



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 10, 2026 – 07:59 AM UTC

PDB ID : 4BWC / pdb_00004bwc
Title : X-ray structure of a phospholipase B like protein 1 from bovine kidneys
Authors : Repo, H.; Kuokkanen, E.; Oksanen, E.; Goldman, A.; Heikinheimo, P.
Deposited on : 2013-07-01
Resolution : 1.89 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
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
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

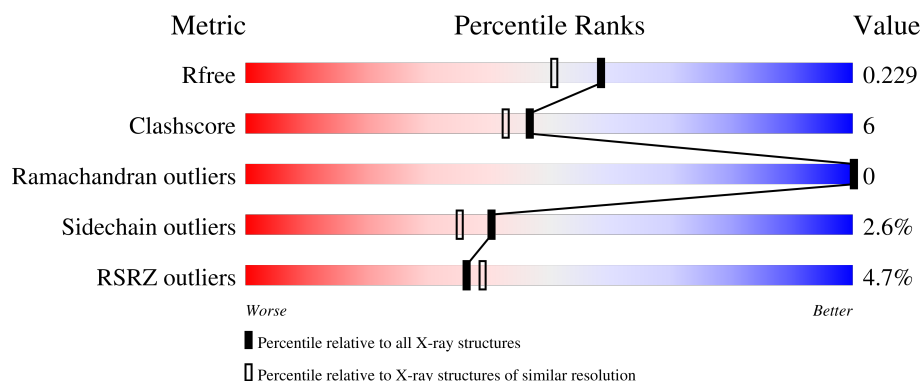
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.89 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	7789 (1.90-1.90)
Clashscore	190562	8410 (1.90-1.90)
Ramachandran outliers	187476	8333 (1.90-1.90)
Sidechain outliers	187428	8333 (1.90-1.90)
RSRZ outliers	180081	7790 (1.90-1.90)

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	170	10% 82% 16% .
2	B	321	2% 81% 18% .
3	C	2	50% 50%
3	D	2	100%
3	E	2	100%

2 Entry composition

There are 8 unique types of molecules in this entry. The entry contains 4334 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 PHOSPHOLIPASE B-LIKE 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	170	Total	C	N	O	S	0	0	0
			1376	893	226	250	7			

- Molecule 2 is a protein called PHOSPHOLIPASE B-LIKE 1.

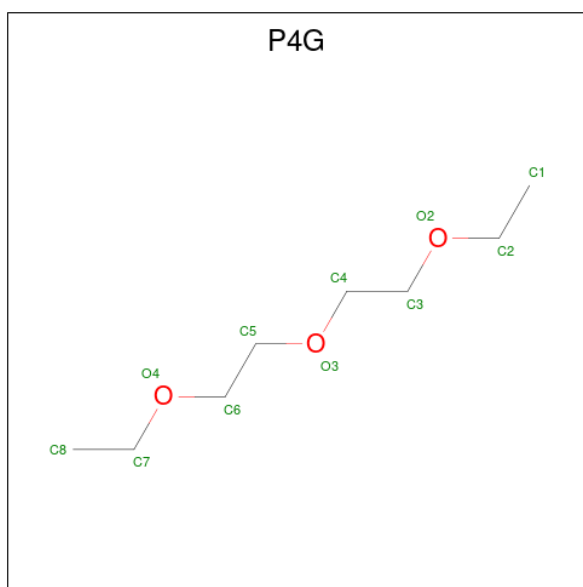
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	321	Total	C	N	O	S	0	2	0
			2631	1699	431	487	14			

- Molecule 3 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



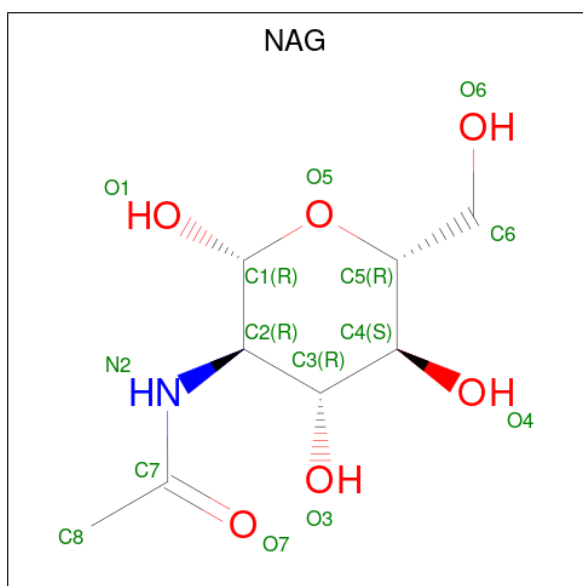
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	C	2	Total	C	N	O	0	0	0
			28	16	2	10			
3	D	2	Total	C	N	O	0	0	0
			28	16	2	10			
3	E	2	Total	C	N	O	0	0	0
			28	16	2	10			

- Molecule 4 is 1-ETHOXY-2-(2-ETHOXYETHOXY)ETHANE (CCD ID: P4G) (formula: C₈H₁₈O₃).



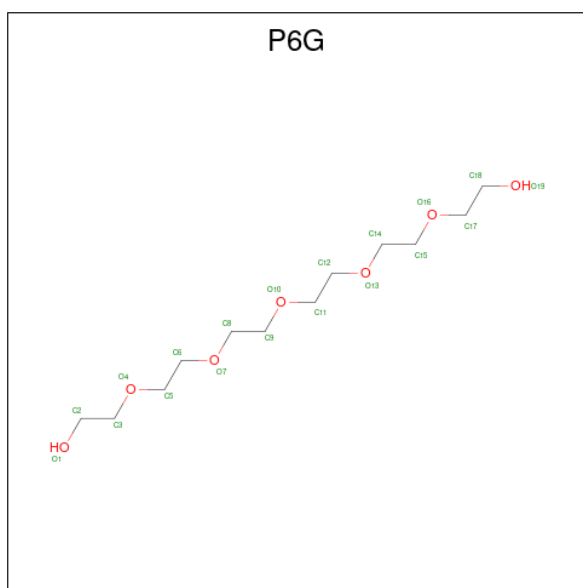
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			11	8	3		

- Molecule 5 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: $C_8H_{15}NO_6$).



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

- Molecule 6 is HEXAETHYLENE GLYCOL (CCD ID: P6G) (formula: $C_{12}H_{26}O_7$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	B	1	Total	C	O	0	0
			19	12	7		

- Molecule 7 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	B	1	Total	Cl	0	0
			1	1		

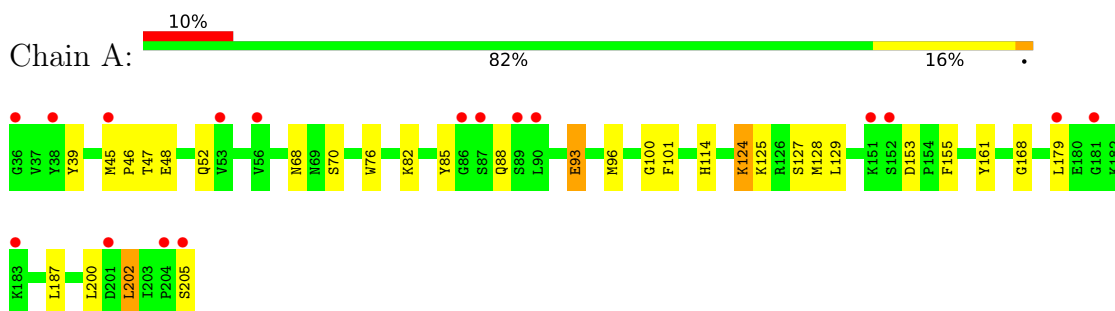
- Molecule 8 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	A	50	Total	O	0	0
			50	50		
8	B	134	Total	O	0	0
			134	134		

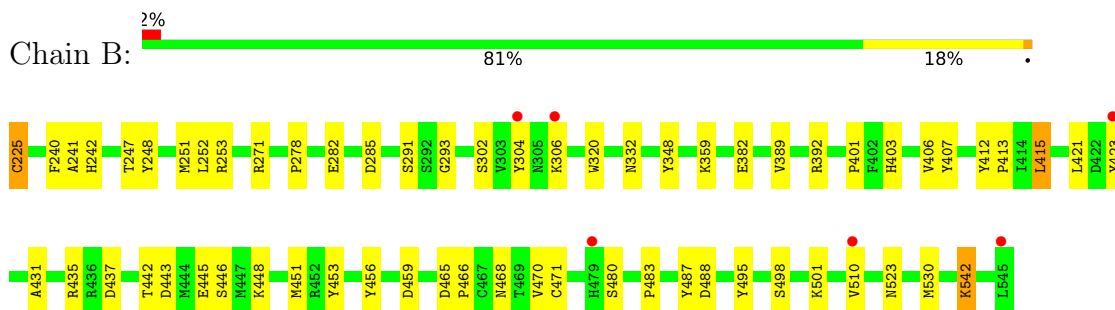
3 Residue-property plots

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: PHOSPHOLIPASE B-LIKE 1



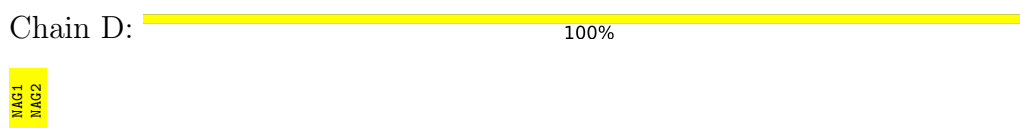
- Molecule 2: PHOSPHOLIPASE B-LIKE 1



- Molecule 3: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



- Molecule 3: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



- Molecule 3: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain E:

100%

MAG1
MAG2

4 Data and refinement statistics

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α , β , γ	97.37Å 97.37Å 140.94Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	46.98 – 1.89 46.98 – 1.89	Depositor EDS
% Data completeness (in resolution range)	99.8 (46.98-1.89) 99.8 (46.98-1.89)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.75 (at 1.88Å)	Xtriage
Refinement program	REFMAC 5.6.0117	Depositor
R, R_{free}	0.188 , 0.231 0.187 , 0.229	Depositor DCC
R_{free} test set	3134 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	28.7	Xtriage
Anisotropy	0.040	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 40.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.027 for -h,-k,l	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	4334	wwPDB-VP
Average B, all atoms (Å ²)	34.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.71% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: OCS, CL, NAG, P6G, P4G

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	1.35	3/1412 (0.2%)	1.21	3/1909 (0.2%)
2	B	1.55	15/2705 (0.6%)	1.28	14/3673 (0.4%)
All	All	1.48	18/4117 (0.4%)	1.25	17/5582 (0.3%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1

All (18) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	403	HIS	N-CA	7.15	1.54	1.46
2	B	242	HIS	CG-CD2	6.58	1.43	1.35
2	B	242	HIS	CE1-NE2	6.06	1.38	1.32
2	B	392	ARG	N-CA	6.03	1.54	1.46
2	B	282	GLU	C-O	5.91	1.30	1.23
2	B	483	PRO	CA-C	5.80	1.59	1.53
2	B	253	ARG	CA-C	-5.70	1.45	1.52
2	B	446	SER	CA-C	5.65	1.60	1.52
2	B	320	TRP	CD2-CE2	5.61	1.50	1.41
1	A	100	GLY	N-CA	5.54	1.52	1.45
2	B	431	ALA	N-CA	5.46	1.52	1.46
2	B	302	SER	CA-C	-5.43	1.46	1.52
2	B	382	GLU	C-O	5.41	1.30	1.24
2	B	389	VAL	CA-CB	5.32	1.60	1.54
1	A	39	TYR	CA-C	-5.25	1.46	1.52
2	B	443	ASP	N-CA	5.16	1.52	1.46

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	332	ASN	N-CA	5.07	1.51	1.46
1	A	114	HIS	ND1-CE1	5.05	1.37	1.32

All (17) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	285	ASP	N-CA-C	8.10	120.91	111.02
2	B	510	VAL	N-CA-C	-6.81	106.36	112.90
2	B	442	THR	N-CA-C	-6.59	104.83	114.39
1	A	187	LEU	N-CA-C	-6.37	104.44	111.82
2	B	406	VAL	N-CA-C	6.15	116.32	110.42
2	B	542	LYS	CA-C-N	-5.82	113.97	119.85
2	B	542	LYS	C-N-CA	-5.82	113.97	119.85
2	B	435	ARG	N-CA-C	-5.79	104.97	111.28
1	A	202	LEU	N-CA-C	5.68	117.55	111.36
2	B	470	VAL	N-CA-C	5.68	116.46	110.72
2	B	530	MET	CA-C-N	-5.62	114.82	120.21
2	B	530	MET	C-N-CA	-5.62	114.82	120.21
2	B	437	ASP	N-CA-C	5.56	120.95	113.72
2	B	421	LEU	N-CA-C	5.54	119.65	113.01
1	A	129	LEU	N-CA-C	-5.37	105.43	111.28
2	B	471	CYS	CA-C-N	5.19	128.08	120.71
2	B	471	CYS	C-N-CA	5.19	128.08	120.71

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	76	TRP	Peptide

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	1376	0	1356	22	0
2	B	2631	0	2551	24	0
3	C	28	0	25	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	D	28	0	25	0	0
3	E	28	0	25	1	0
4	A	11	0	18	0	0
5	B	28	0	26	1	0
6	B	19	0	26	3	0
7	B	1	0	0	0	0
8	A	50	0	0	2	0
8	B	134	0	0	3	0
All	All	4334	0	4052	47	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 (47) 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:124:LYS:H	1:A:128:MET:HE1	1.35	0.91
1:A:124:LYS:H	1:A:128:MET:CE	1.90	0.85
2:B:304:TYR:CD2	2:B:415:LEU:HD11	2.17	0.79
2:B:225:OCS:N	2:B:225:OCS:OD1	2.15	0.78
2:B:498:SER:HA	6:B:1546:P6G:H122	1.68	0.75
1:A:127:SER:HB3	8:A:2031:HOH:O	1.88	0.72
1:A:125:LYS:H	1:A:128:MET:CE	2.04	0.69
1:A:125:LYS:H	1:A:128:MET:HE3	1.58	0.69
1:A:93:GLU:H	1:A:93:GLU:CD	2.02	0.68
2:B:304:TYR:CD2	2:B:415:LEU:CD1	2.78	0.67
2:B:445:GLU:OE2	8:B:2107:HOH:O	2.14	0.65
2:B:304:TYR:CG	2:B:415:LEU:HD11	2.31	0.65
2:B:248:TYR:HB3	2:B:251:MET:HE2	1.81	0.63
2:B:495:TYR:CE1	6:B:1546:P6G:H21	2.37	0.60
2:B:523:ASN:HD22	5:B:1503:NAG:H83	1.70	0.56
1:A:125:LYS:N	1:A:128:MET:CE	2.70	0.55
3:E:1:NAG:H62	3:E:2:NAG:C1	2.38	0.54
1:A:85:TYR:O	8:A:2002:HOH:O	2.19	0.53
1:A:48:GLU:H	1:A:48:GLU:CD	2.17	0.53
2:B:252:LEU:O	2:B:278:PRO:HD3	2.11	0.50
1:A:124:LYS:N	1:A:128:MET:CE	2.68	0.50
1:A:124:LYS:N	1:A:128:MET:HE1	2.15	0.48
1:A:96:MET:HG3	1:A:161:TYR:HB3	1.95	0.48
1:A:45:MET:HE2	1:A:52:GLN:HB3	1.95	0.48
1:A:68:ASN:HD22	3:C:1:NAG:C7	2.26	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:488:ASP:OD1	2:B:488:ASP:C	2.58	0.46
1:A:46:PRO:HG3	1:A:88:GLN:OE1	2.15	0.46
2:B:501:LYS:HG2	2:B:542:LYS:HB3	1.97	0.46
2:B:293:GLY:HA2	6:B:1546:P6G:H111	1.98	0.45
2:B:241:ALA:CB	2:B:451:MET:HG3	2.46	0.45
2:B:448:LYS:NZ	8:B:2107:HOH:O	2.46	0.45
2:B:271:ARG:HB3	2:B:291:SER:HB3	1.99	0.44
1:A:48:GLU:OE1	1:A:48:GLU:N	2.43	0.44
1:A:202:LEU:O	1:A:205:SER:HB2	2.18	0.43
1:A:101:PHE:HA	1:A:168:GLY:O	2.19	0.43
1:A:124:LYS:H	1:A:128:MET:HE3	1.77	0.43
2:B:412:TYR:N	2:B:413:PRO:CD	2.82	0.43
2:B:453:TYR:OH	2:B:459:ASP:OD2	2.33	0.42
1:A:47:THR:HB	1:A:48:GLU:OE1	2.19	0.42
2:B:401:PRO:HG2	2:B:407:TYR:HA	2.01	0.42
2:B:415:LEU:HD22	2:B:423:TYR:CE2	2.54	0.42
1:A:153:ASP:OD2	1:A:155:PHE:HB3	2.20	0.42
2:B:465:ASP:HB3	2:B:468:ASN:HB2	2.03	0.41
2:B:348:TYR:HD1	2:B:348:TYR:HA	1.81	0.41
2:B:456:TYR:CG	2:B:466:PRO:HA	2.55	0.40
2:B:359:LYS:HE2	8:B:2044:HOH:O	2.21	0.40
1:A:200:LEU:HD23	1:A:200:LEU:HA	1.76	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 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	168/170 (99%)	166 (99%)	2 (1%)	0	100	100
2	B	321/321 (100%)	303 (94%)	18 (6%)	0	100	100
All	All	489/491 (100%)	469 (96%)	20 (4%)	0	100	100

There are no Ramachandran outliers to report.

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	144/144 (100%)	139 (96%)	5 (4%)	32	24
2	B	289/287 (101%)	283 (98%)	6 (2%)	47	44
All	All	433/431 (100%)	422 (98%)	11 (2%)	40	37

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	70	SER
1	A	82	LYS
1	A	93	GLU
1	A	124	LYS
1	A	179	LEU
2	B	240	PHE
2	B	247	THR
2	B	306	LYS
2	B	415	LEU
2	B	480	SER
2	B	487	TYR

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

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

1 non-standard protein/DNA/RNA residue is 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	OCS	B	225	2	6,8,9	2.37	1 (16%)	7,11,13	2.99	4 (57%)

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	OCS	B	225	2	-	4/4/7/9	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	225	OCS	OD2-SG	5.44	1.67	1.47

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	225	OCS	OD2-SG-OD3	4.25	122.03	111.40
2	B	225	OCS	OD2-SG-OD1	-4.25	100.78	111.40
2	B	225	OCS	OD2-SG-CB	3.82	113.35	105.97
2	B	225	OCS	OD3-SG-OD1	-3.08	103.80	113.82

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	225	OCS	N-CA-CB-SG
2	B	225	OCS	CA-CB-SG-OD1
2	B	225	OCS	CA-CB-SG-OD2
2	B	225	OCS	CA-CB-SG-OD3

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	225	OCS	1	0

5.5 Carbohydrates [i](#)

6 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	$\# Z > 2$
3	NAG	C	1	3,1	14,14,15	1.26	1 (7%)	17,19,21	1.79	4 (23%)
3	NAG	C	2	3	14,14,15	0.79	1 (7%)	17,19,21	2.15	6 (35%)
3	NAG	D	1	3,2	14,14,15	0.66	0	17,19,21	2.04	3 (17%)
3	NAG	D	2	3	14,14,15	0.81	1 (7%)	17,19,21	1.75	4 (23%)
3	NAG	E	1	3,2	14,14,15	0.76	0	17,19,21	2.07	7 (41%)
3	NAG	E	2	3	14,14,15	0.67	0	17,19,21	1.64	5 (29%)

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	C	1	3,1	-	2/6/23/26	0/1/1/1
3	NAG	C	2	3	-	0/6/23/26	0/1/1/1
3	NAG	D	1	3,2	-	0/6/23/26	0/1/1/1
3	NAG	D	2	3	-	2/6/23/26	0/1/1/1
3	NAG	E	1	3,2	-	0/6/23/26	0/1/1/1
3	NAG	E	2	3	-	3/6/23/26	0/1/1/1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	1	NAG	O5-C1	-3.38	1.38	1.43
3	D	2	NAG	C1-C2	2.36	1.55	1.52
3	C	2	NAG	C1-C2	2.33	1.55	1.52

All (29) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	1	NAG	C1-C2-N2	-6.02	100.94	110.43
3	C	2	NAG	C3-C4-C5	-4.92	101.31	110.23
3	D	2	NAG	C4-C3-C2	4.35	117.40	111.02
3	C	1	NAG	O7-C7-C8	-4.09	114.77	122.05
3	C	2	NAG	C2-N2-C7	4.09	128.38	122.90
3	E	1	NAG	C6-C5-C4	-3.89	103.46	113.02
3	C	2	NAG	C1-C2-N2	3.41	115.81	110.43
3	E	1	NAG	O4-C4-C3	-3.07	103.14	110.38
3	E	1	NAG	O7-C7-C8	-3.07	116.59	122.05
3	D	1	NAG	O3-C3-C4	-2.98	103.35	110.38
3	C	1	NAG	O3-C3-C4	-2.94	103.45	110.38
3	E	1	NAG	C8-C7-N2	2.86	120.86	116.12
3	E	1	NAG	O6-C6-C5	-2.85	101.64	111.33
3	E	2	NAG	O5-C1-C2	2.82	115.66	111.29
3	C	1	NAG	O7-C7-N2	2.63	126.63	121.98
3	E	2	NAG	C2-N2-C7	2.59	126.38	122.90
3	D	2	NAG	O5-C5-C6	2.50	112.53	107.66
3	E	2	NAG	C1-C2-N2	-2.42	106.62	110.43
3	E	2	NAG	O5-C5-C6	2.39	112.31	107.66
3	C	1	NAG	O4-C4-C5	2.32	115.03	109.32
3	E	2	NAG	C4-C3-C2	2.29	114.37	111.02
3	D	2	NAG	O5-C5-C4	-2.26	105.33	110.83
3	C	2	NAG	O4-C4-C5	2.20	114.75	109.32
3	E	1	NAG	C1-O5-C5	2.19	115.12	112.19
3	C	2	NAG	O5-C5-C6	2.18	111.90	107.66
3	D	1	NAG	O4-C4-C5	2.17	114.66	109.32
3	C	2	NAG	O3-C3-C2	2.14	113.85	109.40
3	E	1	NAG	O5-C5-C4	2.08	115.89	110.83
3	D	2	NAG	O3-C3-C4	-2.04	105.58	110.38

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	E	2	NAG	C1-C2-N2-C7

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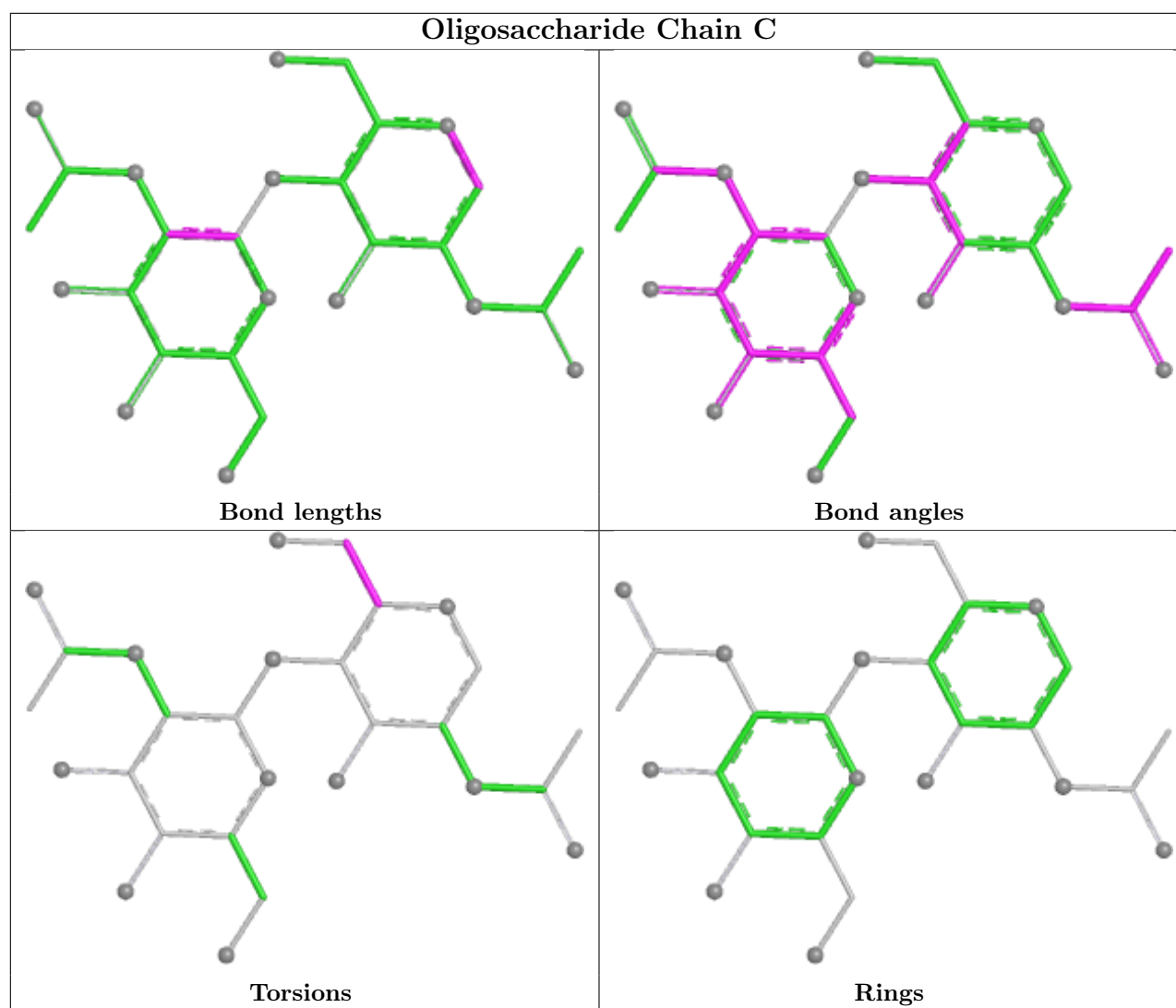
Mol	Chain	Res	Type	Atoms
3	E	2	NAG	O5-C5-C6-O6
3	C	1	NAG	C4-C5-C6-O6
3	E	2	NAG	C4-C5-C6-O6
3	C	1	NAG	O5-C5-C6-O6
3	D	2	NAG	O5-C5-C6-O6
3	D	2	NAG	C4-C5-C6-O6

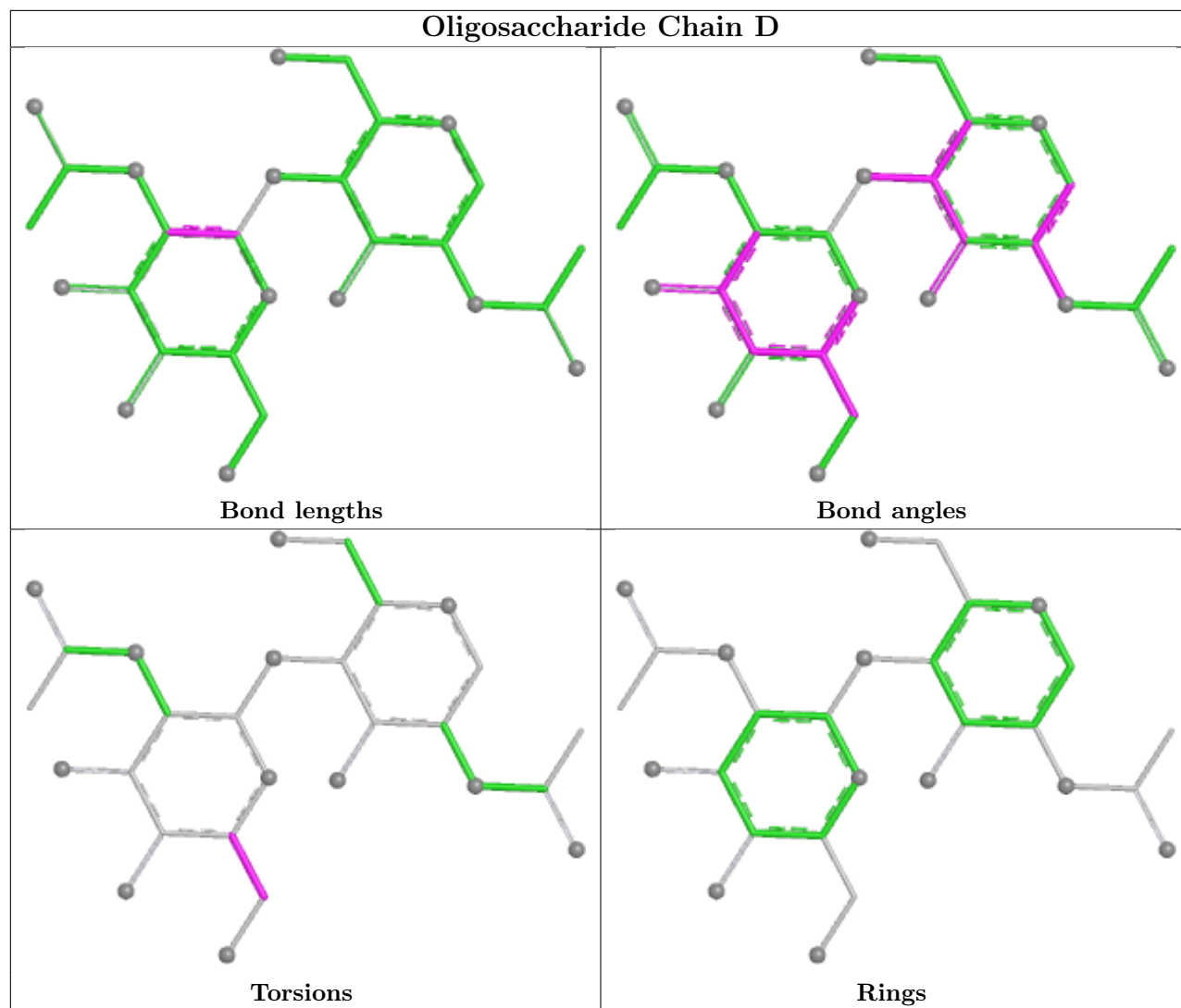
There are no ring outliers.

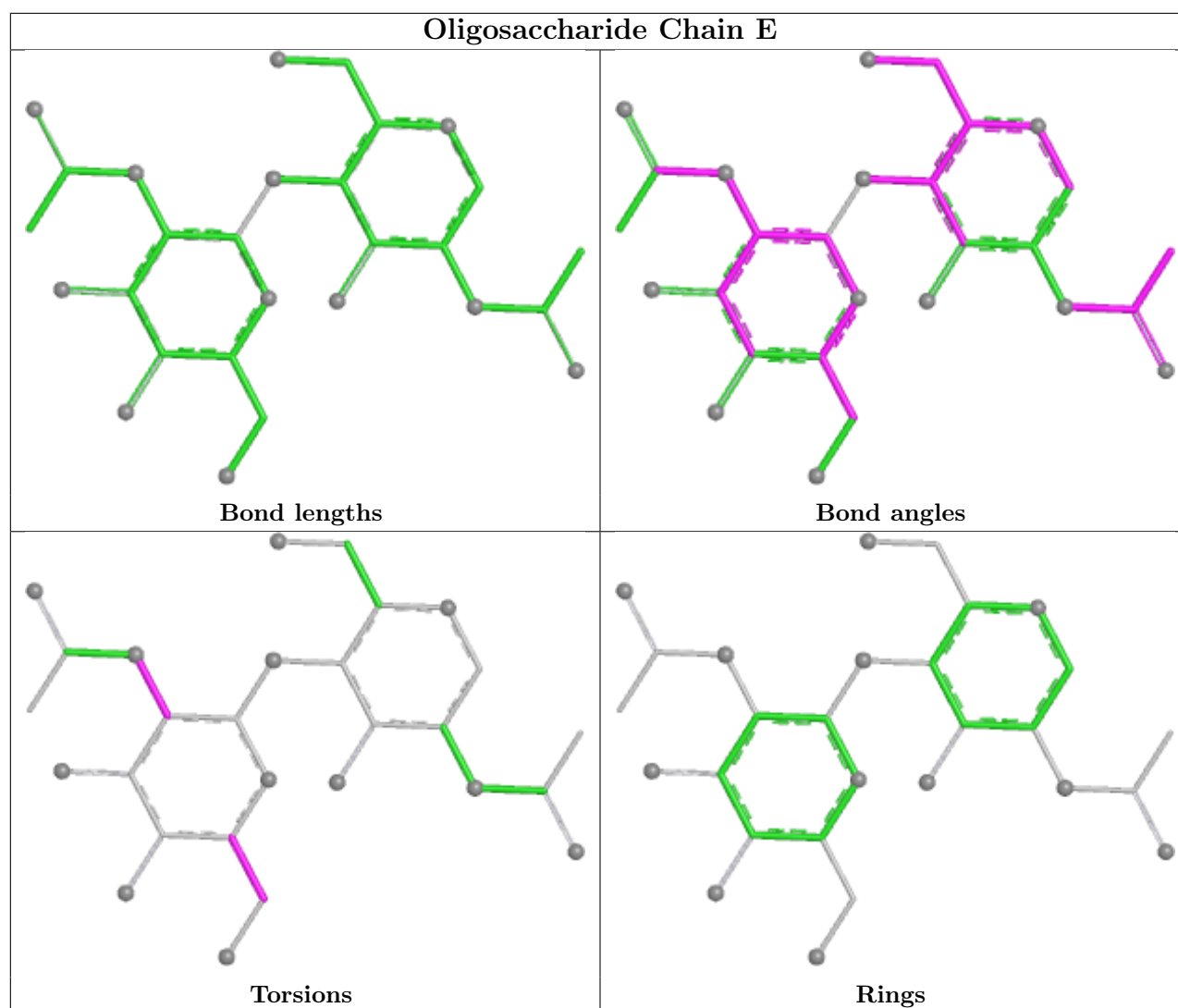
3 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	E	1	NAG	1	0
3	E	2	NAG	1	0
3	C	1	NAG	1	0

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







5.6 Ligand geometry [i](#)

Of 5 ligands modelled in this entry, 1 is monoatomic - leaving 4 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	$\# Z > 2$
6	P6G	B	1546	-	18,18,18	0.72	0	17,17,17	0.86	0
5	NAG	B	1503	2	14,14,15	0.70	0	17,19,21	2.19	6 (35%)
5	NAG	B	1388	2	14,14,15	1.03	1 (7%)	17,19,21	2.27	4 (23%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	P4G	A	1206	-	10,10,10	0.79	0	9,9,9	0.93	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
6	P6G	B	1546	-	-	8/16/16/16	-
5	NAG	B	1503	2	-	2/6/23/26	0/1/1/1
5	NAG	B	1388	2	-	0/6/23/26	0/1/1/1
4	P4G	A	1206	-	-	3/8/8/8	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	B	1388	NAG	C1-C2	3.22	1.56	1.52

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	B	1388	NAG	C3-C4-C5	-6.40	98.62	110.23
5	B	1503	NAG	C1-O5-C5	4.46	118.17	112.19
5	B	1503	NAG	C1-C2-N2	4.34	117.28	110.43
5	B	1388	NAG	O5-C5-C6	3.54	114.55	107.66
5	B	1503	NAG	C8-C7-N2	3.26	121.53	116.12
5	B	1503	NAG	O5-C1-C2	-3.26	106.25	111.29
5	B	1503	NAG	C4-C3-C2	-3.06	106.53	111.02
5	B	1388	NAG	C2-N2-C7	2.71	126.53	122.90
5	B	1388	NAG	O6-C6-C5	-2.19	103.87	111.33
5	B	1503	NAG	O7-C7-C8	-2.14	118.24	122.05

There are no chirality outliers.

All (13) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	B	1546	P6G	O4-C5-C6-O7
6	B	1546	P6G	O10-C11-C12-O13
5	B	1503	NAG	C8-C7-N2-C2
5	B	1503	NAG	O7-C7-N2-C2

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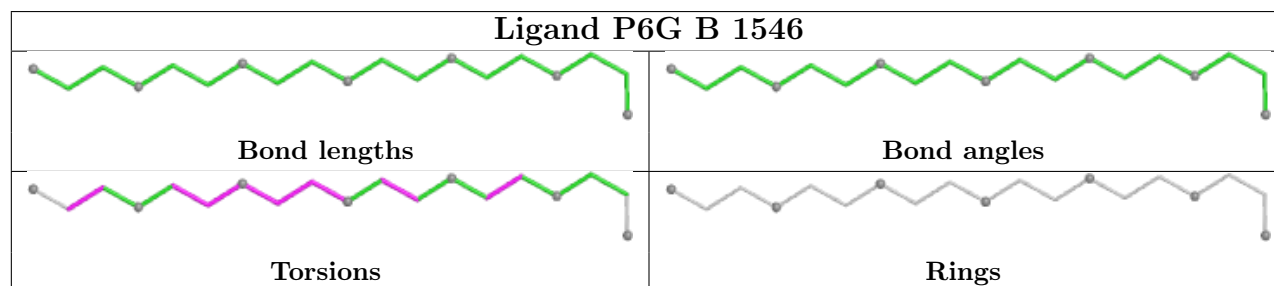
Mol	Chain	Res	Type	Atoms
6	B	1546	P6G	O16-C17-C18-O19
6	B	1546	P6G	O13-C14-C15-O16
4	A	1206	P4G	O3-C5-C6-O4
6	B	1546	P6G	O7-C8-C9-O10
4	A	1206	P4G	O2-C3-C4-O3
6	B	1546	P6G	C12-C11-O10-C9
6	B	1546	P6G	C15-C14-O13-C12
4	A	1206	P4G	C1-C2-O2-C3
6	B	1546	P6G	C11-C12-O13-C14

There are no ring outliers.

2 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	B	1546	P6G	3	0
5	B	1503	NAG	1	0

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



5.7 Other polymers ⓘ

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

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	170/170 (100%)	0.68	17 (10%) 12 13	24, 38, 63, 81	0
2	B	320/321 (99%)	-0.18	6 (1%) 66 70	13, 27, 44, 61	2 (0%)
All	All	490/491 (99%)	0.12	23 (4%) 36 39	13, 31, 53, 81	2 (0%)

All (23) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	179	LEU	4.4
1	A	183	LYS	2.9
1	A	38	TYR	2.9
1	A	204	PRO	2.8
1	A	53	VAL	2.7
1	A	205	SER	2.6
2	B	423	TYR	2.6
1	A	45	MET	2.6
1	A	201	ASP	2.6
2	B	545	LEU	2.5
1	A	89	SER	2.5
1	A	86	GLY	2.4
1	A	152	SER	2.4
1	A	151	LYS	2.4
1	A	56	VAL	2.4
1	A	87	SER	2.4
1	A	181	GLY	2.3
1	A	90	LEU	2.3
2	B	306	LYS	2.2
2	B	304	TYR	2.1
1	A	36	GLY	2.1
2	B	510	VAL	2.1
2	B	479	HIS	2.0

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

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	OCS	B	225	9/10	0.95	0.09	22,27,46,50	0

6.3 Carbohydrates ⓘ

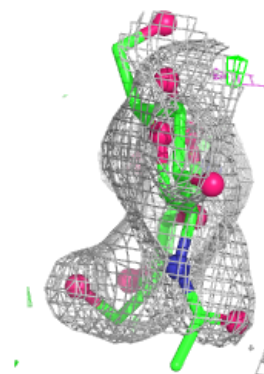
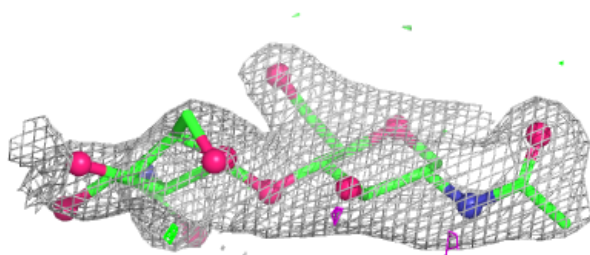
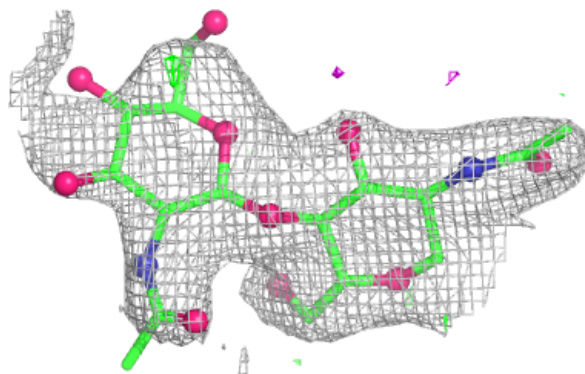
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists 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	E	2	14/15	0.63	0.17	64,100,111,115	0
3	NAG	C	2	14/15	0.72	0.17	71,83,96,99	0
3	NAG	D	2	14/15	0.81	0.13	64,78,81,94	0
3	NAG	E	1	14/15	0.91	0.09	39,47,57,75	0
3	NAG	C	1	14/15	0.92	0.11	42,51,57,65	0
3	NAG	D	1	14/15	0.93	0.09	44,52,59,65	0

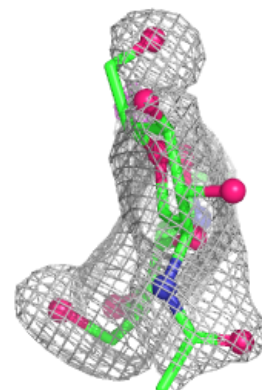
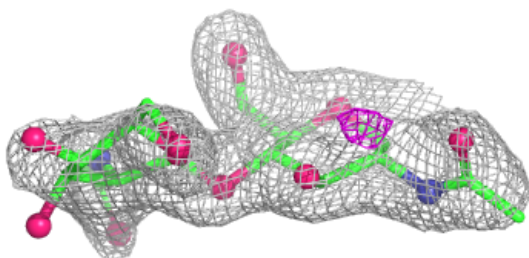
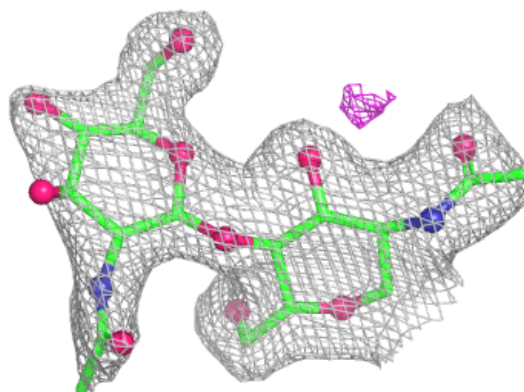
The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

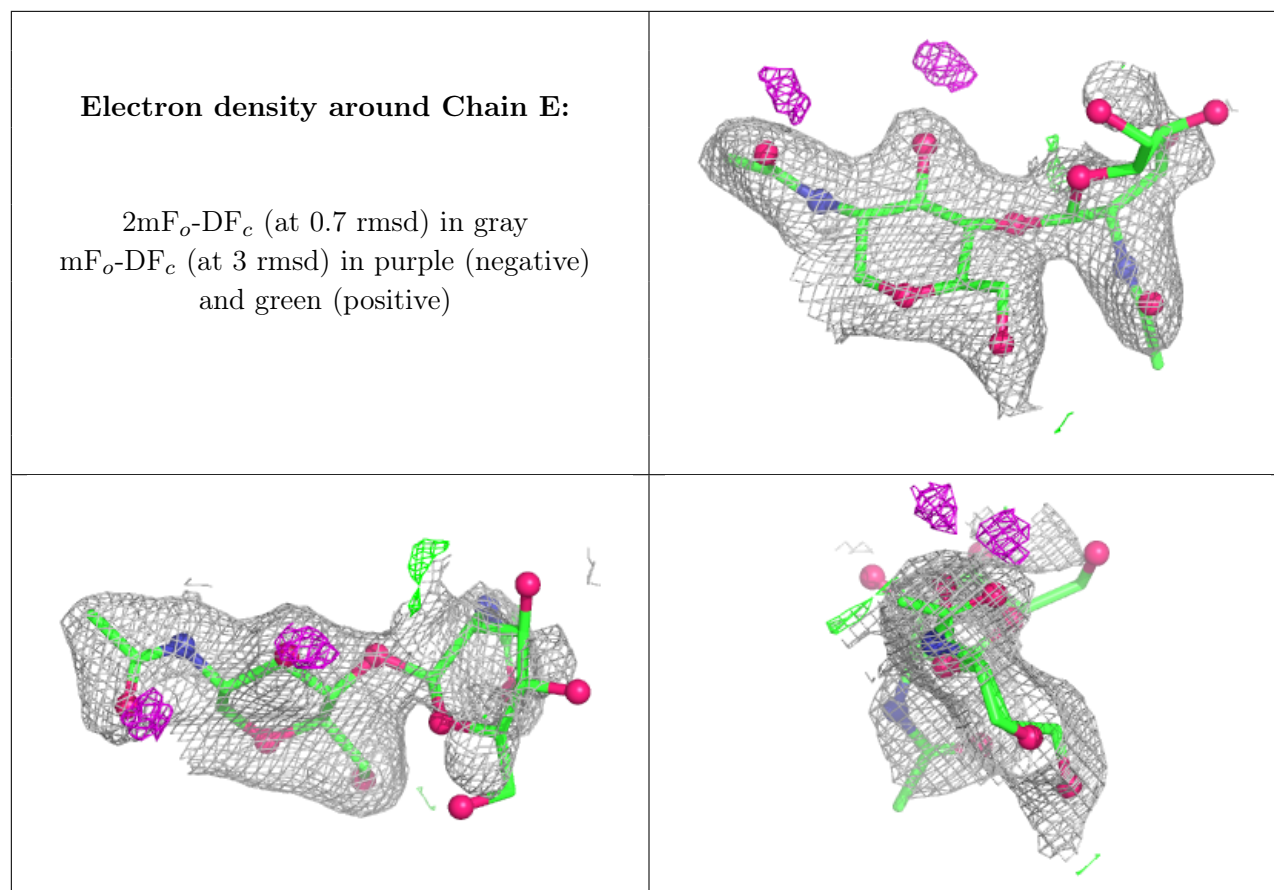
Electron density around Chain C:

$2mF_o-DF_c$ (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)



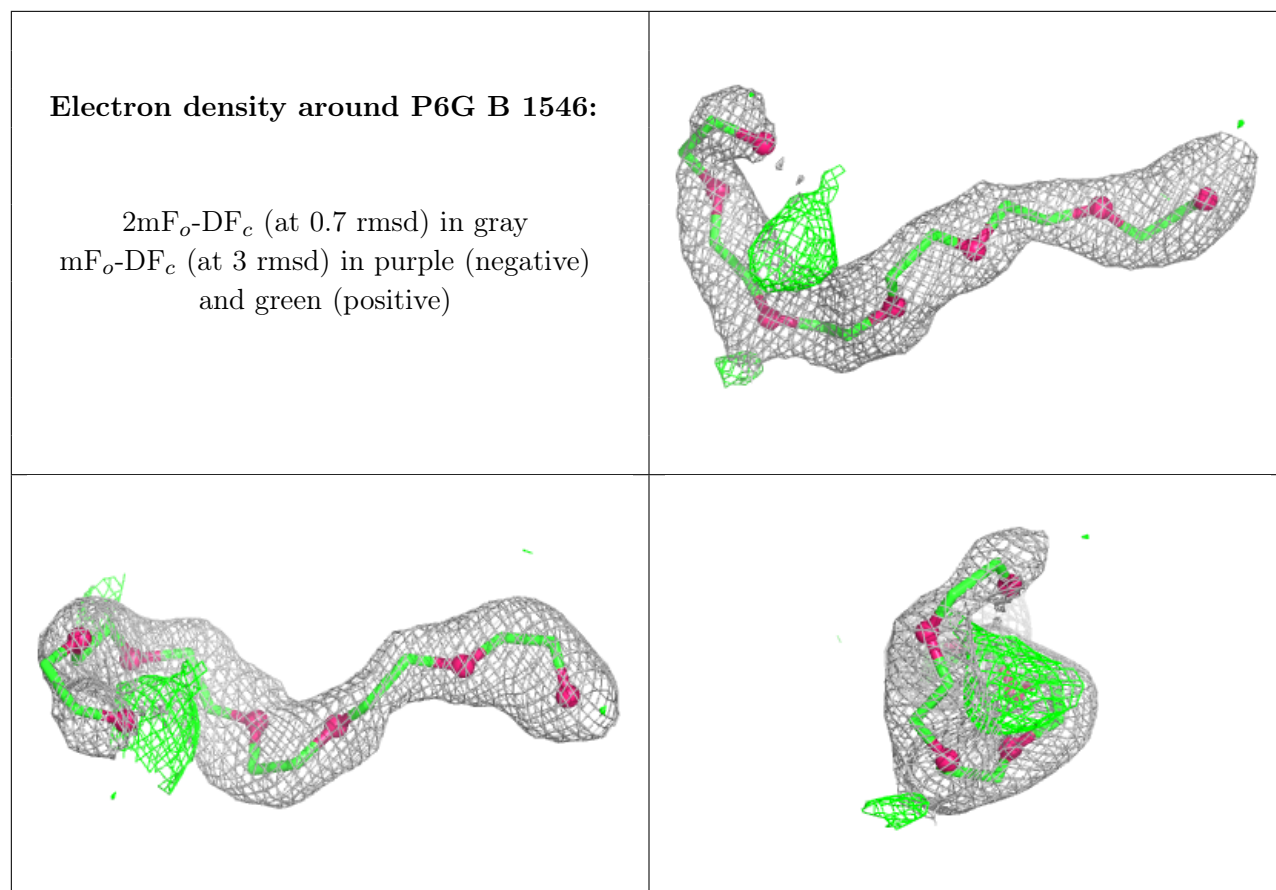


6.4 Ligands ⓘ

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
5	NAG	B	1503	14/15	0.63	0.22	75,86,102,104	0
4	P4G	A	1206	11/11	0.73	0.27	57,65,79,90	0
5	NAG	B	1388	14/15	0.86	0.12	43,52,60,72	0
6	P6G	B	1546	19/19	0.87	0.17	45,53,72,75	0
7	CL	B	1547	1/1	0.99	0.20	32,32,32,32	1

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.



6.5 Other polymers ⓘ

There are no such residues in this entry.