



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 03:09 PM UTC

PDB ID : 8ZI5 / pdb_00008zi5
Title : Crystal structure of a beta-1,4-endoglucanase from *Bispora* sp. MEY-1 in complex with mannotetrose
Authors : Zheng, J.; Luo, H.
Deposited on : 2024-05-13
Resolution : 1.73 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

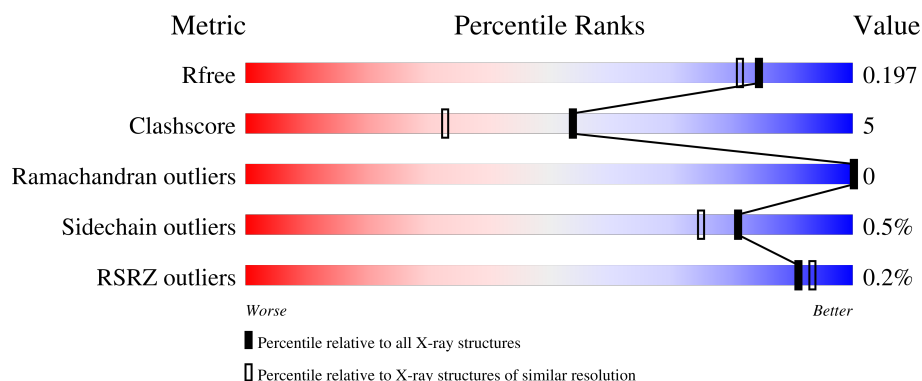
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

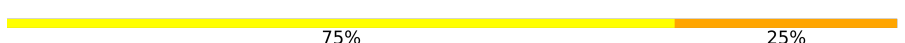
The reported resolution of this entry is 1.73 Å.

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.



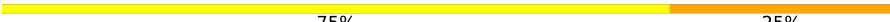
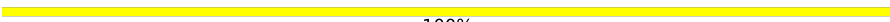
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	1187 (1.74-1.74)
Clashscore	190562	1207 (1.74-1.74)
Ramachandran outliers	187476	1200 (1.74-1.74)
Sidechain outliers	187428	1200 (1.74-1.74)
RSRZ outliers	180081	1188 (1.74-1.74)

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	322	
1	B	322	
1	C	322	
1	D	322	
2	E	4	

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Mol	Chain	Length	Quality of chain
2	F	4	 75%25%
2	G	4	 100%

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 11687 atoms, of which 72 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 cellulase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	309	Total	C	N	O	S	0	0	0
			2385	1502	385	483	15			
1	B	309	Total	C	N	O	S	0	0	0
			2385	1502	385	483	15			
1	C	308	Total	C	N	O	S	0	0	0
			2379	1499	384	481	15			
1	D	307	Total	C	N	O	S	0	0	0
			2367	1490	383	479	15			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	152	GLN	GLU	engineered mutation	UNP A0A150VE32
A	267	GLN	GLU	engineered mutation	UNP A0A150VE32
B	152	GLN	GLU	engineered mutation	UNP A0A150VE32
B	267	GLN	GLU	engineered mutation	UNP A0A150VE32
C	152	GLN	GLU	engineered mutation	UNP A0A150VE32
C	267	GLN	GLU	engineered mutation	UNP A0A150VE32
D	152	GLN	GLU	engineered mutation	UNP A0A150VE32
D	267	GLN	GLU	engineered mutation	UNP A0A150VE32

- Molecule 2 is an oligosaccharide called beta-D-mannopyranose-(1-4)-beta-D-mannopyranose-(1-4)-beta-D-mannopyranose-(1-4)-beta-D-mannopyranose.



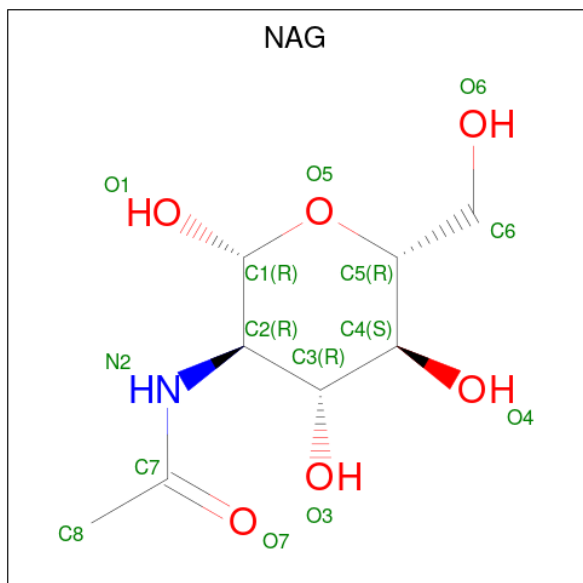
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	E	4	Total	C	H	O	0	0	0
			87	24	42	21			

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace
2	F	4	Total	C	O	0	0	0
			45	24	21			
2	G	4	Total	C	O	0	0	0
			45	24	21			

- Molecule 3 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: $C_8H_{15}NO_6$).



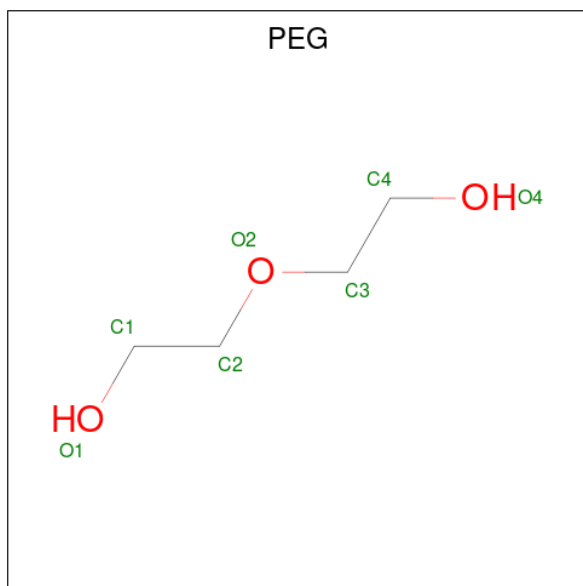
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	0	0
			14	8	1	5		
3	A	1	Total	C	N	O	0	0
			14	8	1	5		
3	A	1	Total	C	N	O	0	0
			14	8	1	5		
3	A	1	Total	C	N	O	0	0
			14	8	1	5		
3	B	1	Total	C	N	O	0	0
			14	8	1	5		
3	B	1	Total	C	N	O	0	0
			14	8	1	5		
3	B	1	Total	C	N	O	0	0
			14	8	1	5		
3	C	1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

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

- Molecule 4 is DI(HYDROXYETHYL)ETHER (CCD ID: PEG) (formula: $C_4H_{10}O_3$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	H	O	0	0
			17	4	10	3		
4	A	1	Total	C	H	O	0	0
			17	4	10	3		

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	H	O	0	0
			17	4	10	3		

- Molecule 5 is water.

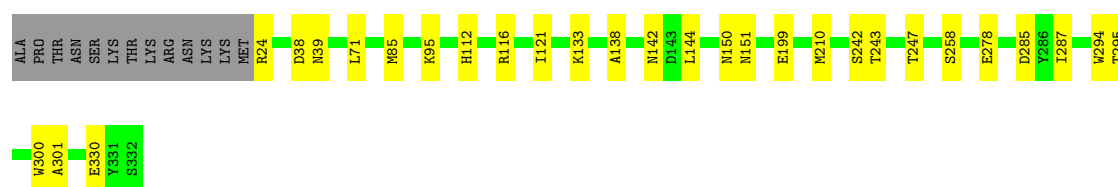
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	415	Total	O	0	0
			415	415		
5	B	410	Total	O	0	0
			410	410		
5	C	425	Total	O	0	0
			425	425		
5	D	441	Total	O	0	0
			441	441		

3 Residue-property plots

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

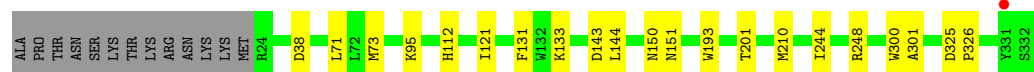
- Molecule 1: cellulase

Chain A: 



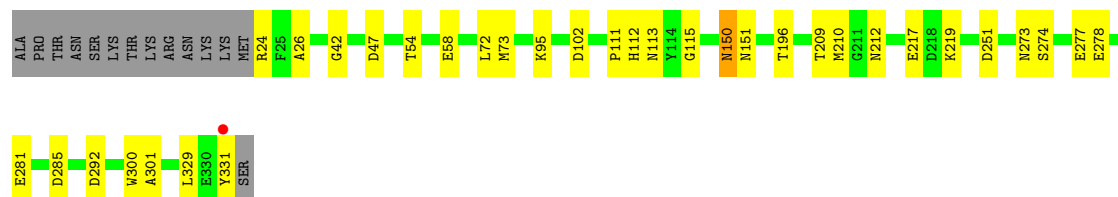
- Molecule 1: cellulase

Chain B: 



- Molecule 1: cellulase

Chain C: 

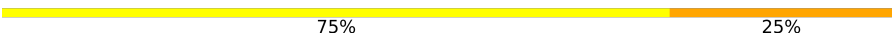


- Molecule 1: cellulase

Chain D: 



- Molecule 2: beta-D-mannopyranose-(1-4)-beta-D-mannopyranose-(1-4)-beta-D-mannopyranose-(1-4)-beta-D-mannopyranose

Chain E: 



- Molecule 2: beta-D-mannopyranose-(1-4)-beta-D-mannopyranose-(1-4)-beta-D-mannopyranose-(1-4)-beta-D-mannopyranose

Chain F:



- Molecule 2: beta-D-mannopyranose-(1-4)-beta-D-mannopyranose-(1-4)-beta-D-mannopyranose-(1-4)-beta-D-mannopyranose

Chain G:



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	69.72Å 88.59Å 175.74Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	18.51 – 1.73 18.51 – 1.73	Depositor EDS
% Data completeness (in resolution range)	97.3 (18.51-1.73) 97.1 (18.51-1.73)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.32 (at 1.73Å)	Xtrriage
Refinement program	PHENIX (1.19.1_4122: ???)	Depositor
R, R_{free}	0.151 , 0.197 0.151 , 0.197	Depositor DCC
R_{free} test set	5615 reflections (4.93%)	wwPDB-VP
Wilson B-factor (Å ²)	16.6	Xtrriage
Anisotropy	0.279	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 40.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	11687	wwPDB-VP
Average B, all atoms (Å ²)	18.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 34.38 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 6.8916e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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: PEG, BMA, NAG

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# $ Z > 5$	RMSZ	# $ Z > 5$
1	A	0.31	0/2446	0.59	1/3340 (0.0%)
1	B	0.30	0/2446	0.58	0/3340
1	C	0.30	0/2440	0.57	1/3332 (0.0%)
1	D	0.30	0/2427	0.56	0/3314
All	All	0.30	0/9759	0.58	2/13326 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	210	MET	CB-CG-SD	-5.73	95.52	112.70
1	A	210	MET	CB-CG-SD	-5.29	96.82	112.70

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	2385	0	2191	23	0
1	B	2385	0	2191	18	0
1	C	2379	0	2185	30	0
1	D	2367	0	2177	17	0
2	E	45	42	39	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	F	45	0	39	1	0
2	G	45	0	39	0	0
3	A	56	0	52	2	0
3	B	56	0	52	0	0
3	C	70	0	65	0	0
3	D	70	0	65	4	0
4	A	21	30	30	5	0
5	A	415	0	0	12	1
5	B	410	0	0	4	5
5	C	425	0	0	15	9
5	D	441	0	0	5	5
All	All	11615	72	9125	93	10

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 5.

All (93) 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:258:SER:OG	5:A:501:HOH:O	1.75	1.05
1:D:24:ARG:NH2	5:D:601:HOH:O	1.88	0.98
1:C:24:ARG:NH1	5:C:501:HOH:O	1.92	0.88
1:D:95:LYS:HG2	5:D:714:HOH:O	1.72	0.88
1:C:24:ARG:NH2	5:C:504:HOH:O	2.08	0.86
1:A:242:SER:HB2	1:A:278:GLU:HG2	1.60	0.82
1:C:115:GLY:H	1:C:150:ASN:HD22	1.28	0.79
5:A:910:HOH:O	2:F:2:BMA:H3	1.84	0.76
1:A:287:ILE:HG23	1:A:294:TRP:HB3	1.68	0.74
1:B:201:THR:HA	2:E:1:BMA:H3	1.69	0.73
1:A:287:ILE:HG23	1:A:294:TRP:CB	2.18	0.73
1:C:209:THR:O	5:C:503:HOH:O	2.07	0.73
1:C:251:ASP:HB2	5:C:619:HOH:O	1.89	0.73
1:D:316:ASP:OD1	5:D:602:HOH:O	2.07	0.72
1:D:92:ASN:OD1	3:D:501:NAG:C3	2.39	0.70
1:A:133:LYS:NZ	5:A:504:HOH:O	2.23	0.70
1:C:42:GLY:HA2	5:C:505:HOH:O	1.92	0.68
1:C:26:ALA:HB2	5:C:502:HOH:O	1.92	0.68
1:D:277:GLU:O	1:D:281:GLU:HG3	1.94	0.67
1:A:285:ASP:HB3	5:A:827:HOH:O	1.93	0.67
1:C:95:LYS:HE3	5:C:742:HOH:O	1.94	0.67
1:C:47:ASP:OD2	5:C:505:HOH:O	2.15	0.65

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:277:GLU:O	1:C:281:GLU:HG3	1.98	0.64
1:A:24:ARG:HB3	1:A:295:THR:O	2.01	0.60
1:C:274:SER:O	1:C:278:GLU:HG3	2.02	0.60
1:D:24:ARG:N	5:D:609:HOH:O	2.35	0.59
3:A:403:NAG:H3	5:A:621:HOH:O	2.01	0.59
1:D:72:LEU:HD22	1:D:74:GLU:OE1	2.02	0.59
1:D:242:SER:HB2	1:D:278:GLU:HG2	1.86	0.57
1:C:24:ARG:HD3	5:C:502:HOH:O	2.05	0.56
1:C:115:GLY:H	1:C:150:ASN:ND2	2.00	0.56
1:B:300:TRP:CD2	1:B:301:ALA:HB2	2.40	0.56
1:A:144:LEU:HD21	1:D:102:ASP:HB3	1.88	0.56
1:D:310:MET:HE3	1:D:311:PHE:CZ	2.41	0.56
1:D:300:TRP:CD2	1:D:301:ALA:HB2	2.40	0.56
1:A:39:ASN:OD1	4:A:407:PEG:H41	2.06	0.54
1:C:219:LYS:NZ	5:C:506:HOH:O	2.39	0.54
1:D:68:ARG:HA	1:D:108:MET:HB3	1.89	0.54
1:B:95:LYS:HE2	5:B:969:HOH:O	2.07	0.53
1:B:143:ASP:OD2	5:B:801:HOH:O	2.18	0.53
1:B:121:ILE:HD12	1:B:121:ILE:N	2.24	0.53
1:C:292:ASP:HB3	5:C:827:HOH:O	2.07	0.53
1:D:73:MET:HG3	1:D:111:PRO:HB3	1.91	0.53
4:A:405:PEG:H41	5:A:718:HOH:O	2.09	0.52
1:B:325:ASP:HB3	1:B:326:PRO:HD3	1.92	0.51
1:C:24:ARG:NH1	5:C:502:HOH:O	1.99	0.51
1:B:144:LEU:HD21	1:C:102:ASP:HB3	1.93	0.50
1:B:71:LEU:C	1:B:71:LEU:HD12	2.36	0.50
3:D:501:NAG:O7	3:D:501:NAG:H1	2.11	0.49
1:C:300:TRP:CD2	1:C:301:ALA:HB2	2.47	0.49
1:A:330:GLU:OE1	5:A:502:HOH:O	2.20	0.49
1:C:54:THR:O	1:C:58:GLU:HG3	2.13	0.49
1:B:133:LYS:NZ	5:B:812:HOH:O	2.44	0.49
1:A:300:TRP:CD2	1:A:301:ALA:HB2	2.48	0.48
1:A:112:HIS:HA	1:A:151:ASN:HB3	1.95	0.48
1:C:285:ASP:OD1	1:C:331:TYR:OH	2.31	0.48
1:B:210:MET:HB3	1:B:210:MET:HE3	1.76	0.48
1:A:71:LEU:HD12	1:A:71:LEU:C	2.39	0.48
1:C:273:ASN:O	1:C:277:GLU:HG3	2.12	0.48
1:B:121:ILE:HD13	5:B:1022:HOH:O	2.13	0.47
1:A:142:ASN:CG	4:A:405:PEG:H12	2.39	0.47
1:B:112:HIS:HA	1:B:151:ASN:HB3	1.96	0.47
1:C:196:THR:HG22	1:C:196:THR:O	2.14	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:217:GLU:OE1	5:C:506:HOH:O	2.20	0.47
1:A:38:ASP:HB2	5:A:776:HOH:O	2.14	0.47
1:A:142:ASN:HB2	4:A:405:PEG:H42	1.96	0.47
1:D:112:HIS:HA	1:D:151:ASN:HB3	1.96	0.46
1:B:193:TRP:HB3	1:B:248:ARG:HB3	1.96	0.46
1:A:287:ILE:HG23	1:A:294:TRP:HB2	1.94	0.46
4:A:407:PEG:H32	5:A:802:HOH:O	2.16	0.46
1:B:121:ILE:N	1:B:121:ILE:CD1	2.79	0.46
1:B:121:ILE:CD1	1:B:121:ILE:H	2.29	0.45
1:C:72:LEU:HD22	5:C:753:HOH:O	2.16	0.44
1:C:212:ASN:OD1	5:C:503:HOH:O	2.21	0.44
3:D:502:NAG:H82	5:D:602:HOH:O	2.18	0.44
1:B:95:LYS:HD3	1:B:95:LYS:HA	1.54	0.43
1:C:112:HIS:HA	1:C:151:ASN:HB3	2.00	0.43
1:A:116:ARG:HG2	1:A:121:ILE:HD12	2.01	0.43
1:B:73:MET:HG2	1:B:131:PHE:CZ	2.53	0.43
1:B:244:ILE:O	1:B:248:ARG:HG3	2.19	0.43
3:A:403:NAG:H82	5:A:733:HOH:O	2.19	0.43
1:C:329:LEU:C	1:C:331:TYR:H	2.27	0.43
1:D:88:ASP:HB3	3:D:501:NAG:H5	1.99	0.43
1:A:121:ILE:CD1	5:A:539:HOH:O	2.67	0.42
1:C:73:MET:HG3	1:C:111:PRO:HB3	2.01	0.42
1:A:85:MET:HE1	1:A:138:ALA:HB2	2.00	0.42
1:A:199:GLU:OE2	5:A:503:HOH:O	2.22	0.42
1:C:329:LEU:C	1:C:331:TYR:N	2.76	0.42
1:A:95:LYS:HA	1:A:95:LYS:HD2	1.87	0.41
1:C:113:ASN:HB2	1:C:150:ASN:HD21	1.85	0.41
1:D:242:SER:HB2	1:D:278:GLU:CG	2.51	0.41
1:D:223:HIS:CE1	1:D:266:GLY:HA3	2.56	0.41
1:A:243:THR:O	1:A:247:THR:HG23	2.20	0.40

All (10) 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)
5:B:1165:HOH:O	5:C:619:HOH:O[4_556]	1.91	0.29
5:C:892:HOH:O	5:D:1002:HOH:O[2_465]	2.01	0.19
5:B:812:HOH:O	5:C:547:HOH:O[4_556]	2.04	0.16
5:B:1073:HOH:O	5:C:809:HOH:O[4_556]	2.06	0.14
5:C:807:HOH:O	5:D:904:HOH:O[2_465]	2.06	0.14

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:C:913:HOH:O	5:D:980:HOH:O[2_465]	2.06	0.14
5:C:805:HOH:O	5:D:773:HOH:O[2_465]	2.07	0.13
5:B:1061:HOH:O	5:C:876:HOH:O[4_556]	2.08	0.12
5:C:847:HOH:O	5:D:754:HOH:O[2_465]	2.12	0.08
5:A:717:HOH:O	5:B:1076:HOH:O[3_545]	2.19	0.01

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 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	307/322 (95%)	301 (98%)	6 (2%)	0	100	100
1	B	307/322 (95%)	301 (98%)	6 (2%)	0	100	100
1	C	306/322 (95%)	299 (98%)	7 (2%)	0	100	100
1	D	305/322 (95%)	297 (97%)	8 (3%)	0	100	100
All	All	1225/1288 (95%)	1198 (98%)	27 (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 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	247/259 (95%)	246 (100%)	1 (0%)	84	79
1	B	247/259 (95%)	245 (99%)	2 (1%)	73	64

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	C	246/259 (95%)	245 (100%)	1 (0%)	84	79
1	D	245/259 (95%)	244 (100%)	1 (0%)	84	79
All	All	985/1036 (95%)	980 (100%)	5 (0%)	81	75

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	150	ASN
1	B	38	ASP
1	B	150	ASN
1	C	150	ASN
1	D	150	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	62	GLN
1	A	79	ASN
1	A	152	GLN
1	A	159	GLN
1	A	260	ASN
1	B	152	GLN
1	B	260	ASN
1	C	150	ASN
1	C	152	GLN
1	C	159	GLN
1	C	183	ASN
1	D	120	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 ⓘ

12 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	BMA	E	1	2	12,12,12	2.12	6 (50%)	17,17,17	1.64	4 (23%)
2	BMA	E	2	2	11,11,12	2.59	5 (45%)	15,15,17	2.23	6 (40%)
2	BMA	E	3	2	11,11,12	2.63	6 (54%)	15,15,17	1.53	3 (20%)
2	BMA	E	4	2	11,11,12	2.54	4 (36%)	15,15,17	1.14	1 (6%)
2	BMA	F	1	2	12,12,12	2.08	5 (41%)	17,17,17	1.54	4 (23%)
2	BMA	F	2	2	11,11,12	2.48	5 (45%)	15,15,17	2.19	3 (20%)
2	BMA	F	3	2	11,11,12	2.56	5 (45%)	15,15,17	0.98	0
2	BMA	F	4	2	11,11,12	2.53	5 (45%)	15,15,17	0.89	0
2	BMA	G	1	2	12,12,12	1.93	4 (33%)	17,17,17	0.95	1 (5%)
2	BMA	G	2	2	11,11,12	2.32	5 (45%)	15,15,17	1.47	2 (13%)
2	BMA	G	3	2	11,11,12	2.46	6 (54%)	15,15,17	1.22	2 (13%)
2	BMA	G	4	2	11,11,12	2.51	5 (45%)	15,15,17	0.97	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	BMA	E	1	2	-	1/2/22/22	0/1/1/1
2	BMA	E	2	2	-	2/2/19/22	0/1/1/1
2	BMA	E	3	2	-	0/2/19/22	0/1/1/1
2	BMA	E	4	2	-	2/2/19/22	0/1/1/1
2	BMA	F	1	2	-	2/2/22/22	0/1/1/1
2	BMA	F	2	2	-	2/2/19/22	0/1/1/1
2	BMA	F	3	2	-	0/2/19/22	0/1/1/1
2	BMA	F	4	2	-	0/2/19/22	0/1/1/1
2	BMA	G	1	2	-	0/2/22/22	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	BMA	G	2	2	-	0/2/19/22	0/1/1/1
2	BMA	G	3	2	-	0/2/19/22	0/1/1/1
2	BMA	G	4	2	-	0/2/19/22	0/1/1/1

All (61) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	F	3	BMA	O5-C5	6.16	1.55	1.43
2	E	3	BMA	O5-C5	6.06	1.55	1.43
2	E	4	BMA	O5-C5	5.73	1.54	1.43
2	G	3	BMA	O5-C5	5.64	1.54	1.43
2	G	4	BMA	O5-C5	5.58	1.54	1.43
2	F	4	BMA	O5-C5	5.57	1.54	1.43
2	F	2	BMA	O5-C5	5.34	1.53	1.43
2	E	2	BMA	O5-C5	5.10	1.53	1.43
2	G	2	BMA	O5-C5	4.93	1.53	1.43
2	E	2	BMA	C2-C3	-4.48	1.45	1.52
2	F	1	BMA	O5-C5	4.04	1.54	1.44
2	E	1	BMA	O5-C5	3.97	1.54	1.44
2	E	4	BMA	C2-C3	-3.68	1.46	1.52
2	F	4	BMA	C2-C3	-3.67	1.46	1.52
2	G	1	BMA	O5-C5	3.63	1.53	1.44
2	F	2	BMA	C2-C3	-3.43	1.47	1.52
2	E	3	BMA	C2-C3	-3.35	1.47	1.52
2	G	4	BMA	C2-C3	-3.23	1.47	1.52
2	G	2	BMA	C2-C3	-3.20	1.47	1.52
2	E	1	BMA	C6-C5	-3.05	1.41	1.51
2	E	2	BMA	C6-C5	-2.96	1.41	1.51
2	G	2	BMA	C6-C5	-2.73	1.42	1.51
2	G	1	BMA	O3-C3	2.70	1.49	1.43
2	F	1	BMA	O3-C3	2.69	1.49	1.43
2	E	1	BMA	O3-C3	2.68	1.49	1.43
2	G	1	BMA	C6-C5	-2.68	1.42	1.51
2	G	4	BMA	O3-C3	2.67	1.49	1.43
2	F	3	BMA	O3-C3	2.65	1.49	1.43
2	E	4	BMA	C6-C5	-2.63	1.43	1.51
2	F	2	BMA	C6-C5	-2.62	1.43	1.51
2	G	4	BMA	C6-C5	-2.61	1.43	1.51
2	E	3	BMA	O2-C2	2.59	1.48	1.43
2	F	4	BMA	O2-C2	2.59	1.48	1.43
2	F	1	BMA	C4-C5	2.56	1.58	1.53
2	F	4	BMA	O3-C3	2.55	1.49	1.43

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	F	1	BMA	C6-C5	-2.51	1.43	1.51
2	G	3	BMA	O3-C3	2.51	1.49	1.43
2	G	3	BMA	C2-C3	-2.48	1.48	1.52
2	F	3	BMA	O2-C2	2.48	1.48	1.43
2	F	2	BMA	O2-C2	2.43	1.48	1.43
2	E	3	BMA	C6-C5	-2.41	1.43	1.51
2	E	4	BMA	O3-C3	2.35	1.48	1.43
2	F	3	BMA	C2-C3	-2.33	1.48	1.52
2	G	3	BMA	C6-C5	-2.30	1.44	1.51
2	F	1	BMA	C3-C2	-2.30	1.46	1.52
2	G	3	BMA	O2-C2	2.29	1.48	1.43
2	E	2	BMA	O3-C3	2.29	1.48	1.43
2	G	2	BMA	O3-C3	2.28	1.48	1.43
2	F	4	BMA	C6-C5	-2.28	1.44	1.51
2	E	3	BMA	C4-C3	-2.25	1.46	1.52
2	E	1	BMA	C3-C2	-2.23	1.46	1.52
2	E	1	BMA	O2-C2	2.21	1.48	1.43
2	F	2	BMA	O3-C3	2.20	1.48	1.43
2	E	1	BMA	C4-C5	2.17	1.57	1.53
2	G	2	BMA	O2-C2	2.17	1.47	1.43
2	G	3	BMA	C1-C2	-2.11	1.47	1.52
2	G	4	BMA	O2-C2	2.08	1.47	1.43
2	E	3	BMA	C1-C2	-2.04	1.47	1.52
2	G	1	BMA	C4-C5	2.03	1.57	1.53
2	F	3	BMA	C6-C5	-2.02	1.45	1.51
2	E	2	BMA	O2-C2	2.00	1.47	1.43

All (27) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	F	2	BMA	C3-C4-C5	5.43	120.07	110.23
2	F	2	BMA	C2-C3-C4	4.32	118.46	110.86
2	E	1	BMA	C1-O5-C5	-4.12	105.68	113.65
2	E	2	BMA	O5-C5-C4	-3.99	101.11	110.83
2	E	2	BMA	C1-C2-C3	3.96	115.41	109.64
2	F	1	BMA	C3-C4-C5	3.46	116.50	110.23
2	F	2	BMA	C1-C2-C3	3.40	114.59	109.64
2	G	2	BMA	O4-C4-C5	-3.39	100.97	109.32
2	E	3	BMA	C1-C2-C3	3.23	114.34	109.64
2	E	2	BMA	O5-C1-C2	3.20	118.43	110.79
2	E	2	BMA	C3-C4-C5	3.14	115.92	110.23
2	F	1	BMA	C1-O5-C5	-2.85	108.14	113.65

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	G	2	BMA	C1-O5-C5	-2.85	108.37	112.19
2	E	2	BMA	C2-C3-C4	2.64	115.51	110.86
2	F	1	BMA	O5-C5-C6	2.54	112.74	106.44
2	F	1	BMA	O4-C4-C3	-2.48	104.53	110.38
2	E	1	BMA	O5-C5-C4	-2.46	105.27	109.70
2	E	1	BMA	C1-C2-C3	2.33	115.11	110.36
2	E	1	BMA	O5-C5-C6	2.32	112.19	106.44
2	G	3	BMA	O5-C5-C4	-2.29	105.25	110.83
2	E	3	BMA	O6-C6-C5	-2.24	103.71	111.33
2	G	4	BMA	O5-C5-C4	-2.24	105.39	110.83
2	E	4	BMA	O5-C5-C4	-2.16	105.58	110.83
2	G	1	BMA	O4-C4-C5	-2.15	104.02	109.32
2	E	3	BMA	O4-C4-C5	-2.08	104.21	109.32
2	E	2	BMA	O4-C4-C3	-2.07	105.50	110.38
2	G	3	BMA	C1-C2-C3	2.01	112.57	109.64

There are no chirality outliers.

All (9) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	F	1	BMA	O5-C5-C6-O6
2	F	2	BMA	O5-C5-C6-O6
2	F	1	BMA	C4-C5-C6-O6
2	E	2	BMA	C4-C5-C6-O6
2	E	2	BMA	O5-C5-C6-O6
2	E	4	BMA	O5-C5-C6-O6
2	F	2	BMA	C4-C5-C6-O6
2	E	4	BMA	C4-C5-C6-O6
2	E	1	BMA	O5-C5-C6-O6

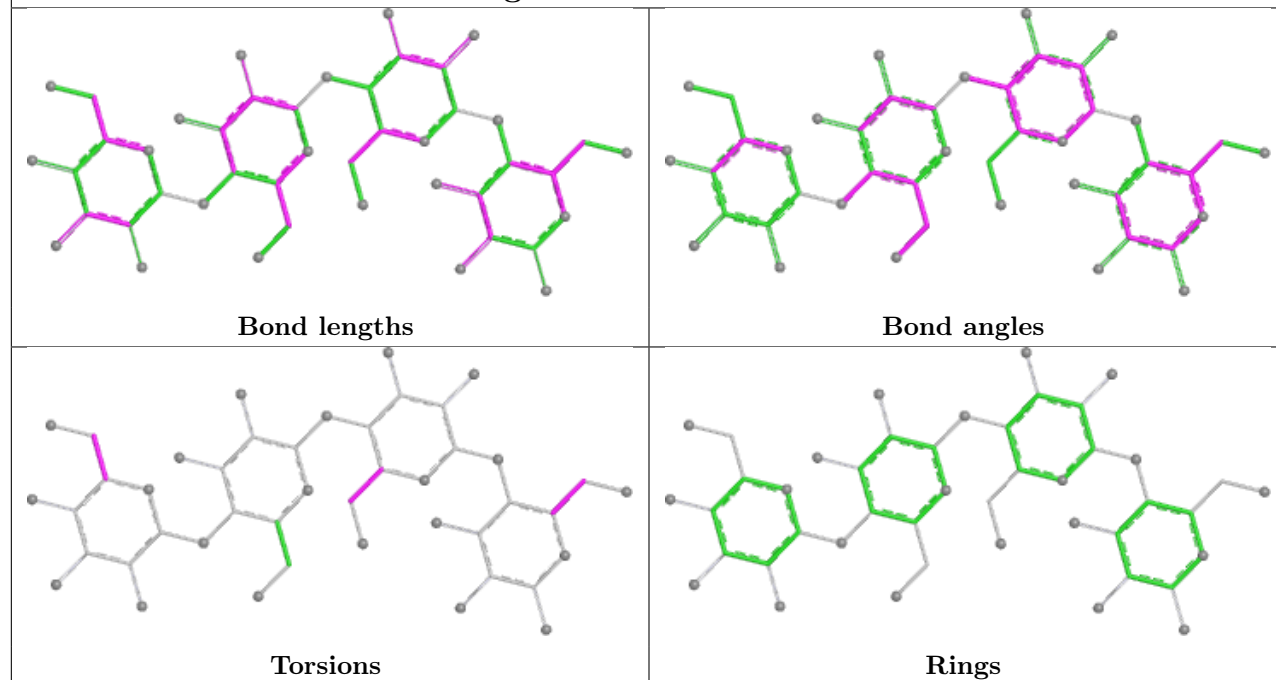
There are no ring outliers.

2 monomers are involved in 2 short contacts:

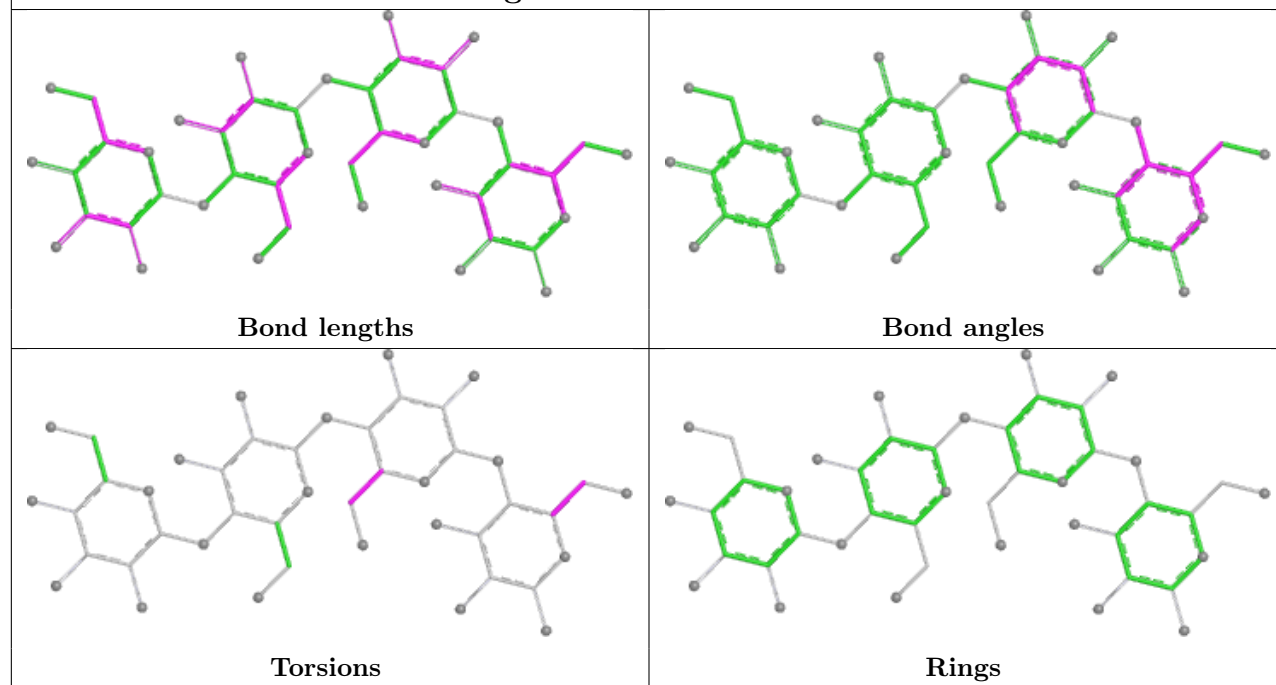
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	F	2	BMA	1	0
2	E	1	BMA	1	0

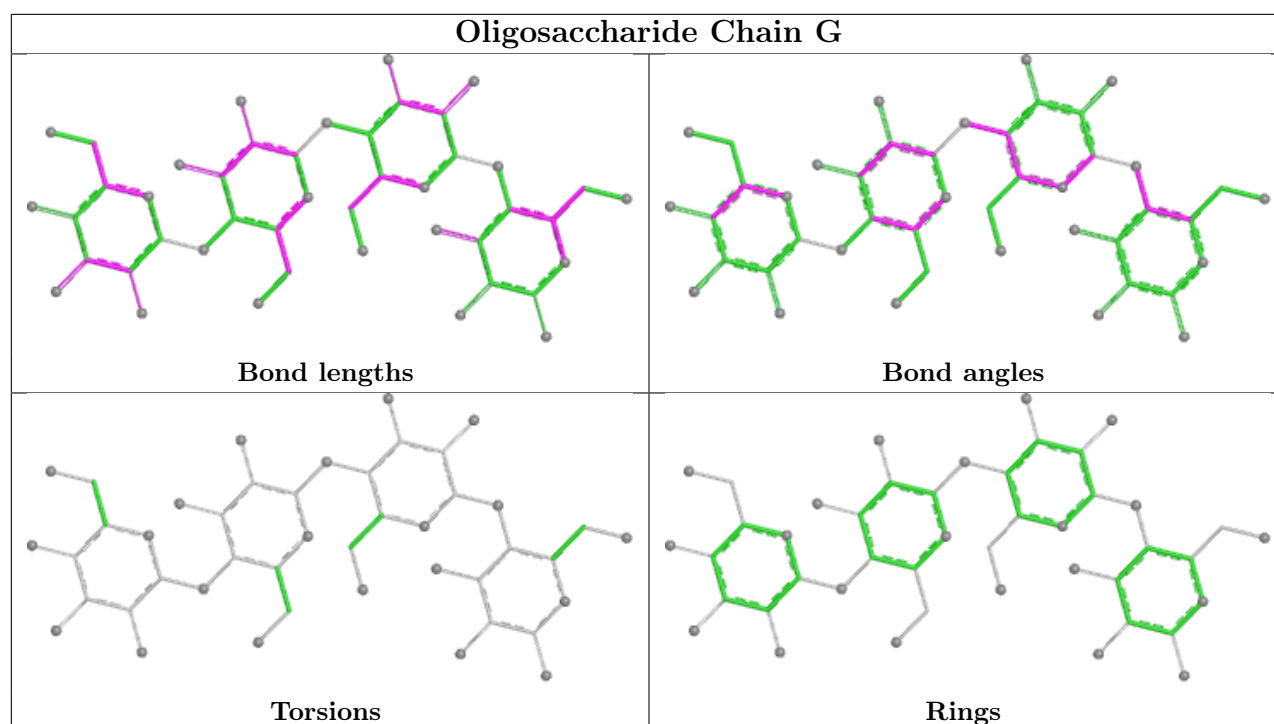
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.

Oligosaccharide Chain E



Oligosaccharide Chain F





5.6 Ligand geometry [i](#)

21 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	NAG	B	402	1	14,14,15	0.41	0	17,19,21	0.58	0
3	NAG	A	401	1	14,14,15	0.35	0	17,19,21	0.46	0
3	NAG	D	502	1	14,14,15	0.51	0	17,19,21	0.51	0
3	NAG	D	505	1	14,14,15	0.46	0	17,19,21	0.38	0
4	PEG	A	407	-	6,6,6	0.15	0	5,5,5	0.06	0
3	NAG	D	503	1	14,14,15	0.57	1 (7%)	17,19,21	0.42	0
3	NAG	A	404	1	14,14,15	0.73	1 (7%)	17,19,21	0.80	1 (5%)
3	NAG	D	504	1	14,14,15	0.55	0	17,19,21	0.45	0
3	NAG	A	403	1	14,14,15	0.32	0	17,19,21	0.47	0
3	NAG	B	401	1	14,14,15	0.39	0	17,19,21	0.50	0
3	NAG	C	402	1	14,14,15	0.63	0	17,19,21	0.47	0
3	NAG	B	404	1	14,14,15	0.37	0	17,19,21	0.63	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	NAG	B	403	1	14,14,15	0.55	0	17,19,21	0.49	0
4	PEG	A	406	-	6,6,6	0.17	0	5,5,5	0.06	0
4	PEG	A	405	-	6,6,6	0.17	0	5,5,5	0.18	0
3	NAG	C	405	1	14,14,15	0.58	0	17,19,21	0.60	0
3	NAG	A	402	1	14,14,15	0.43	0	17,19,21	0.68	0
3	NAG	C	403	1	14,14,15	0.73	1 (7%)	17,19,21	0.53	0
3	NAG	C	401	1	14,14,15	0.58	0	17,19,21	0.48	0
3	NAG	C	404	1	14,14,15	0.37	0	17,19,21	0.49	0
3	NAG	D	501	-	14,14,15	0.30	0	19,19,21	0.93	1 (5%)

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
3	NAG	B	402	1	-	0/6/23/26	0/1/1/1
3	NAG	A	401	1	-	0/6/23/26	0/1/1/1
3	NAG	D	502	1	-	2/6/23/26	0/1/1/1
3	NAG	D	505	1	-	0/6/23/26	0/1/1/1
4	PEG	A	407	-	-	1/4/4/4	-
3	NAG	D	503	1	-	0/6/23/26	0/1/1/1
3	NAG	A	404	1	-	2/6/23/26	0/1/1/1
3	NAG	D	504	1	-	0/6/23/26	0/1/1/1
3	NAG	A	403	1	-	0/6/23/26	0/1/1/1
3	NAG	B	401	1	-	0/6/23/26	0/1/1/1
3	NAG	C	402	1	-	0/6/23/26	0/1/1/1
3	NAG	B	404	1	-	0/6/23/26	0/1/1/1
3	NAG	B	403	1	-	0/6/23/26	0/1/1/1
4	PEG	A	406	-	-	2/4/4/4	-
4	PEG	A	405	-	-	1/4/4/4	-
3	NAG	C	405	1	-	2/6/23/26	0/1/1/1
3	NAG	A	402	1	-	0/6/23/26	0/1/1/1
3	NAG	C	403	1	-	0/6/23/26	0/1/1/1
3	NAG	C	401	1	-	0/6/23/26	0/1/1/1
3	NAG	C	404	1	-	0/6/23/26	0/1/1/1
3	NAG	D	501	-	-	2/6/22/26	0/1/1/1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	404	NAG	O5-C1	-2.33	1.39	1.43
3	C	403	NAG	C1-C2	2.23	1.55	1.52
3	D	503	NAG	C1-C2	2.04	1.55	1.52

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	501	NAG	C2-N2-C7	2.63	126.43	122.90
3	A	404	NAG	C3-C4-C5	2.33	114.45	110.23

There are no chirality outliers.

All (12) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	D	501	NAG	C1-C2-N2-C7
3	C	405	NAG	C4-C5-C6-O6
3	A	404	NAG	O5-C5-C6-O6
3	D	502	NAG	C8-C7-N2-C2
3	D	502	NAG	O7-C7-N2-C2
3	C	405	NAG	O5-C5-C6-O6
3	A	404	NAG	C4-C5-C6-O6
4	A	406	PEG	O2-C3-C4-O4
4	A	407	PEG	O2-C3-C4-O4
3	D	501	NAG	O5-C5-C6-O6
4	A	405	PEG	O2-C3-C4-O4
4	A	406	PEG	C1-C2-O2-C3

There are no ring outliers.

5 monomers are involved in 11 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	D	502	NAG	1	0
4	A	407	PEG	2	0
3	A	403	NAG	2	0
4	A	405	PEG	3	0
3	D	501	NAG	3	0

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	309/322 (95%)	-0.33	0 100 100	11, 16, 24, 43	0
1	B	309/322 (95%)	-0.35	1 (0%) 90 93	11, 15, 23, 37	0
1	C	308/322 (95%)	-0.39	1 (0%) 90 93	11, 15, 23, 41	0
1	D	307/322 (95%)	-0.38	0 100 100	12, 16, 23, 36	0
All	All	1233/1288 (95%)	-0.36	2 (0%) 91 93	11, 16, 24, 43	0

All (2) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	331	TYR	3.8
1	B	331	TYR	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.

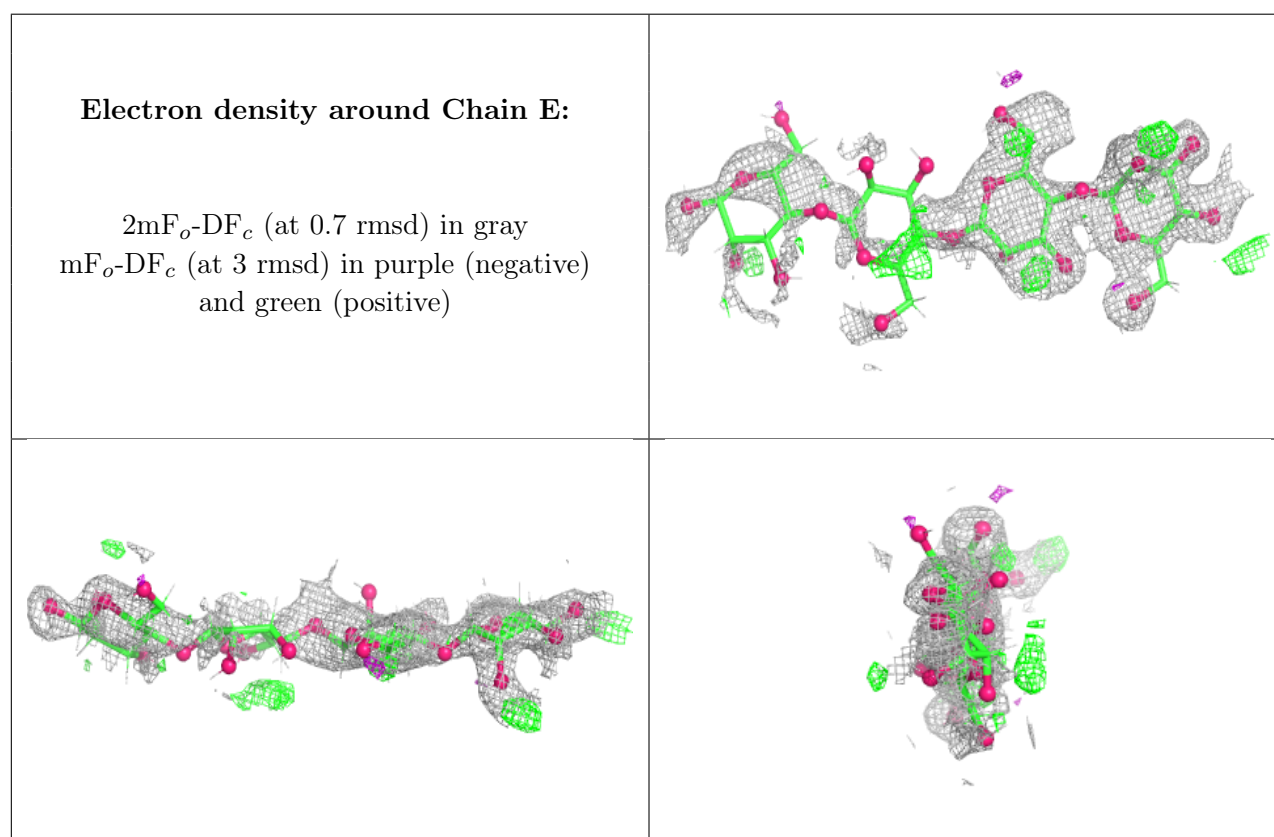
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	BMA	E	1	12/12	0.76	0.16	27,35,42,44	23
2	BMA	E	2	11/12	0.79	0.18	27,35,40,43	21
2	BMA	F	2	11/12	0.82	0.15	33,41,44,46	0
2	BMA	F	1	12/12	0.83	0.10	37,40,42,46	0
2	BMA	E	3	11/12	0.84	0.13	20,26,33,33	21

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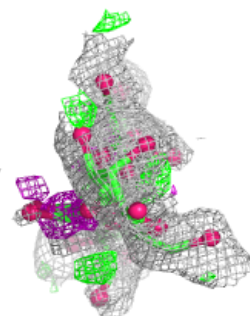
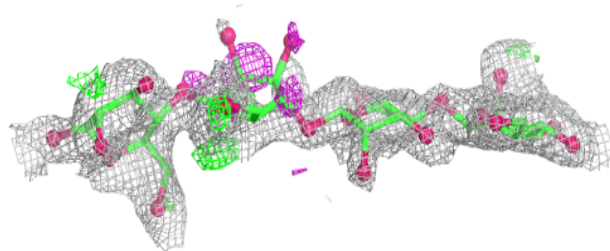
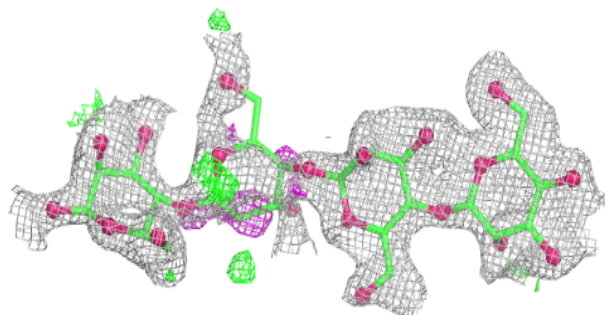
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	BMA	E	4	11/12	0.86	0.11	14,24,28,34	22
2	BMA	F	4	11/12	0.90	0.07	19,27,32,32	0
2	BMA	G	4	11/12	0.90	0.08	21,27,30,33	0
2	BMA	G	3	11/12	0.92	0.07	18,23,24,26	0
2	BMA	F	3	11/12	0.92	0.08	24,29,35,35	0
2	BMA	G	1	12/12	0.93	0.08	17,20,23,29	0
2	BMA	G	2	11/12	0.93	0.07	19,20,26,27	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.

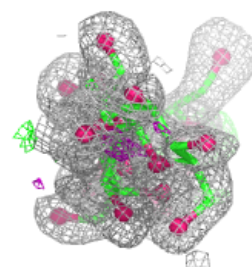
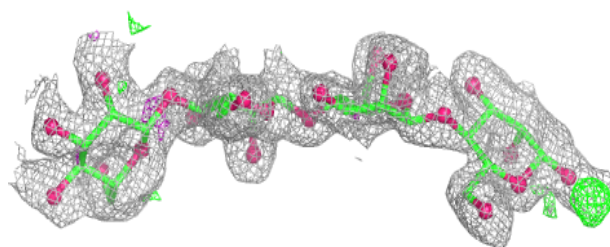
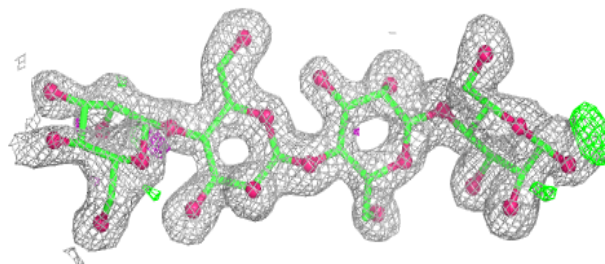


Electron density around Chain F:

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

**Electron density around Chain G:**

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



6.4 Ligands

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
3	NAG	D	501	14/15	0.58	0.17	31,39,43,46	0
3	NAG	A	403	14/15	0.79	0.12	31,36,47,49	0
3	NAG	A	404	14/15	0.83	0.13	29,37,43,43	0
4	PEG	A	406	7/7	0.84	0.10	29,38,47,53	0
3	NAG	D	504	14/15	0.85	0.09	25,29,37,39	0
3	NAG	C	405	14/15	0.85	0.10	26,30,35,36	0
3	NAG	C	402	14/15	0.86	0.09	24,28,32,33	0
4	PEG	A	407	7/7	0.86	0.09	30,36,44,46	0
3	NAG	B	403	14/15	0.87	0.09	31,38,43,48	0
4	PEG	A	405	7/7	0.87	0.17	23,29,39,39	0
3	NAG	D	505	14/15	0.90	0.09	24,28,35,36	0
3	NAG	C	403	14/15	0.90	0.07	16,20,23,25	0
3	NAG	C	404	14/15	0.91	0.08	28,32,36,38	0
3	NAG	B	402	14/15	0.92	0.07	16,20,23,26	0
3	NAG	C	401	14/15	0.92	0.09	16,26,37,37	0
3	NAG	D	503	14/15	0.93	0.07	20,25,28,30	0
3	NAG	A	401	14/15	0.94	0.06	14,21,24,25	0
3	NAG	B	401	14/15	0.95	0.06	13,16,19,21	0
3	NAG	D	502	14/15	0.95	0.07	16,21,27,38	0
3	NAG	A	402	14/15	0.96	0.06	14,15,17,17	0
3	NAG	B	404	14/15	0.97	0.05	16,17,20,20	0

6.5 Other polymers

There are no such residues in this entry.