1	1:C:208:ASP:OD2	2.36	0.44
1:E:7:LYS:NZ	1:E:7:LYS:HB2	2.33	0.44
1:C:153:GLN:CB	5:C:383:GOL:H12	2.48	0.43
1:C:84:LYS:HE2	1:C:88:ASP:OD1	2.19	0.43
1:C:173:GLU:O	1:C:174:ASN:CB	2.66	0.43
1:A:306:LYS:O	1:A:310:GLU:HG3	2.17	0.43
1:C:68:PHE:HB3	1:C:105:ILE:HD13	2.01	0.43
1:C:173:GLU:O	1:C:175:GLY:HA2	2.19	0.42
1:E:98:VAL:HG21	1:E:108:PRO:HD3	2.02	0.42
1:C:193:LEU:O	1:C:197:VAL:HG23	2.20	0.42
1:E:344:VAL:O	1:E:348:VAL:HG23	2.20	0.42
1:C:275:GLU:HA	1:C:278[B]:LYS:HG3	2.01	0.42
1:E:48:PHE:N	1:E:49:PRO:HD2	2.35	0.42
1:E:133:ILE:N	1:E:134:PRO:CD	2.83	0.42
1:E:137:ASP:OD1	1:E:141:LYS:HE3	2.19	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:67[A]:ARG:NH1	1:C:338:SER:HB3	2.35	0.42
1:C:93:PHE:CZ	1:C:111:VAL:HG21	2.54	0.42
1:A:134:PRO:HB2	4:A:384:ACT:H2	2.02	0.41
1:C:193:LEU:HD22	1:C:362:LEU:HD21	2.03	0.41
1:E:246:THR:OG1	1:E:247:VAL:N	2.54	0.40
1:C:261:GLY:CA	1:C:331:MET:HE2	2.51	0.40
1:A:234:SER:OG	1:A:298:LYS:HD3	2.20	0.40

All (2) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:C:374:ZN:ZN	4:C:380:ACT:O[3_455]	1.46	0.74
3:A:375:ZN:ZN	6:A:401:HOH:O[2_555]	1.51	0.69

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

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	373/372 (100%)	361 (97%)	8 (2%)	4 (1%)	11	3
1	C	374/372 (100%)	364 (97%)	7 (2%)	3 (1%)	16	6
1	E	369/372 (99%)	361 (98%)	8 (2%)	0	100	100
All	All	1116/1116 (100%)	1086 (97%)	23 (2%)	7 (1%)	21	10

All (7) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	142	ALA
1	A	143	LYS
1	A	141	LYS
1	A	174	ASN

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Mol	Chain	Res	Type
1	C	174	ASN
1	C	355	ARG
1	C	143	LYS

5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

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	293/293 (100%)	287 (98%)	6 (2%)	48	36
1	C	291/293 (99%)	286 (98%)	5 (2%)	53	42
1	E	286/293 (98%)	279 (98%)	7 (2%)	43	28
All	All	870/879 (99%)	852 (98%)	18 (2%)	47	33

All (18) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1	MET
1	A	42	ASP
1	A	44	LEU
1	A	171	LYS
1	A	174	ASN
1	A	259	PHE
1	C	1	MET
1	C	101	ASN
1	C	141	LYS
1	C	259	PHE
1	C	338	SER
1	E	7	LYS
1	E	51	VAL
1	E	61	ILE
1	E	101	ASN
1	E	252	LYS
1	E	259	PHE
1	E	329	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	350	ASN
1	A	356	GLN
1	A	368	ASN
1	C	73	GLN
1	C	101	ASN
1	C	326	GLN
1	E	101	ASN
1	E	216	HIS
1	E	242	ASN
1	E	283	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

8 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	GLC	B	1[A]	2	12,12,12	0.53	0	17,17,17	0.98	1 (5%)
2	GLC	B	2[A]	2	11,11,12	0.57	0	15,15,17	0.86	0
2	GLC	D	1[A]	2	12,12,12	0.48	0	17,17,17	0.90	0
2	GLC	D	2[A]	2	11,11,12	0.54	0	15,15,17	1.10	1 (6%)
2	GLC	F	1[A]	2	12,12,12	0.51	0	17,17,17	0.76	0
2	GLC	F	1[B]	2	12,12,12	0.59	0	17,17,17	1.54	3 (17%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	GLC	F	2[A]	2	11,11,12	0.61	0	15,15,17	0.89	1 (6%)
2	GLC	F	2[B]	2	11,11,12	0.62	0	15,15,17	0.87	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
2	GLC	B	1[A]	2	-	1/2/22/22	0/1/1/1
2	GLC	B	2[A]	2	-	0/2/19/22	0/1/1/1
2	GLC	D	1[A]	2	-	0/2/22/22	0/1/1/1
2	GLC	D	2[A]	2	-	0/2/19/22	0/1/1/1
2	GLC	F	1[A]	2	-	1/2/22/22	0/1/1/1
2	GLC	F	1[B]	2	-	0/2/22/22	0/1/1/1
2	GLC	F	2[A]	2	-	0/2/19/22	0/1/1/1
2	GLC	F	2[B]	2	-	0/2/19/22	0/1/1/1

There are no bond length outliers.

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	F	1[B]	GLC	O5-C1-C2	4.38	118.00	110.30
2	F	1[B]	GLC	C1-O5-C5	3.20	119.85	113.65
2	D	2[A]	GLC	C1-O5-C5	3.13	116.38	112.19
2	F	1[B]	GLC	C1-C2-C3	2.65	115.75	110.36
2	B	1[A]	GLC	C1-O5-C5	2.28	118.07	113.65
2	F	2[A]	GLC	C2-C3-C4	-2.25	106.91	110.86
2	F	2[B]	GLC	C2-C3-C4	-2.23	106.94	110.86

There are no chirality outliers.

All (2) torsion outliers are listed below:

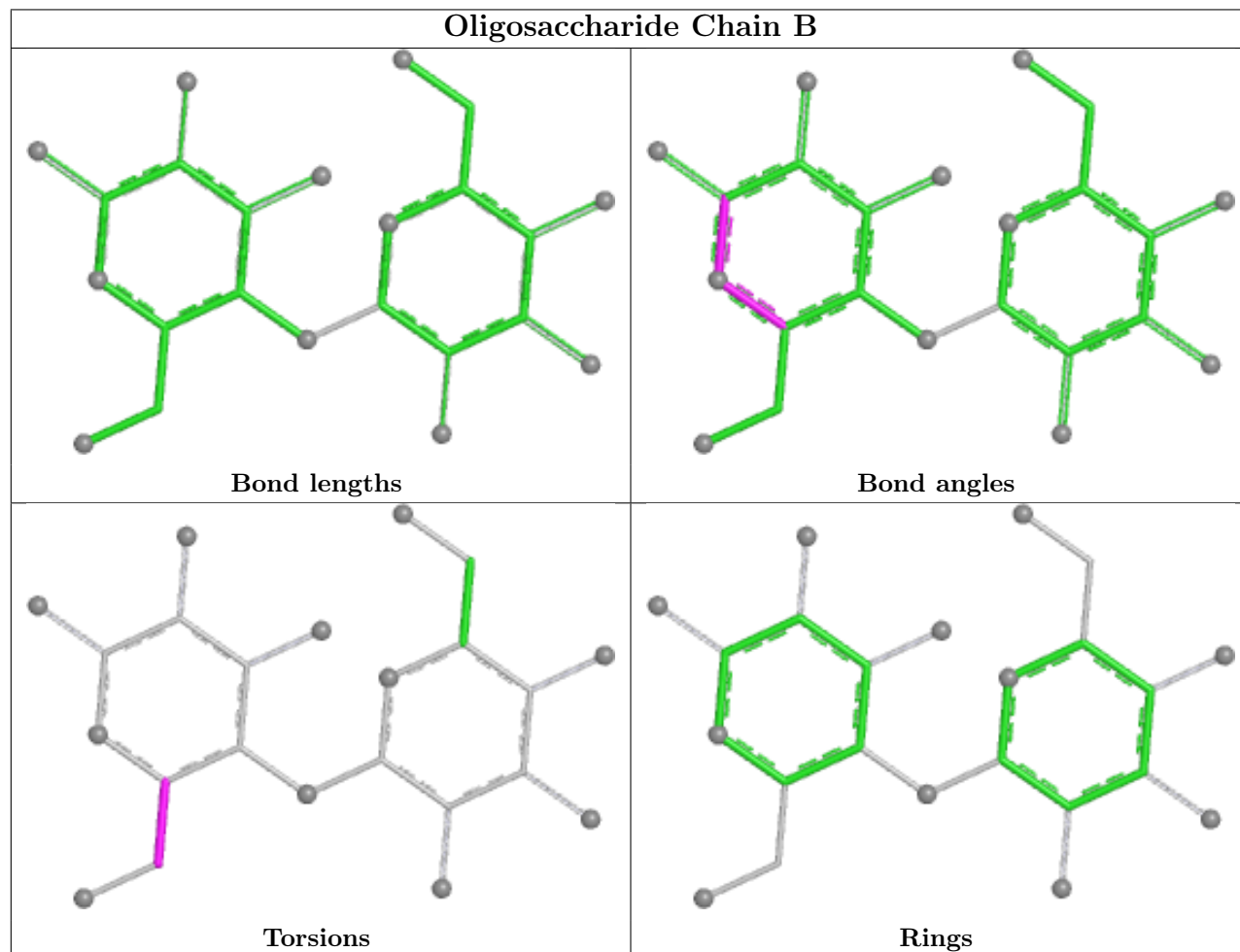
Mol	Chain	Res	Type	Atoms
2	F	1[A]	GLC	C4-C5-C6-O6
2	B	1[A]	GLC	C4-C5-C6-O6

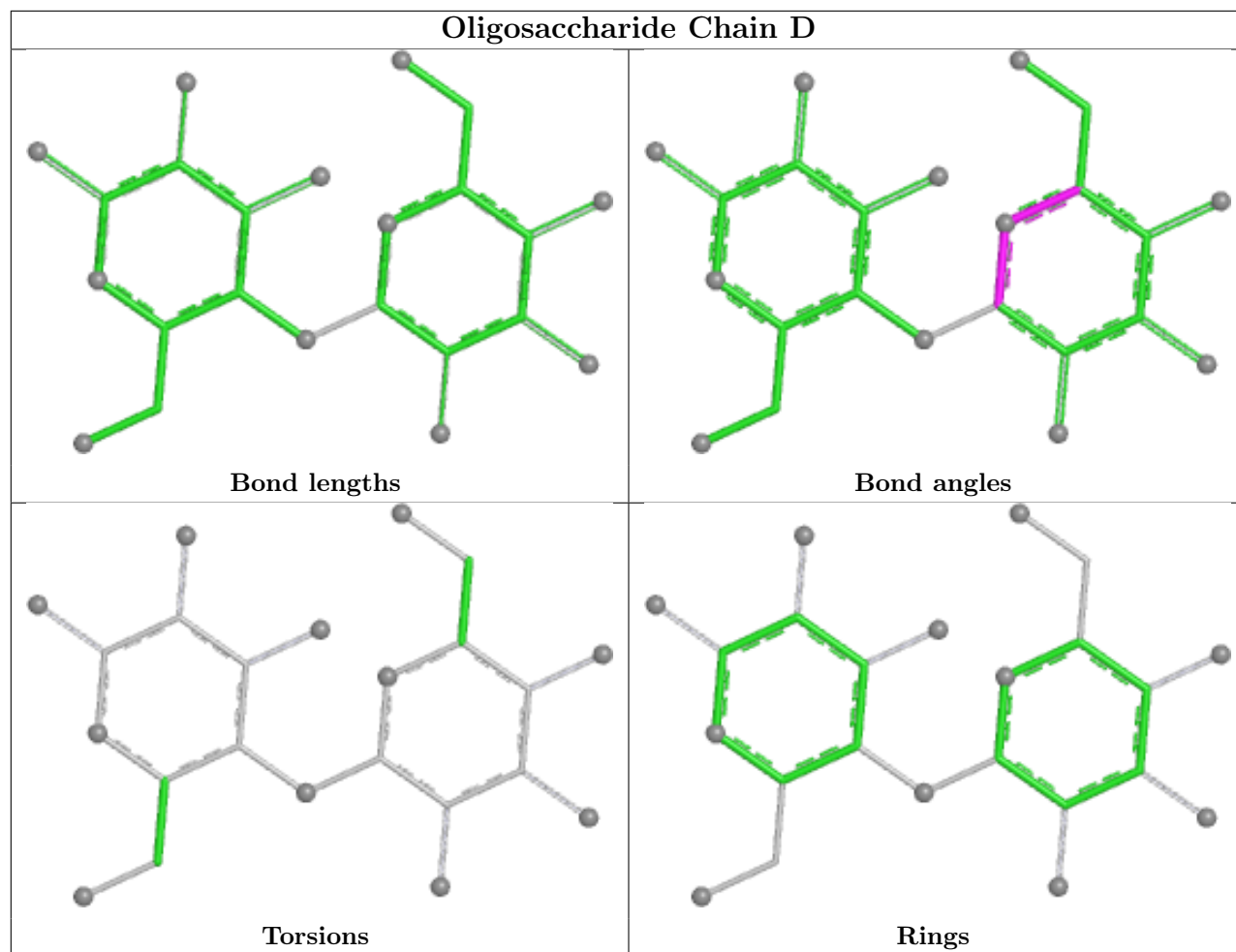
There are no ring outliers.

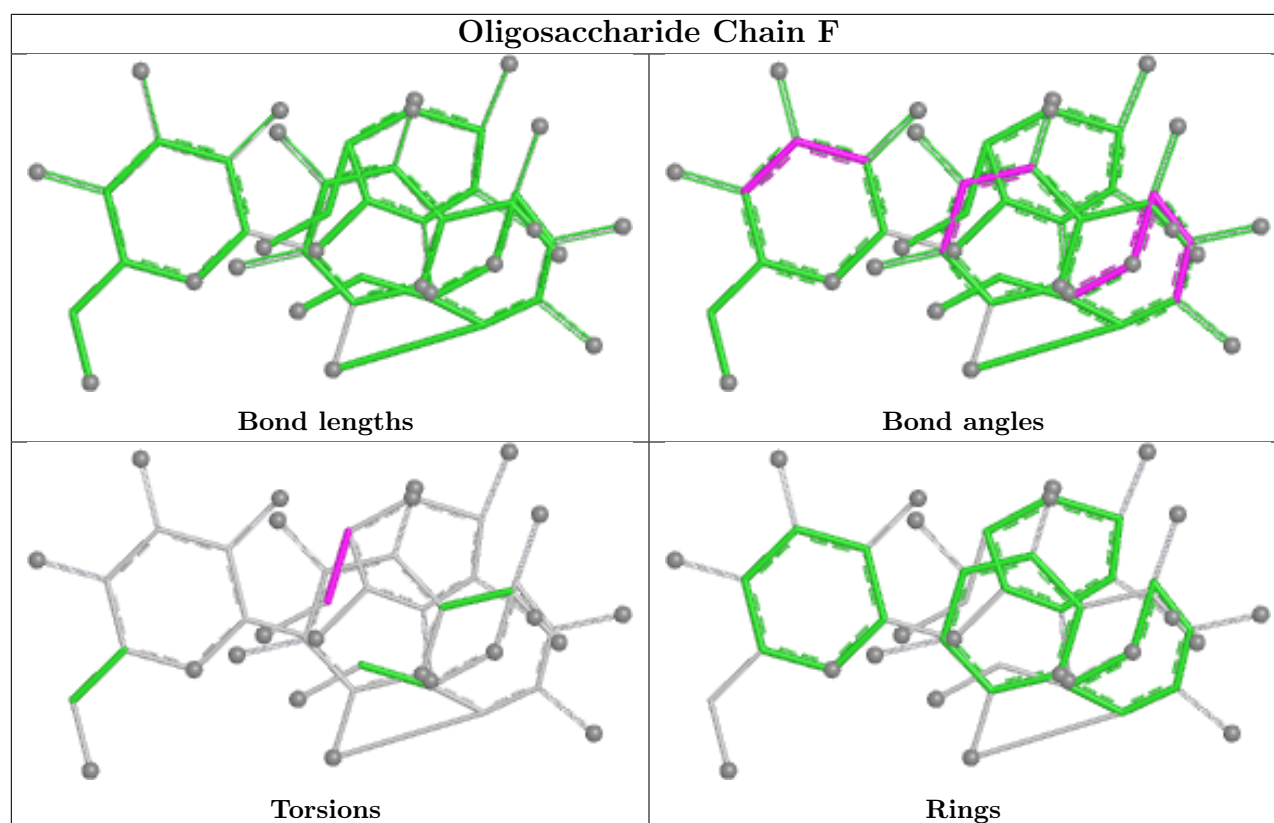
1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	F	2[A]	GLC	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](#)

Of 36 ligands modelled in this entry, 23 are monoatomic - leaving 13 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	$\# Z > 2$
4	ACT	C	380	-	3,3,3	0.72	0	3,3,3	1.66	1 (33%)
4	ACT	A	384	3	3,3,3	1.06	0	3,3,3	1.42	0
4	ACT	A	385	3	3,3,3	0.96	0	3,3,3	1.54	1 (33%)
5	GOL	A	386	-	5,5,5	0.47	0	5,5,5	0.35	0
5	GOL	A	387	-	5,5,5	0.33	0	5,5,5	0.36	0
4	ACT	A	383	3	3,3,3	0.97	0	3,3,3	1.08	0
5	GOL	A	388	-	5,5,5	0.38	0	5,5,5	0.33	0
5	GOL	C	383	-	5,5,5	0.40	0	5,5,5	0.55	0
4	ACT	C	385	3	3,3,3	0.74	0	3,3,3	1.36	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
5	GOL	C	384	-	5,5,5	0.39	0	5,5,5	0.25	0
4	ACT	C	382	-	3,3,3	0.92	0	3,3,3	1.41	0
4	ACT	C	381	-	3,3,3	0.64	0	3,3,3	1.39	0
4	ACT	E	379	3	3,3,3	0.81	0	3,3,3	1.33	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	GOL	A	386	-	-	4/4/4/4	-
5	GOL	A	387	-	-	0/4/4/4	-
5	GOL	A	388	-	-	2/4/4/4	-
5	GOL	C	383	-	-	2/4/4/4	-
5	GOL	C	384	-	-	2/4/4/4	-

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	C	380	ACT	OXT-C-CH3	2.15	124.09	115.05
4	A	385	ACT	OXT-C-O	-2.05	114.41	122.03

There are no chirality outliers.

All (10) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	386	GOL	C1-C2-C3-O3
5	A	388	GOL	O1-C1-C2-C3
5	A	386	GOL	O1-C1-C2-C3
5	C	383	GOL	O1-C1-C2-C3
5	A	386	GOL	O1-C1-C2-O2
5	A	388	GOL	O1-C1-C2-O2
5	A	386	GOL	O2-C2-C3-O3
5	C	383	GOL	O1-C1-C2-O2
5	C	384	GOL	O2-C2-C3-O3
5	C	384	GOL	C1-C2-C3-O3

There are no ring outliers.

8 monomers are involved in 12 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	C	380	ACT	0	1
4	A	384	ACT	1	0
5	A	386	GOL	3	0
5	A	387	GOL	1	0
4	A	383	ACT	1	0
5	C	383	GOL	3	0
5	C	384	GOL	1	0
4	E	379	ACT	1	0

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 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ > 2		OWAB(Å ²)	Q < 0.9
1	A	371/372 (99%)	0.21	18 (4%)	35 38	11, 23, 43, 73	4 (1%)
1	C	371/372 (99%)	0.27	24 (6%)	25 27	8, 22, 45, 65	5 (1%)
1	E	370/372 (99%)	1.42	74 (20%)	3 2	19, 43, 64, 88	1 (0%)
All	All	1112/1116 (99%)	0.63	116 (10%)	11 11	8, 30, 58, 88	10 (0%)

All (116) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	371	ALA	7.1
1	E	1	MET	6.0
1	C	142	ALA	5.9
1	C	371	ALA	5.4
1	A	1	MET	5.1
1	E	370	ALA	4.9
1	A	142	ALA	4.7
1	C	370	ALA	4.6
1	E	313	ALA	4.4
1	E	269	ALA	3.8
1	E	54	THR	3.7
1	A	370	ALA	3.7
1	E	330	ILE	3.5
1	E	342	TYR	3.4
1	E	26	LYS	3.4
1	E	51	VAL	3.4
1	E	86	PHE	3.4
1	C	174	ASN	3.3
1	E	101	ASN	3.3
1	A	355	ARG	3.3
1	E	349	ILE	3.3
1	A	172	TYR	3.3
1	E	90	LEU	3.3

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Mol	Chain	Res	Type	RSRZ
1	A	342	TYR	3.2
1	A	174	ASN	3.2
1	C	342	TYR	3.1
1	E	124	PRO	3.0
1	E	312	LEU	3.0
1	C	354	GLY	3.0
1	A	53	ALA	3.0
1	E	53	ALA	3.0
1	E	52	ALA	2.9
1	E	76	LEU	2.9
1	E	47	LYS	2.9
1	E	172	TYR	2.9
1	C	1	MET	2.9
1	A	141	LYS	2.9
1	E	34	ILE	2.9
1	E	123	LEU	2.9
1	E	174	ASN	2.8
1	E	85	ALA	2.8
1	E	304	ALA	2.8
1	E	358	VAL	2.8
1	E	194	THR	2.8
1	E	308	TYR	2.8
1	E	242	ASN	2.8
1	E	50	GLN	2.8
1	E	200	ILE	2.7
1	E	318	ILE	2.7
1	E	93	PHE	2.7
1	A	2	LYS	2.7
1	E	176	LYS	2.7
1	E	314	LYS	2.7
1	E	126	PRO	2.7
1	E	276	LEU	2.7
1	E	241	VAL	2.7
1	E	102	GLY	2.6
1	C	357	THR	2.6
1	E	357	THR	2.6
1	C	55	GLY	2.6
1	C	182	VAL	2.6
1	C	364	ALA	2.6
1	E	293	ALA	2.5
1	E	104	LEU	2.5
1	C	175	GLY	2.5

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Mol	Chain	Res	Type	RSRZ
1	E	48	PHE	2.5
1	E	305	LEU	2.5
1	A	360	ALA	2.5
1	C	360	ALA	2.5
1	C	201	LYS	2.5
1	E	68	PHE	2.4
1	C	78	ALA	2.4
1	E	110	ALA	2.4
1	E	355	ARG	2.4
1	A	175	GLY	2.4
1	C	101	ASN	2.4
1	E	75	GLY	2.4
1	C	179	ILE	2.4
1	E	187	ALA	2.4
1	E	326	GLN	2.4
1	E	251	PHE	2.4
1	E	135	ALA	2.4
1	A	143	LYS	2.4
1	C	143	LYS	2.4
1	C	180	LYS	2.3
1	C	367	THR	2.3
1	C	365	ALA	2.3
1	E	270	ALA	2.3
1	A	367	THR	2.3
1	E	294	VAL	2.2
1	E	127	PRO	2.2
1	E	142	ALA	2.2
1	E	136	LEU	2.2
1	E	291	LEU	2.2
1	C	168	TYR	2.2
1	E	133	ILE	2.2
1	E	130	TRP	2.2
1	E	83	ASP	2.2
1	E	122	LEU	2.2
1	E	354	GLY	2.2
1	A	84	LYS	2.2
1	E	80	ILE	2.1
1	E	345	ARG	2.1
1	C	356	GLN	2.1
1	E	250	THR	2.1
1	E	89	LYS	2.1
1	E	128	LYS	2.1

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Mol	Chain	Res	Type	RSRZ
1	C	202	ASN	2.1
1	E	247	VAL	2.1
1	E	195	PHE	2.0
1	E	306	LYS	2.0
1	E	310	GLU	2.0
1	A	364	ALA	2.0
1	E	2	LYS	2.0
1	E	103	LYS	2.0
1	A	54	THR	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

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

6.3 Carbohydrates [i](#)

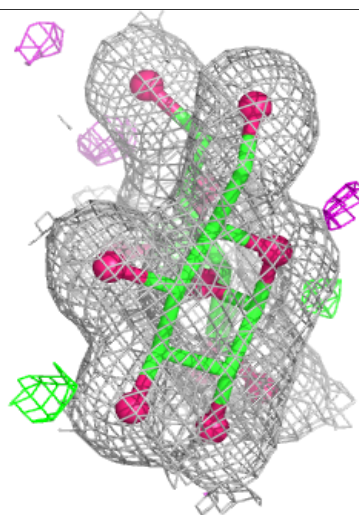
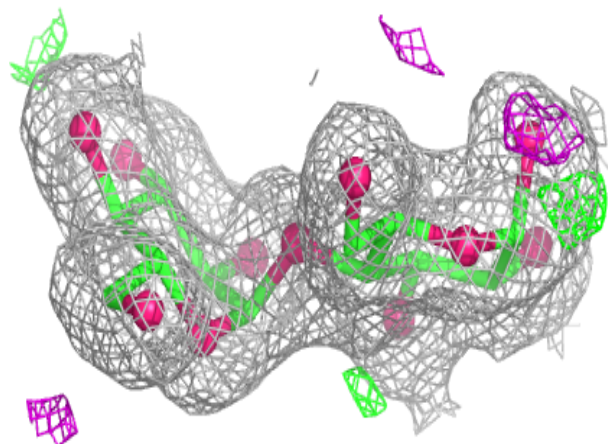
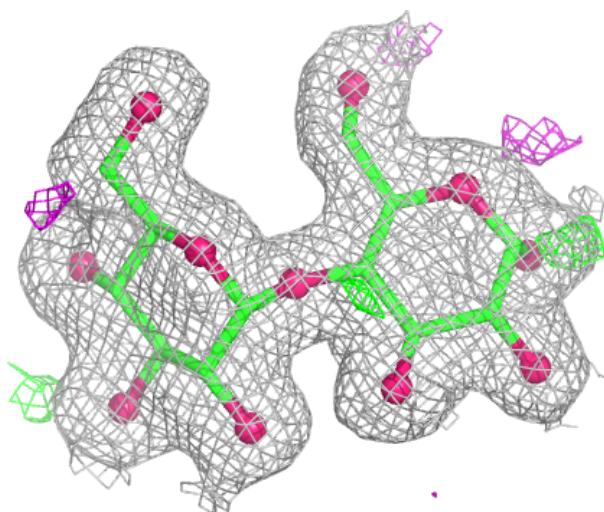
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	GLC	B	1[A]	12/12	-	-	7,16,21,23	0
2	GLC	B	2[A]	11/12	-	-	13,17,19,20	0
2	GLC	F	1[A]	12/12	0.93	0.07	24,29,32,34	12
2	GLC	F	1[B]	12/12	0.93	0.07	25,30,33,33	12
2	GLC	D	1[A]	12/12	0.96	0.06	10,15,22,22	0
2	GLC	F	2[A]	11/12	0.96	0.07	26,28,30,31	11
2	GLC	F	2[B]	11/12	0.96	0.07	26,28,30,30	11
2	GLC	D	2[A]	11/12	0.97	0.05	16,17,19,21	0

The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

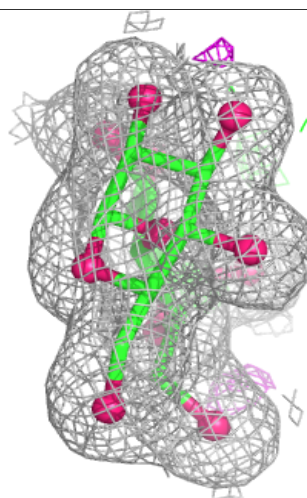
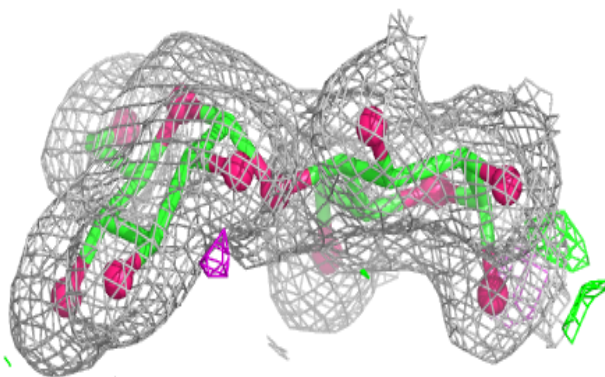
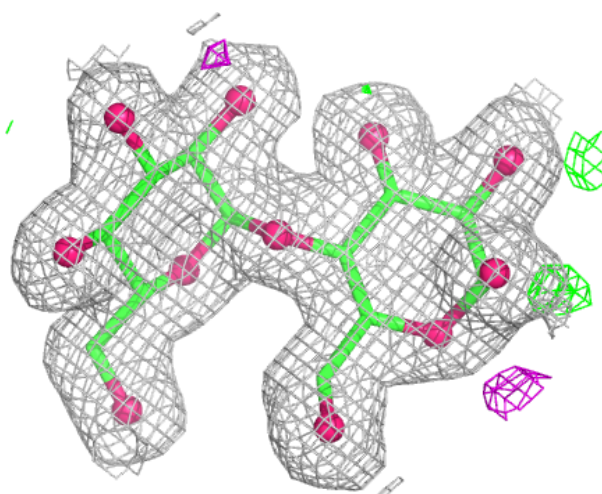
Electron density around Chain B:

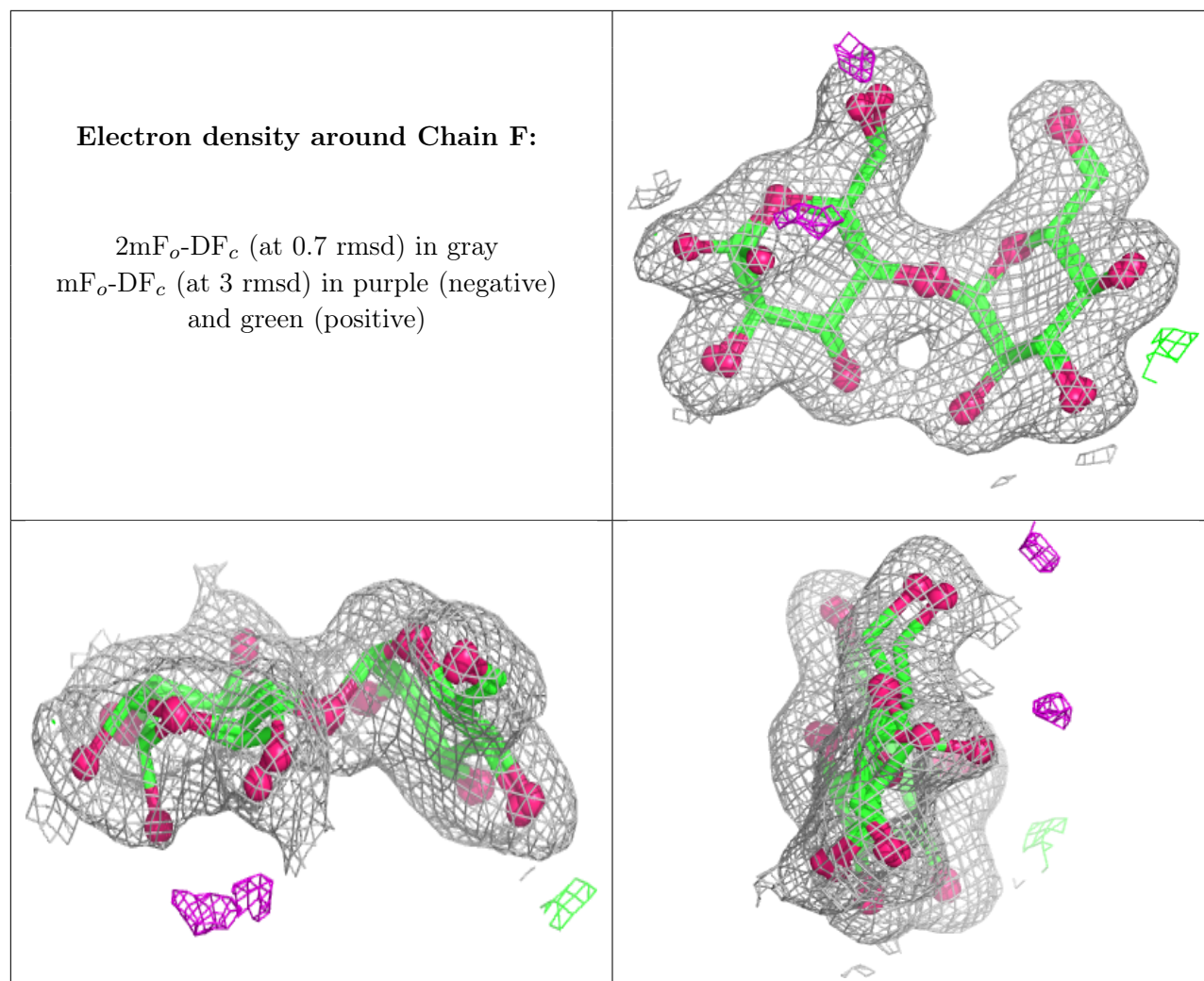
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around Chain D:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)





6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q < 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	ACT	E	379	4/4	0.61	0.23	52,52,55,55	0
5	GOL	C	384	6/6	0.75	0.19	44,52,53,53	0
3	ZN	E	378	1/1	0.76	0.52	46,46,46,46	1
4	ACT	C	385	4/4	0.76	0.17	40,49,50,56	0
5	GOL	A	388	6/6	0.79	0.18	54,61,63,65	0
5	GOL	A	387	6/6	0.85	0.15	26,46,48,51	0
4	ACT	A	383	4/4	0.86	0.18	23,25,32,35	0
5	GOL	A	386	6/6	0.88	0.16	35,41,41,43	0
3	ZN	A	380	1/1	0.92	0.10	85,85,85,85	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	ZN	C	375	1/1	0.92	0.08	44,44,44,44	0
5	GOL	C	383	6/6	0.92	0.12	23,40,40,42	0
4	ACT	A	385	4/4	0.92	0.13	19,25,28,38	0
4	ACT	A	384	4/4	0.93	0.10	19,21,24,26	0
3	ZN	A	381	1/1	0.93	0.17	45,45,45,45	1
3	ZN	A	379	1/1	0.93	0.08	51,51,51,51	0
4	ACT	C	381	4/4	0.94	0.15	20,21,32,42	0
3	ZN	C	379	1/1	0.94	0.09	53,53,53,53	1
3	ZN	C	376	1/1	0.95	0.06	45,45,45,45	0
3	ZN	C	378	1/1	0.95	0.09	39,39,39,39	1
3	ZN	A	375	1/1	0.95	0.09	21,21,21,21	1
4	ACT	C	382	4/4	0.96	0.10	22,22,27,34	0
4	ACT	C	380	4/4	0.96	0.11	9,17,22,29	0
3	ZN	A	374	1/1	0.97	0.04	25,25,25,25	0
3	ZN	E	376	1/1	0.97	0.07	60,60,60,60	0
3	ZN	E	377	1/1	0.98	0.07	50,50,50,50	1
3	ZN	A	378	1/1	0.98	0.10	43,43,43,43	0
3	ZN	A	382	1/1	0.98	0.06	38,38,38,38	1
3	ZN	E	373	1/1	0.98	0.04	34,34,34,34	0
3	ZN	C	377	1/1	0.98	0.04	33,33,33,33	1
3	ZN	C	373	1/1	0.99	0.02	17,17,17,17	0
3	ZN	C	374	1/1	0.99	0.02	24,24,24,24	0
3	ZN	A	377	1/1	0.99	0.03	30,30,30,30	1
3	ZN	E	374	1/1	0.99	0.03	39,39,39,39	0
3	ZN	E	375	1/1	0.99	0.09	54,54,54,54	0
3	ZN	A	373	1/1	0.99	0.02	18,18,18,18	0
3	ZN	A	376	1/1	0.99	0.04	30,30,30,30	1

6.5 Other polymers [i](#)

There are no such residues in this entry.