



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 02:07 PM UTC

PDB ID : 5LKR / pdb_00005lkr
Title : Human Butyrylcholinesterase complexed with N-Propargylperidines
Authors : Coquelle, N.; Knez, D.; Colletier, J.P.; Gobec, S.
Deposited on : 2016-07-23
Resolution : 2.52 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

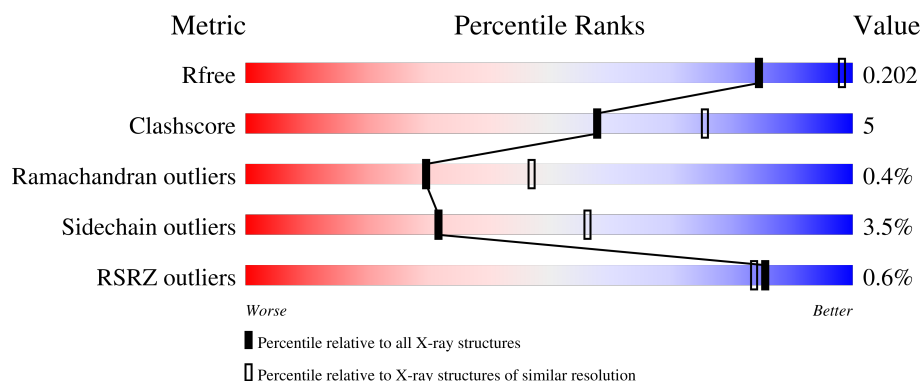
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.52 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.



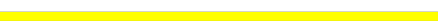
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	7383 (2.54-2.50)
Clashscore	190562	8079 (2.54-2.50)
Ramachandran outliers	187476	7944 (2.54-2.50)
Sidechain outliers	187428	7946 (2.54-2.50)
RSRZ outliers	180081	7387 (2.54-2.50)

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	574	
1	B	574	
2	C	2	
2	D	2	
2	F	2	

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Mol	Chain	Length	Quality of chain
2	G	2	 100%
2	H	2	 100%
2	I	2	 50%  50%
3	E	2	 50%  50%
4	J	2	 100%

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
9	PEG	A	618	-	X	-	-

2 Entry composition [i](#)

There are 10 unique types of molecules in this entry. The entry contains 8751 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 Cholinesterase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	528	Total	C	N	O	S	0	3	1
			4168	2694	695	763	16			
1	B	525	Total	C	N	O	S	0	0	1
			4130	2668	697	750	15			

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



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	C	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	D	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	F	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	G	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	H	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	I	2	Total	C	N	O	0	0	0
			28	16	2	10			

- Molecule 3 is an oligosaccharide called alpha-L-fucopyranose-(1-6)-2-acetamido-2-deoxy-beta-D-glucopyranose.



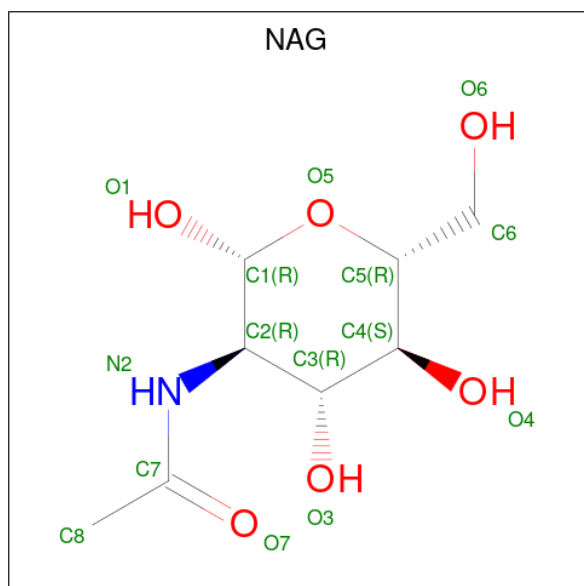
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	E	2	Total	C	N	O	0	0	0
			24	14	1	9			

- Molecule 4 is an oligosaccharide called beta-L-fucopyranose-(1-6)-2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
4	J	2	Total	C	N	O	0	0	0
			24	14	1	9			

- Molecule 5 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: C₈H₁₅NO₆).



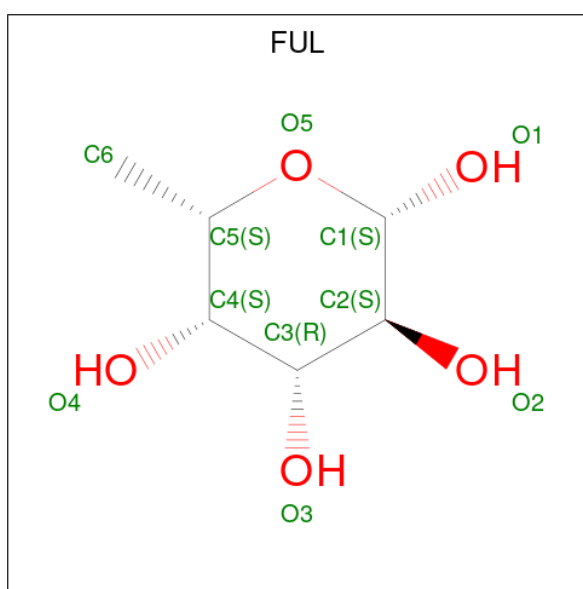
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	A	1	Total	C	N	O	0	0
			14	8	1	5		
5	B	1	Total	C	N	O	0	0
			14	8	1	5		
5	B	1	Total	C	N	O	0	0
			14	8	1	5		
5	B	1	Total	C	N	O	0	0
			14	8	1	5		

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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		
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 beta-L-fucopyranose (CCD ID: FUL) (formula: $C_6H_{12}O_5$).



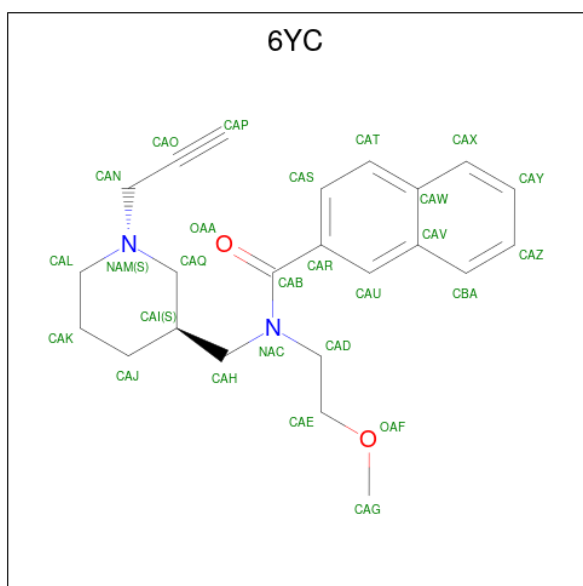
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total	C	O	0	0
			10	6	4		

- Molecule 7 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



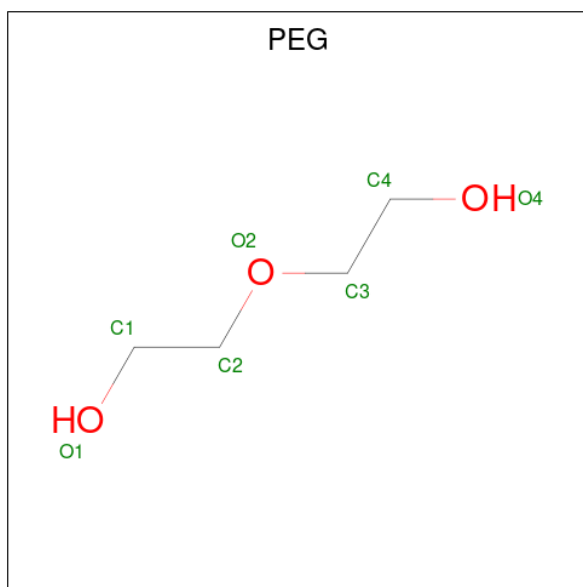
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
7	A	1	Total	C	O	0	0
			6	3	3		
7	A	1	Total	C	O	0	0
			6	3	3		
7	B	1	Total	C	O	0	0
			6	3	3		

- Molecule 8 is {N}-(2-methoxyethyl)- {N}-[[{(3 {S})-1-prop-2-ynylpiperidin-3-yl]methyl]naphthalene-2-carboxamide (CCD ID: 6YC) (formula: C₂₃H₂₈N₂O₂).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
8	A	1	Total	C	N	O	9	0
			27	23	2	2		
8	B	1	Total	C	N	O	0	0
			27	23	2	2		

- Molecule 9 is DI(HYDROXYETHYL)ETHER (CCD ID: PEG) (formula: $C_4H_{10}O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
9	A	1	Total	C	O	0	0
			7	4	3		

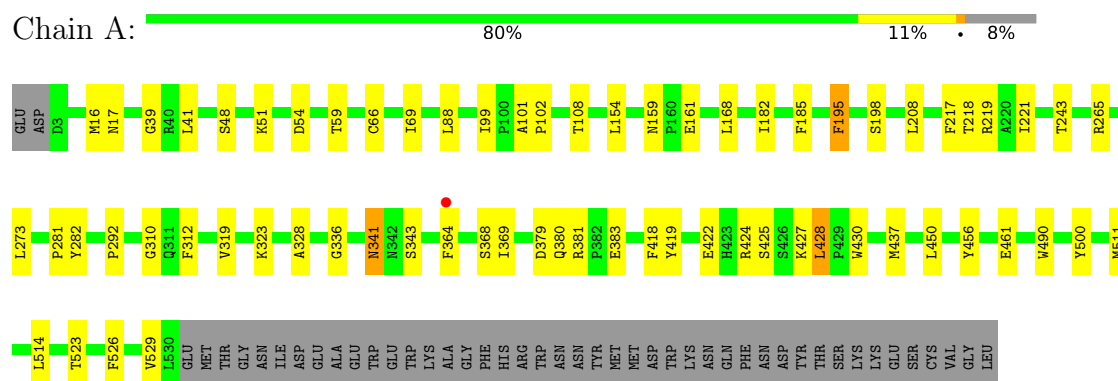
- Molecule 10 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
10	A	15	Total	O	0	0
			15	15		
10	B	21	Total	O	0	0
			21	21		

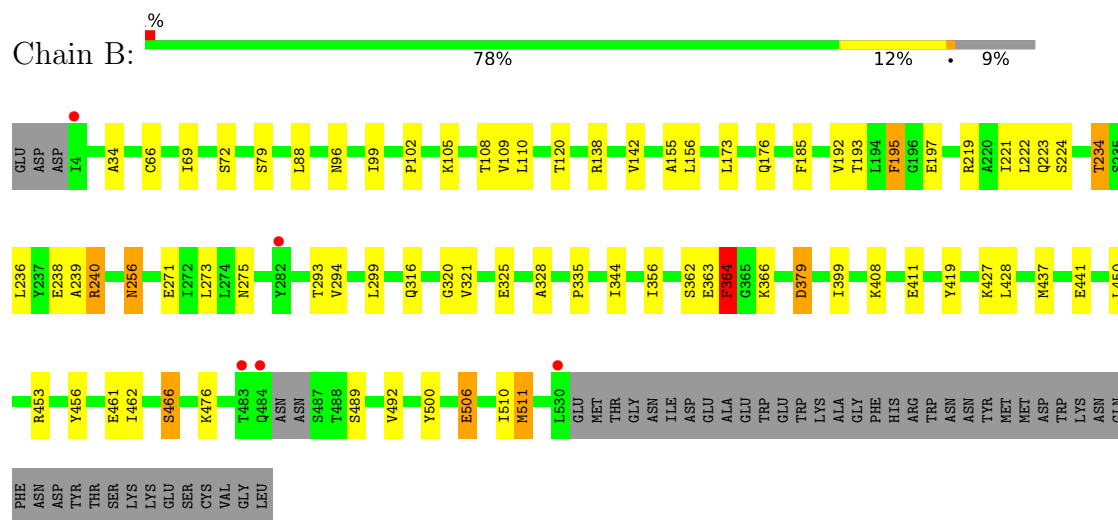
3 Residue-property plots

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.

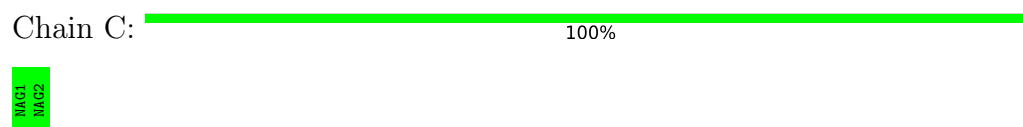
• Molecule 1: Cholinesterase



• Molecule 1: Cholinesterase



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



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

Chain D:  100%

MAG1
MAG2

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

Chain F:  100%

MAG1
MAG2

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

Chain G:  100%

MAG1
MAG2

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

Chain H:  100%

MAG1
MAG2

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

Chain I:  50% 50%

MAG1
MAG2

- Molecule 3: alpha-L-fucopyranose-(1-6)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain E:  50% 50%

MAG1
FUC2

- Molecule 4: beta-L-fucopyranose-(1-6)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain J:  100%

MAG1
FOL2

4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	73.68Å 79.46Å 228.87Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.86 – 2.52 48.86 – 2.61	Depositor EDS
% Data completeness (in resolution range)	99.1 (48.86-2.52) 94.6 (48.86-2.61)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.46 (at 2.61Å)	Xtriage
Refinement program	PHENIX (1.10.1_2155: ???)	Depositor
R, R_{free}	0.185 , 0.238 0.200 , 0.202	Depositor DCC
R_{free} test set	1985 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	75.0	Xtriage
Anisotropy	0.314	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 52.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	8751	wwPDB-VP
Average B, all atoms (Å ²)	77.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.81% 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: GOL, FUC, PEG, 6YC, FUL, 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	0.24	0/4298	0.45	0/5849
1	B	0.27	1/4247 (0.0%)	0.45	1/5773 (0.0%)
All	All	0.26	1/8545 (0.0%)	0.45	1/11622 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	364	PHE	CB-CG	-5.69	1.37	1.50

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	364	PHE	N-CA-CB	-6.40	101.12	110.47

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	4168	0	4015	37	0
1	B	4130	0	3994	38	0
2	C	28	0	25	0	0
2	D	28	0	25	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	F	28	0	25	1	0
2	G	28	0	25	0	0
2	H	28	0	25	0	0
2	I	28	0	25	0	0
3	E	24	0	22	0	0
4	J	24	0	22	0	0
5	A	14	0	13	1	0
5	B	98	0	91	1	0
6	A	10	0	10	0	0
7	A	12	0	16	3	0
7	B	6	0	8	0	0
8	A	27	0	0	0	0
8	B	27	0	0	0	0
9	A	7	0	10	1	0
10	A	15	0	0	1	0
10	B	21	0	0	2	0
All	All	8751	0	8351	77	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 5.

All (77) 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:323:LYS:HD2	1:A:422:GLU:HG2	1.67	0.75
1:B:240:ARG:NH1	10:B:703:HOH:O	2.17	0.74
5:B:607:NAG:O4	10:B:701:HOH:O	2.09	0.70
1:B:271:GLU:O	1:B:275:ASN:ND2	2.26	0.67
1:B:69:ILE:HD11	1:B:88:LEU:HD11	1.75	0.67
1:A:424:ARG:NH2	1:A:430:TRP:O	2.27	0.66
1:B:99:ILE:HD11	1:B:185:PHE:HB3	1.78	0.66
1:B:335:PRO:HD3	1:B:356:ILE:HD12	1.78	0.65
1:A:198:SER:OG	10:A:701:HOH:O	2.14	0.65
1:A:523:THR:HG22	7:A:615:GOL:H32	1.82	0.61
7:A:617:GOL:O3	9:A:618:PEG:O4	2.19	0.58
1:B:102:PRO:O	1:B:138:ARG:NH2	2.26	0.58
1:B:108:THR:HG21	1:B:476:LYS:HA	1.86	0.58
1:B:328:ALA:HB2	1:B:437:MET:HE3	1.85	0.57
1:B:256:ASN:OD1	1:B:256:ASN:N	2.38	0.56
1:B:109:VAL:HB	1:B:192:VAL:HG22	1.88	0.56
1:B:234:THR:HG22	1:B:238:GLU:HB2	1.87	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:363:GLU:HA	1:B:366:LYS:HE3	1.88	0.55
1:B:500:TYR:CZ	1:B:511:MET:HB2	2.42	0.55
1:B:110:LEU:HD23	1:B:193:THR:HB	1.90	0.54
1:B:195:PHE:CB	1:B:221:ILE:HB	2.39	0.53
1:A:336:GLY:H	2:F:2:NAG:H61	1.73	0.53
1:B:462:ILE:O	1:B:466:SER:OG	2.27	0.51
1:A:419:TYR:HB3	1:A:490:TRP:CZ2	2.47	0.50
1:A:500:TYR:CZ	1:A:511:MET:HB2	2.46	0.50
1:A:99:ILE:HD11	1:A:185:PHE:HD2	1.77	0.50
1:B:34:ALA:HB2	1:B:173:LEU:HD23	1.93	0.50
1:B:239:ALA:HB2	1:B:293:THR:HG21	1.94	0.50
1:A:341:ASN:N	1:A:341:ASN:OD1	2.44	0.49
1:B:379:ASP:OD1	1:B:379:ASP:N	2.30	0.49
1:A:154:LEU:HD11	1:A:243:THR:HG23	1.95	0.49
1:B:362:SER:C	1:B:364:PHE:H	2.21	0.49
1:B:450:LEU:HA	1:B:461:GLU:HG3	1.93	0.48
1:B:195:PHE:HB2	1:B:221:ILE:HB	1.95	0.48
1:A:523:THR:HA	7:A:615:GOL:H12	1.96	0.48
1:A:526:PHE:O	1:A:529:VAL:HG12	2.13	0.47
1:A:17:ASN:HD22	5:A:601:NAG:H83	1.79	0.47
1:B:236:LEU:HD11	1:B:294:VAL:O	2.14	0.47
1:A:218:THR:HG22	1:A:219:ARG:HG3	1.98	0.46
1:A:168:LEU:HD11	1:A:292:PRO:HB3	1.97	0.46
1:A:450:LEU:HA	1:A:461:GLU:HG3	1.98	0.46
1:B:224:SER:OG	1:B:325:GLU:OE2	2.25	0.46
1:B:320:GLY:HA3	1:B:419:TYR:CE2	2.51	0.46
1:A:39:GLY:O	1:A:265:ARG:HD3	2.15	0.46
1:B:219:ARG:HD3	1:B:316:GLN:OE1	2.16	0.46
1:B:299:LEU:HD23	1:B:299:LEU:HA	1.82	0.45
1:B:321:VAL:HG21	1:B:399:ILE:HG12	1.98	0.45
1:A:16:MET:HB3	1:A:59:THR:HG22	1.99	0.45
1:A:424:ARG:HG3	1:A:428:LEU:HD23	1.99	0.45
1:B:155:ALA:HB3	1:B:239:ALA:HB1	1.99	0.45
1:B:362:SER:C	1:B:364:PHE:N	2.72	0.45
1:A:369:ILE:HD11	1:A:526:PHE:CE1	2.52	0.44
1:A:69:ILE:HD11	1:A:88:LEU:HD11	1.99	0.44
1:A:159:ASN:OD1	1:A:161:GLU:HB2	2.17	0.44
1:A:310:GLY:HA2	1:A:312:PHE:CE2	2.53	0.44
1:A:319:VAL:O	1:A:418:PHE:HA	2.18	0.43
1:A:500:TYR:CE1	1:A:514:LEU:HB2	2.53	0.43
1:A:208:LEU:HD23	1:A:217:PHE:HZ	1.84	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:195:PHE:CB	1:A:221:ILE:HB	2.49	0.43
1:B:234:THR:HB	1:B:293:THR:HG22	2.01	0.42
1:A:328:ALA:HB2	1:A:437:MET:HE3	2.00	0.42
1:A:427:LYS:HD3	1:A:456:TYR:CZ	2.53	0.42
1:B:489:SER:O	1:B:510:ILE:HD11	2.19	0.42
1:A:66[B]:CYS:SG	1:A:273:LEU:HD11	2.60	0.42
1:A:380:GLN:HA	1:A:381:ARG:C	2.45	0.42
1:B:66:CYS:HB3	1:B:273:LEU:HD11	2.02	0.41
1:B:96:ASN:O	1:B:142:VAL:HA	2.21	0.41
1:B:197:GLU:HA	1:B:223:GLN:O	2.20	0.41
1:A:41:LEU:HD23	1:A:41:LEU:HA	1.85	0.41
1:A:101:ALA:HA	1:A:102:PRO:C	2.46	0.40
1:B:221:ILE:C	1:B:222:LEU:HD12	2.46	0.40
1:B:427:LYS:HD3	1:B:456:TYR:CZ	2.56	0.40
1:A:379:ASP:O	1:A:380:GLN:HG2	2.21	0.40
1:A:341:ASN:HB2	1:A:343:SER:H	1.86	0.40
1:A:99:ILE:HD11	1:A:185:PHE:CD2	2.55	0.40
1:B:197:GLU:HG3	1:B:441:GLU:OE2	2.22	0.40

There are no symmetry-related clashes.

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	529/574 (92%)	503 (95%)	23 (4%)	3 (1%)	21	36
1	B	521/574 (91%)	488 (94%)	32 (6%)	1 (0%)	43	62
All	All	1050/1148 (92%)	991 (94%)	55 (5%)	4 (0%)	30	47

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	506	GLU
1	A	282	TYR
1	A	54	ASP
1	A	281	PRO

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	444/494 (90%)	434 (98%)	10 (2%)	44	70
1	B	436/494 (88%)	415 (95%)	21 (5%)	23	43
All	All	880/988 (89%)	849 (96%)	31 (4%)	32	56

All (31) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	48	SER
1	A	51	LYS
1	A	108	THR
1	A	182	ILE
1	A	195	PHE
1	A	341	ASN
1	A	368	SER
1	A	383	GLU
1	A	425	SER
1	A	428	LEU
1	B	72	SER
1	B	79	SER
1	B	105	LYS
1	B	120	THR
1	B	156	LEU
1	B	176	GLN
1	B	195	PHE
1	B	234	THR
1	B	240	ARG
1	B	256	ASN

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Mol	Chain	Res	Type
1	B	344	ILE
1	B	364	PHE
1	B	379	ASP
1	B	408	LYS
1	B	411	GLU
1	B	428	LEU
1	B	453	ARG
1	B	466	SER
1	B	492	VAL
1	B	506	GLU
1	B	511	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	77	HIS
1	A	126	HIS
1	B	63	ASN
1	B	71	GLN
1	B	83	ASN
1	B	270	GLN

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 ⓘ

16 monosaccharides are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the

expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	NAG	C	1	1,2	14,14,15	0.21	0	17,19,21	0.51	0
2	NAG	C	2	2	14,14,15	0.32	0	17,19,21	0.51	0
2	NAG	D	1	1,2	14,14,15	0.39	0	17,19,21	0.82	1 (5%)
2	NAG	D	2	2	14,14,15	0.73	1 (7%)	17,19,21	0.50	0
3	NAG	E	1	3,1	14,14,15	0.39	0	17,19,21	0.46	0
3	FUC	E	2	3	10,10,11	1.06	0	14,14,16	1.13	2 (14%)
2	NAG	F	1	1,2	14,14,15	0.47	0	17,19,21	1.03	2 (11%)
2	NAG	F	2	2	14,14,15	0.35	0	17,19,21	0.46	0
2	NAG	G	1	1,2	14,14,15	0.36	0	17,19,21	0.82	1 (5%)
2	NAG	G	2	2	14,14,15	0.60	1 (7%)	17,19,21	0.81	1 (5%)
2	NAG	H	1	1,2	14,14,15	0.57	0	17,19,21	0.68	0
2	NAG	H	2	2	14,14,15	0.33	0	17,19,21	0.58	0
2	NAG	I	1	1,2	14,14,15	0.75	1 (7%)	17,19,21	0.85	1 (5%)
2	NAG	I	2	2	14,14,15	0.22	0	17,19,21	0.59	0
4	NAG	J	1	1,4	14,14,15	0.59	0	17,19,21	0.80	1 (5%)
4	FUL	J	2	4	10,10,11	1.94	3 (30%)	14,14,16	1.92	4 (28%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	NAG	C	1	1,2	-	2/6/23/26	0/1/1/1
2	NAG	C	2	2	-	2/6/23/26	0/1/1/1
2	NAG	D	1	1,2	-	2/6/23/26	0/1/1/1
2	NAG	D	2	2	-	0/6/23/26	0/1/1/1
3	NAG	E	1	3,1	-	0/6/23/26	0/1/1/1
3	FUC	E	2	3	-	-	0/1/1/1
2	NAG	F	1	1,2	-	2/6/23/26	0/1/1/1
2	NAG	F	2	2	-	2/6/23/26	0/1/1/1
2	NAG	G	1	1,2	-	2/6/23/26	0/1/1/1
2	NAG	G	2	2	-	0/6/23/26	0/1/1/1
2	NAG	H	1	1,2	-	2/6/23/26	0/1/1/1
2	NAG	H	2	2	-	4/6/23/26	0/1/1/1
2	NAG	I	1	1,2	-	1/6/23/26	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	NAG	I	2	2	-	2/6/23/26	0/1/1/1
4	NAG	J	1	1,4	-	0/6/23/26	0/1/1/1
4	FUL	J	2	4	-	-	0/1/1/1

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	J	2	FUL	O5-C1	4.73	1.51	1.43
2	I	1	NAG	O5-C1	-2.44	1.39	1.43
4	J	2	FUL	C2-C3	-2.41	1.48	1.52
4	J	2	FUL	O5-C5	2.40	1.48	1.43
2	D	2	NAG	C1-C2	2.17	1.55	1.52
2	G	2	NAG	C1-C2	2.10	1.55	1.52

All (13) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	J	2	FUL	C1-C2-C3	3.75	115.11	109.64
4	J	2	FUL	C6-C5-C4	-3.15	107.32	113.08
4	J	2	FUL	O5-C5-C4	2.94	114.84	109.55
2	G	2	NAG	C1-O5-C5	2.68	115.78	112.19
4	J	2	FUL	C1-O5-C5	2.44	118.72	112.97
2	F	1	NAG	C1-O5-C5	2.39	115.38	112.19
3	E	2	FUC	O2-C2-C1	2.34	114.58	109.22
2	D	1	NAG	O4-C4-C3	-2.33	104.87	110.38
3	E	2	FUC	O5-C5-C4	2.32	113.72	109.55
2	G	1	NAG	C1-O5-C5	2.31	115.28	112.19
4	J	1	NAG	C3-C4-C5	2.24	114.30	110.23
2	I	1	NAG	O4-C4-C5	-2.18	103.96	109.32
2	F	1	NAG	C4-C3-C2	-2.17	107.84	111.02

There are no chirality outliers.

All (21) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	2	NAG	C4-C5-C6-O6
2	F	1	NAG	C4-C5-C6-O6
2	C	2	NAG	O5-C5-C6-O6
2	F	1	NAG	O5-C5-C6-O6
2	F	2	NAG	O5-C5-C6-O6
2	F	2	NAG	C4-C5-C6-O6

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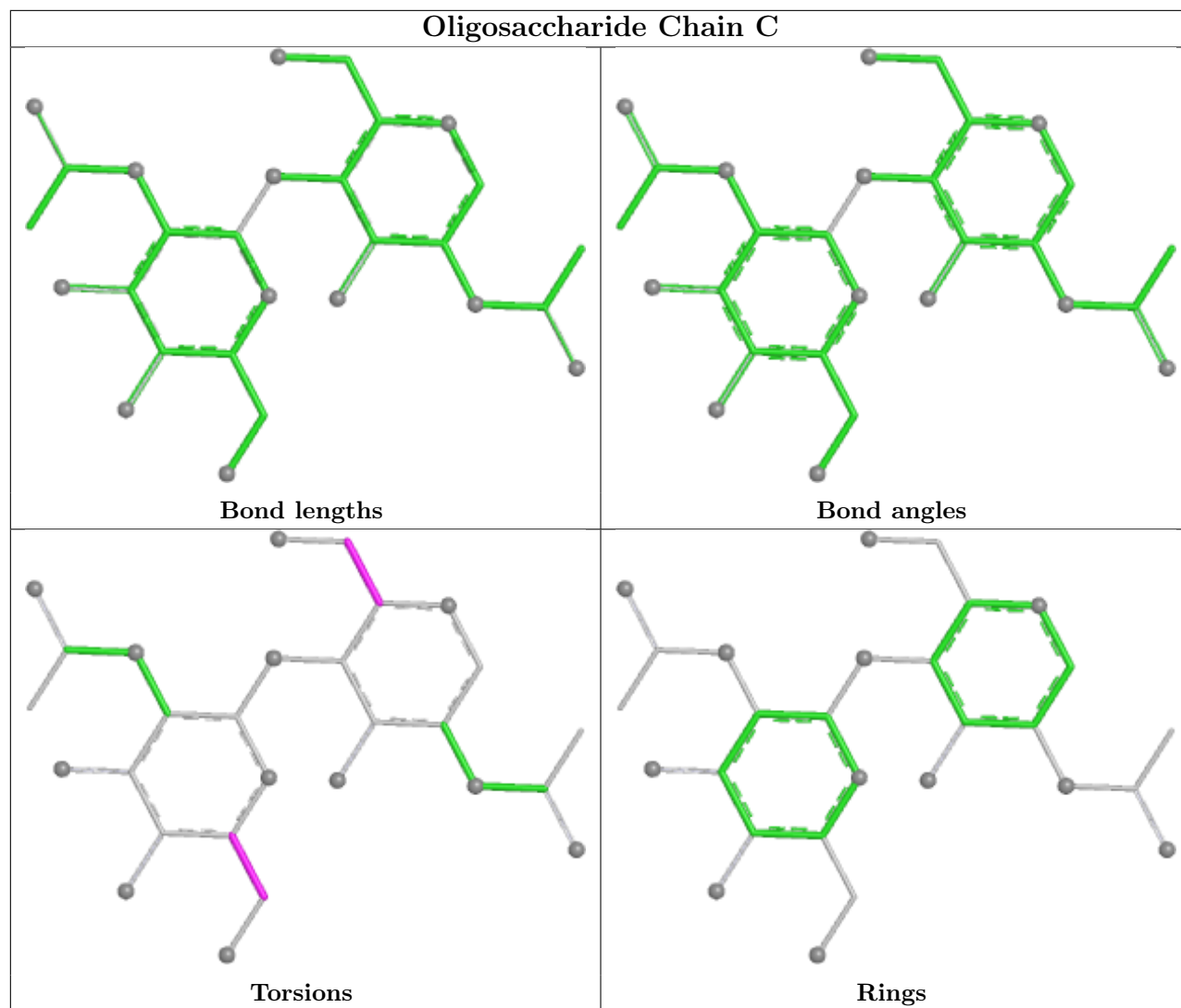
Mol	Chain	Res	Type	Atoms
2	C	1	NAG	O5-C5-C6-O6
2	H	1	NAG	C4-C5-C6-O6
2	H	1	NAG	O5-C5-C6-O6
2	D	1	NAG	C8-C7-N2-C2
2	D	1	NAG	O7-C7-N2-C2
2	H	2	NAG	C8-C7-N2-C2
2	H	2	NAG	O7-C7-N2-C2
2	C	1	NAG	C4-C5-C6-O6
2	I	2	NAG	C4-C5-C6-O6
2	G	1	NAG	C4-C5-C6-O6
2	I	2	NAG	O5-C5-C6-O6
2	H	2	NAG	C4-C5-C6-O6
2	G	1	NAG	O5-C5-C6-O6
2	H	2	NAG	O5-C5-C6-O6
2	I	1	NAG	O5-C5-C6-O6

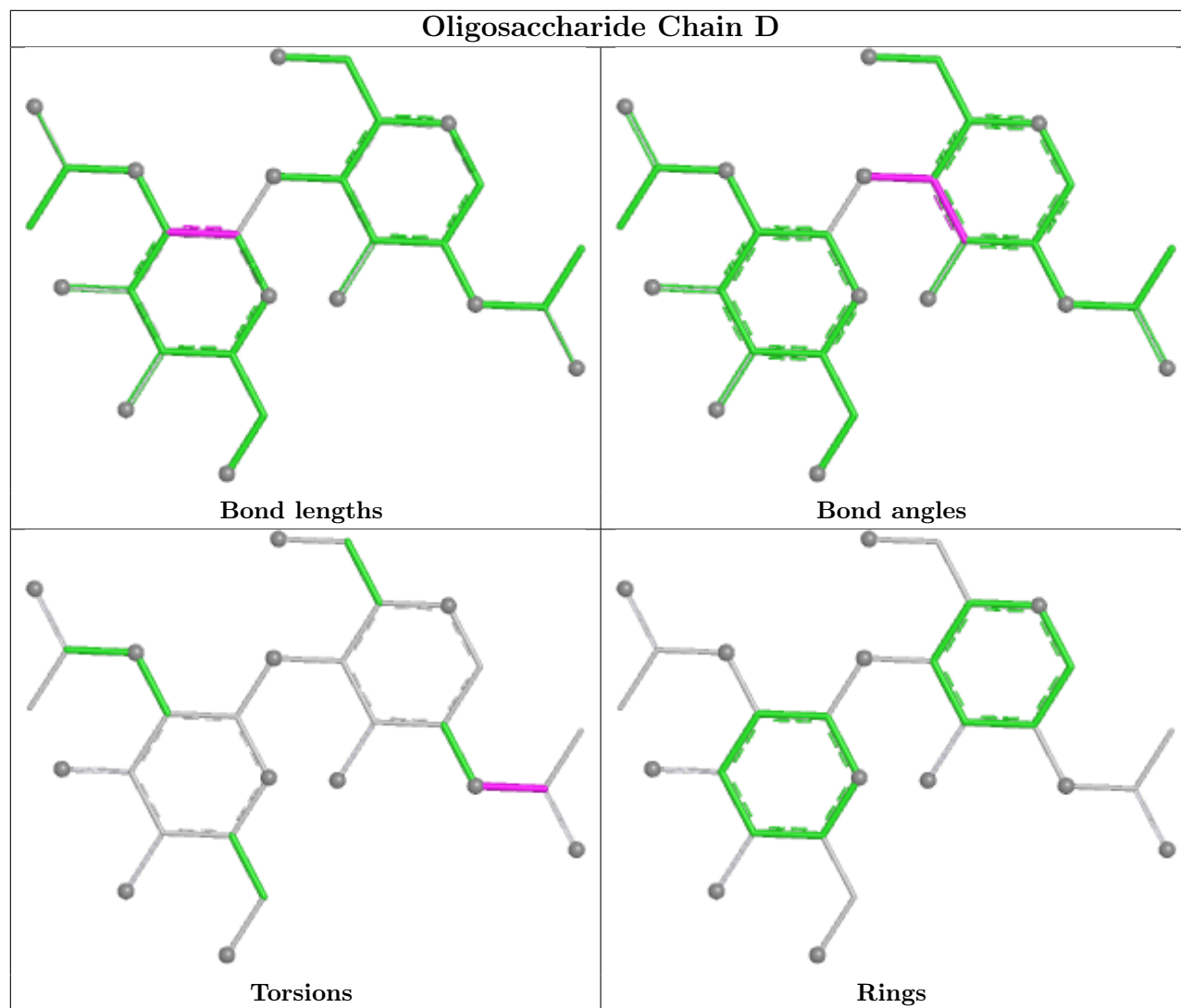
There are no ring outliers.

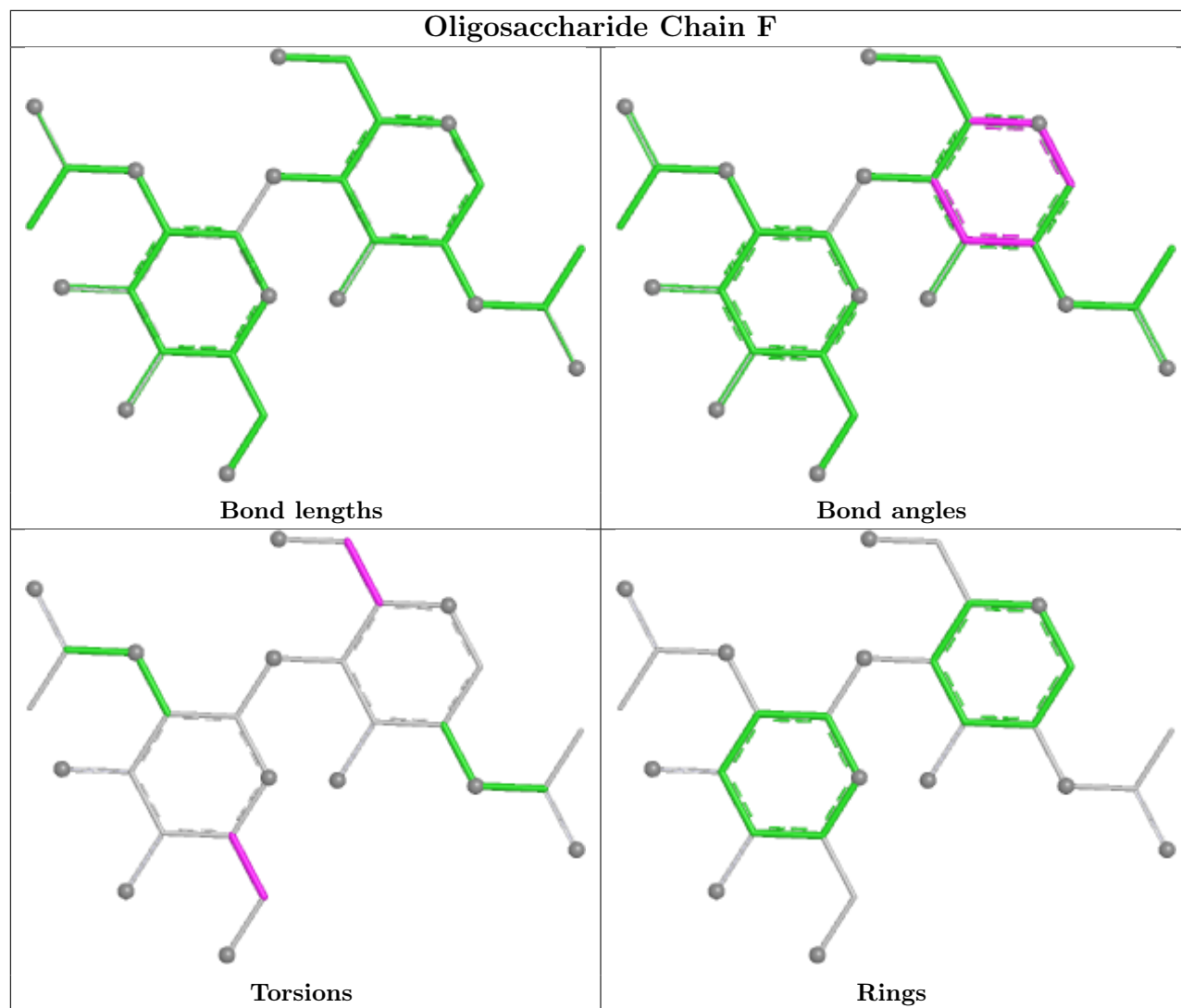
1 monomer is involved in 1 short contact:

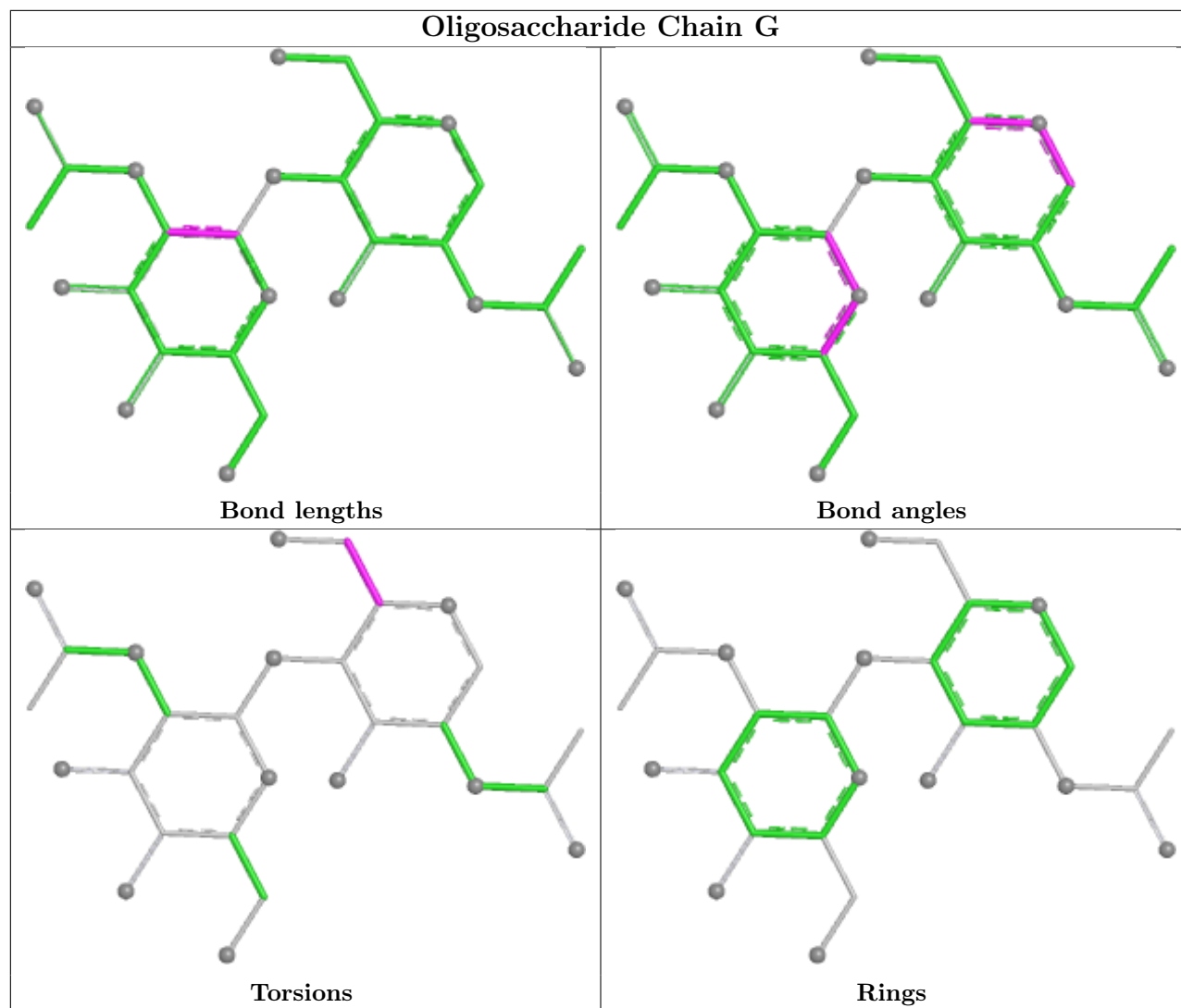
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	F	2	NAG	1	0

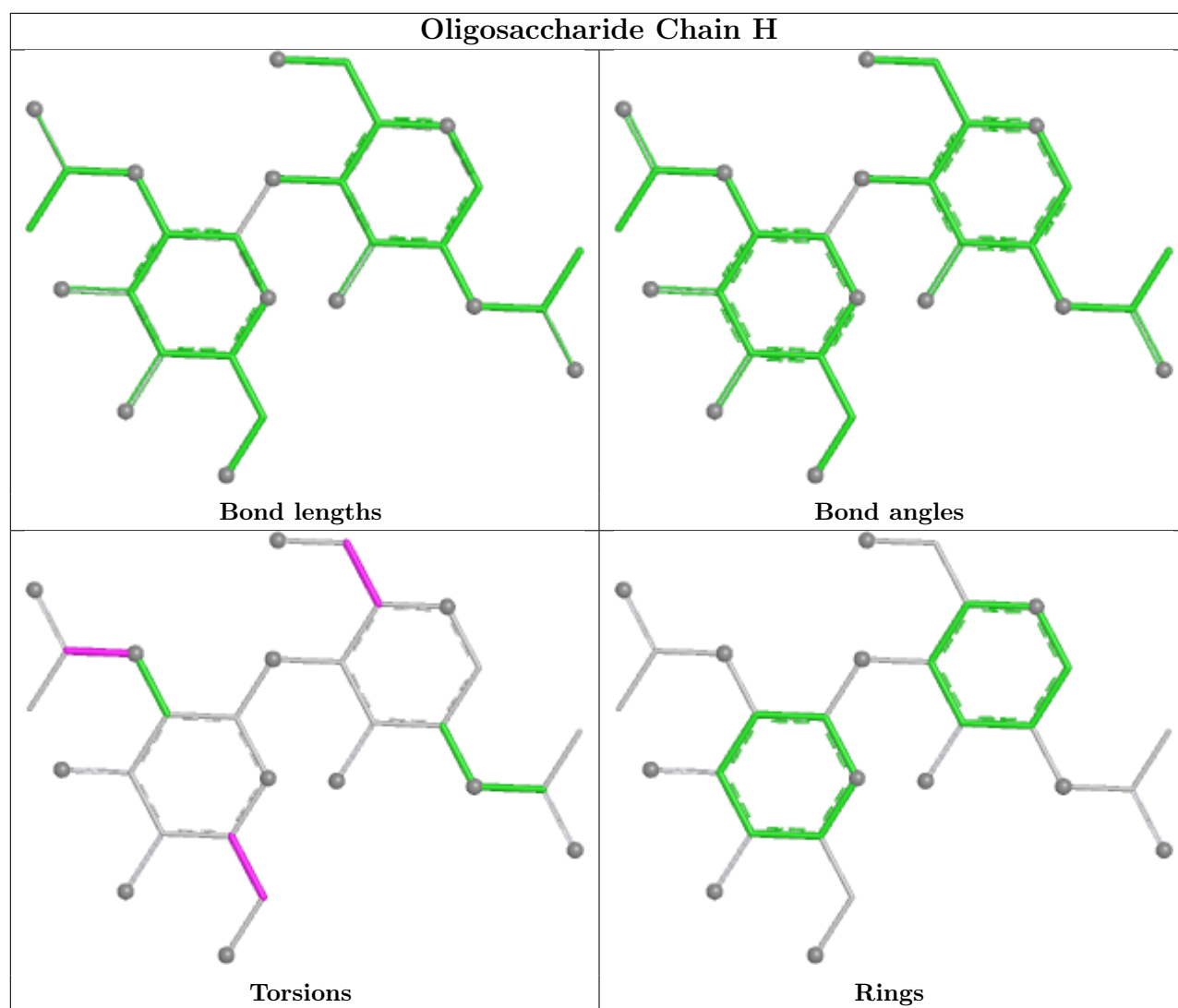
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.

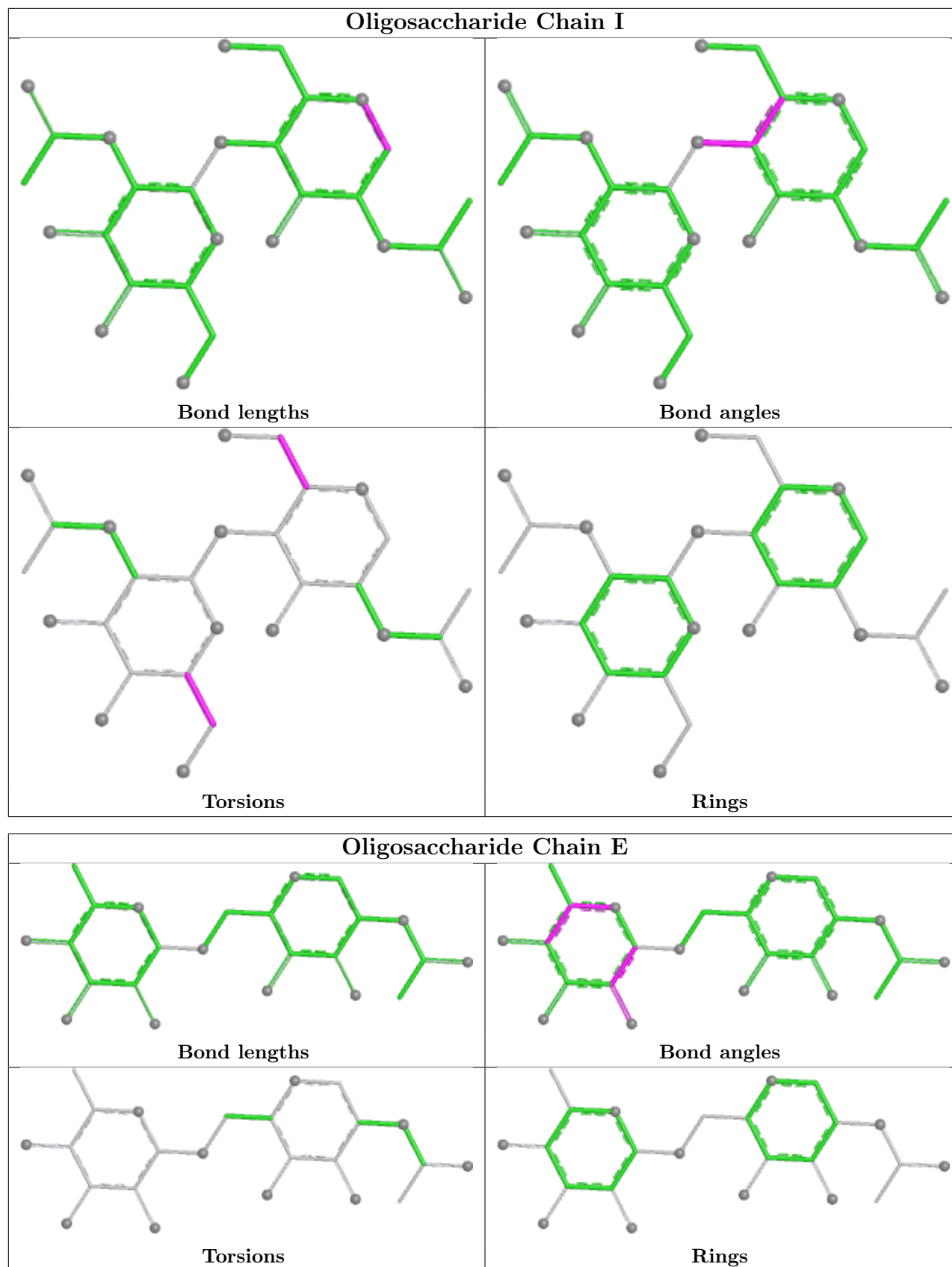


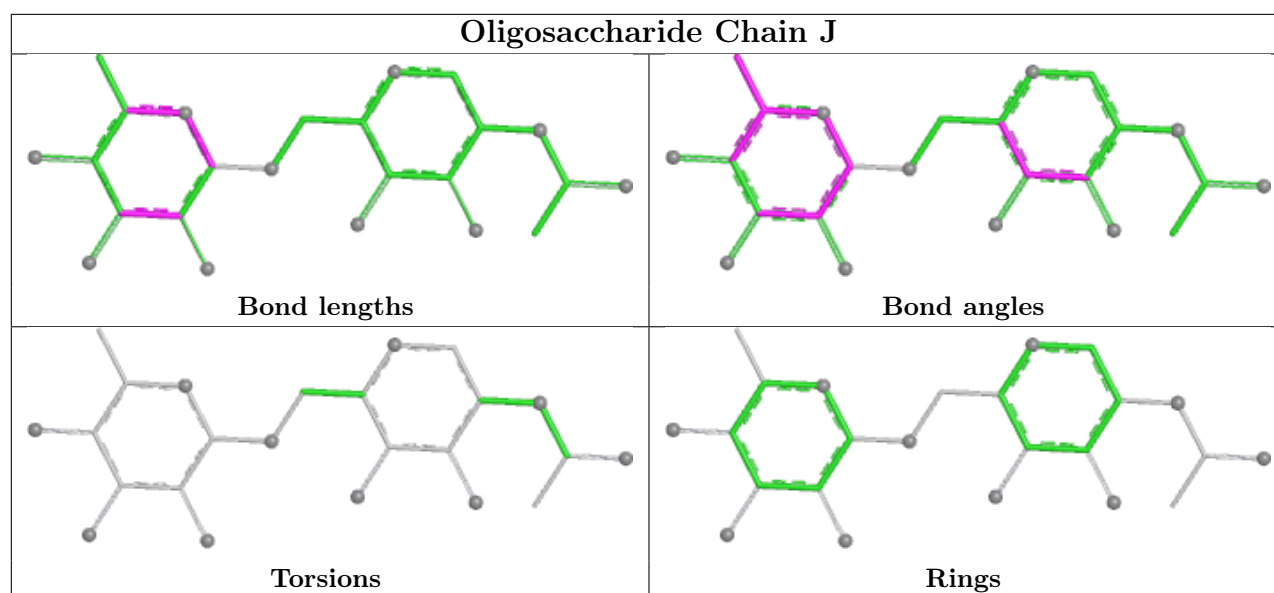












5.6 Ligand geometry [i](#)

15 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	$\# Z > 2$
5	NAG	B	601	1	14,14,15	0.74	1 (7%)	17,19,21	0.61	0
5	NAG	B	612	-	14,14,15	0.77	0	17,19,21	0.69	0
5	NAG	B	613	1	14,14,15	0.34	0	17,19,21	0.54	0
8	6YC	B	611	-	29,29,29	1.42	1 (3%)	37,38,38	1.10	2 (5%)
5	NAG	A	601	1	14,14,15	0.46	0	17,19,21	0.75	1 (5%)
5	NAG	B	607	1	14,14,15	0.37	0	17,19,21	0.68	0
5	NAG	B	608	1	14,14,15	0.55	0	17,19,21	0.68	1 (5%)
5	NAG	B	609	1	14,14,15	1.05	1 (7%)	17,19,21	1.83	1 (5%)
7	GOL	A	615	-	5,5,5	0.40	0	5,5,5	0.31	0
7	GOL	A	617	-	5,5,5	0.85	0	5,5,5	0.91	0
7	GOL	B	610	-	5,5,5	0.38	0	5,5,5	0.33	0
9	PEG	A	618	-	6,6,6	2.36	4 (66%)	5,5,5	1.58	2 (40%)
8	6YC	A	616	-	29,29,29	1.41	1 (3%)	37,38,38	1.02	2 (5%)
6	FUL	A	604	-	10,10,11	1.68	3 (30%)	14,14,16	1.37	3 (21%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
5	NAG	B	606	-	14,14,15	0.65	1 (7%)	17,19,21	0.40	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	NAG	B	601	1	-	2/6/23/26	0/1/1/1
5	NAG	B	612	-	-	4/6/23/26	0/1/1/1
5	NAG	B	613	1	-	0/6/23/26	0/1/1/1
8	6YC	B	611	-	-	4/18/29/29	0/3/3/3
5	NAG	A	601	1	-	4/6/23/26	0/1/1/1
5	NAG	B	607	1	-	3/6/23/26	0/1/1/1
5	NAG	B	608	1	-	2/6/23/26	0/1/1/1
5	NAG	B	609	1	-	4/6/23/26	0/1/1/1
7	GOL	A	615	-	-	4/4/4/4	-
7	GOL	A	617	-	-	4/4/4/4	-
7	GOL	B	610	-	-	2/4/4/4	-
9	PEG	A	618	-	-	2/4/4/4	-
8	6YC	A	616	-	-	5/18/29/29	0/3/3/3
6	FUL	A	604	-	-	-	0/1/1/1
5	NAG	B	606	-	-	0/6/23/26	0/1/1/1

All (12) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	B	611	6YC	CAR-CAB	-5.93	1.39	1.50
8	A	616	6YC	CAR-CAB	-5.91	1.39	1.50
6	A	604	FUL	O5-C1	3.79	1.50	1.43
5	B	609	NAG	O5-C1	3.54	1.49	1.43
9	A	618	PEG	O2-C3	3.17	1.55	1.42
9	A	618	PEG	O4-C4	2.84	1.56	1.42
6	A	604	FUL	C2-C3	-2.37	1.48	1.52
5	B	606	NAG	O5-C1	-2.32	1.39	1.43
6	A	604	FUL	O5-C5	2.28	1.48	1.43
5	B	601	NAG	O5-C1	2.18	1.47	1.43
9	A	618	PEG	C3-C4	2.11	1.60	1.49
9	A	618	PEG	O2-C2	2.10	1.51	1.42

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	B	609	NAG	C1-O5-C5	7.21	121.85	112.19
6	A	604	FUL	C3-C4-C5	3.23	114.72	109.81
6	A	604	FUL	O5-C5-C4	2.98	114.91	109.55
9	A	618	PEG	C3-O2-C2	2.66	124.90	113.26
5	A	601	NAG	C1-O5-C5	2.46	115.48	112.19
8	B	611	6YC	CAN-NAM-CAL	-2.42	109.00	111.68
8	B	611	6YC	CAR-CAB-NAC	-2.40	115.67	118.66
5	B	608	NAG	C1-O5-C5	2.32	115.30	112.19
8	A	616	6YC	CAN-NAM-CAL	-2.27	109.17	111.68
6	A	604	FUL	C6-C5-C4	-2.22	109.02	113.08
8	A	616	6YC	CAR-CAB-NAC	-2.08	116.07	118.66
9	A	618	PEG	O1-C1-C2	-2.07	99.62	111.82

There are no chirality outliers.

All (40) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
7	A	615	GOL	O1-C1-C2-O2
7	A	615	GOL	O1-C1-C2-C3
7	A	615	GOL	C1-C2-C3-O3
7	A	617	GOL	C1-C2-C3-O3
7	A	617	GOL	O2-C2-C3-O3
8	A	616	6YC	CAO-CAN-NAM-CAQ
8	B	611	6YC	CAO-CAN-NAM-CAQ
5	B	608	NAG	O5-C5-C6-O6
5	A	601	NAG	O5-C5-C6-O6
5	B	601	NAG	O5-C5-C6-O6
5	B	601	NAG	C4-C5-C6-O6
5	B	609	NAG	O5-C5-C6-O6
5	A	601	NAG	C4-C5-C6-O6
5	B	608	NAG	C4-C5-C6-O6
8	A	616	6YC	CAE-CAD-NAC-CAH
8	B	611	6YC	CAE-CAD-NAC-CAH
5	A	601	NAG	C8-C7-N2-C2
5	A	601	NAG	O7-C7-N2-C2
5	B	607	NAG	C8-C7-N2-C2
5	B	607	NAG	O7-C7-N2-C2
7	A	617	GOL	O1-C1-C2-O2
5	B	612	NAG	C4-C5-C6-O6
5	B	609	NAG	C4-C5-C6-O6
8	A	616	6YC	NAC-CAD-CAE-OAF

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Mol	Chain	Res	Type	Atoms
5	B	612	NAG	O5-C5-C6-O6
8	B	611	6YC	NAC-CAD-CAE-OAF
8	A	616	6YC	CAE-CAD-NAC-CAB
8	B	611	6YC	CAE-CAD-NAC-CAB
7	A	617	GOL	O1-C1-C2-C3
7	B	610	GOL	O1-C1-C2-C3
7	A	615	GOL	O2-C2-C3-O3
5	B	607	NAG	O5-C5-C6-O6
9	A	618	PEG	O1-C1-C2-O2
5	B	609	NAG	C1-C2-N2-C7
9	A	618	PEG	C4-C3-O2-C2
5	B	609	NAG	C3-C2-N2-C7
5	B	612	NAG	C3-C2-N2-C7
5	B	612	NAG	C1-C2-N2-C7
7	B	610	GOL	O1-C1-C2-O2
8	A	616	6YC	CAD-CAE-OAF-CAG

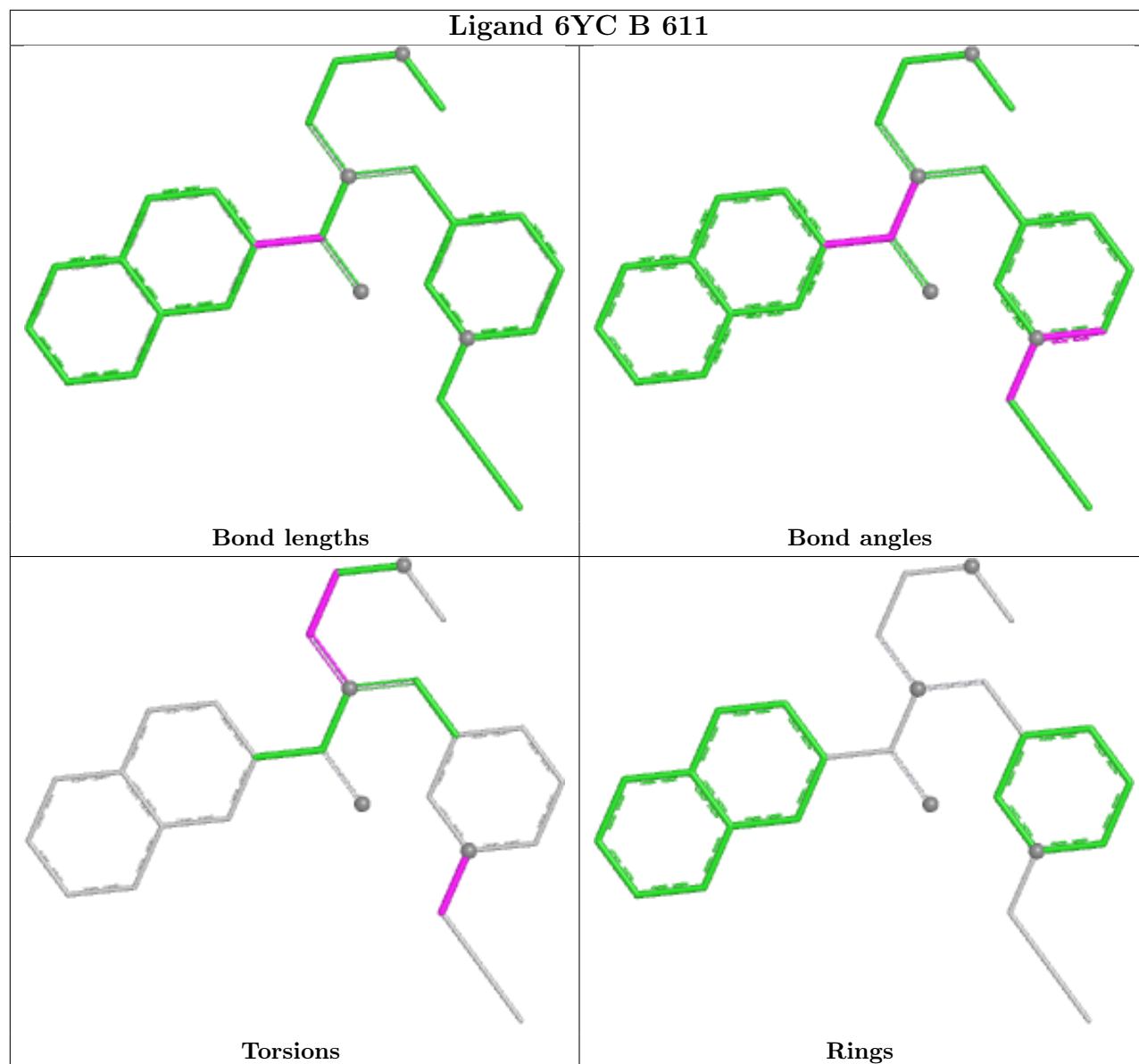
There are no ring outliers.

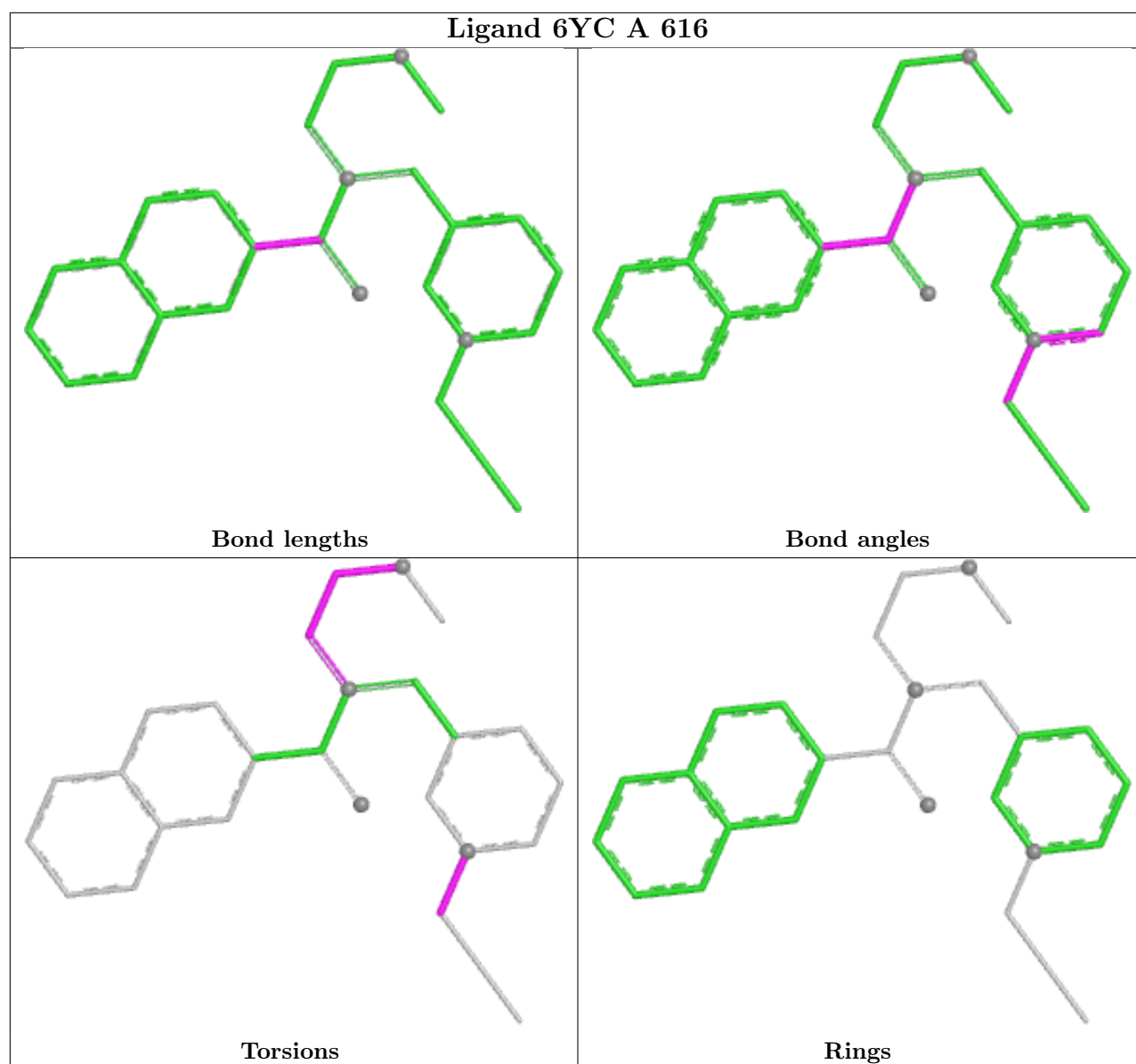
5 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	601	NAG	1	0
5	B	607	NAG	1	0
7	A	615	GOL	2	0
7	A	617	GOL	1	0
9	A	618	PEG	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.

Ligand 6YC B 611





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 [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	528/574 (91%)	-0.13	1 (0%) 91 90	37, 73, 101, 118	4 (0%)
1	B	525/574 (91%)	-0.06	5 (0%) 79 77	46, 73, 104, 129	0
All	All	1053/1148 (91%)	-0.10	6 (0%) 85 84	37, 73, 102, 129	4 (0%)

All (6) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	484	GLN	3.7
1	A	364[A]	PHE	3.6
1	B	530	LEU	3.5
1	B	282	TYR	2.4
1	B	4	ILE	2.1
1	B	483	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.

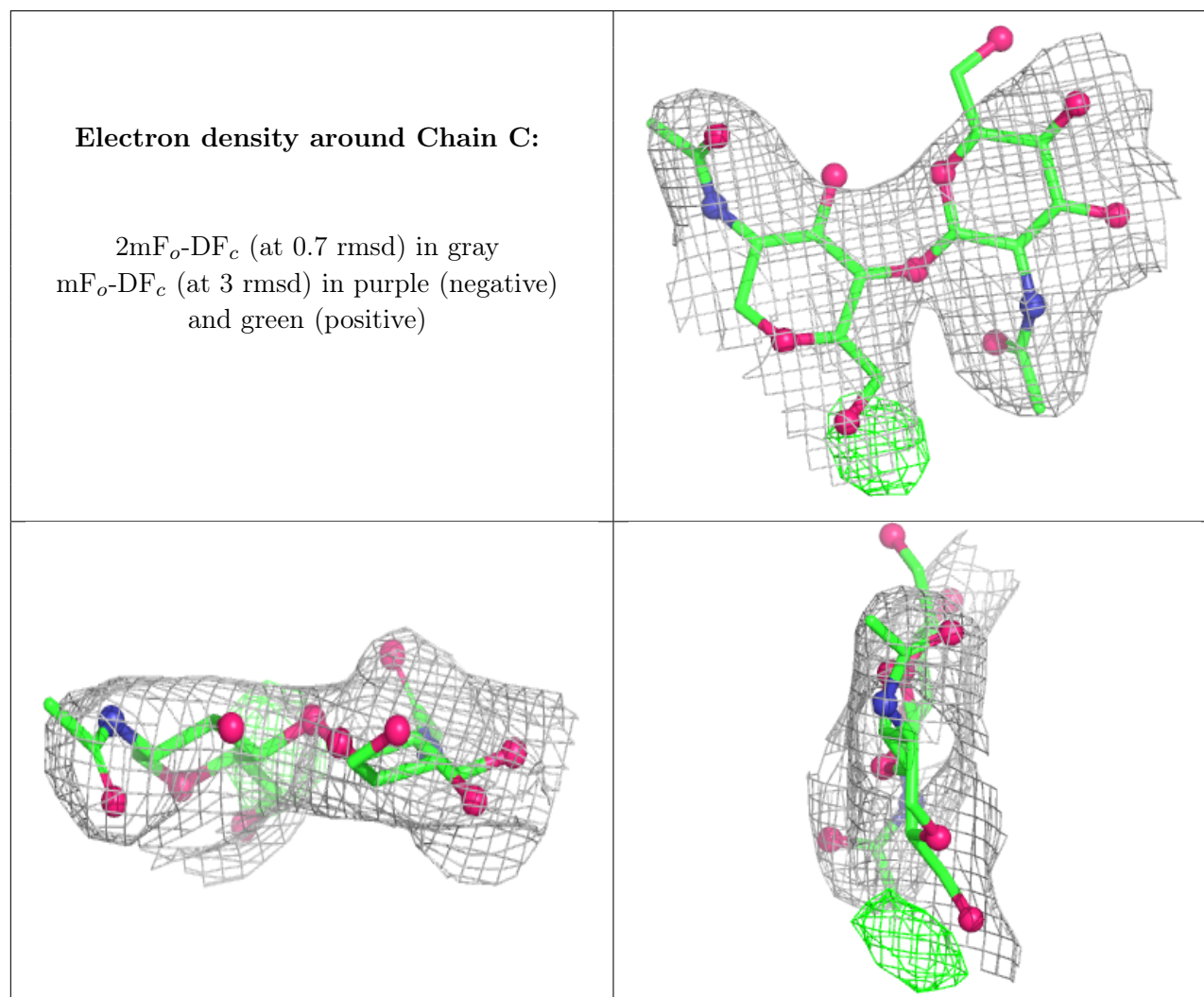
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	NAG	E	1	14/15	0.57	0.13	120,131,139,139	0
2	NAG	D	2	14/15	0.61	0.11	114,133,142,145	0
2	NAG	H	1	14/15	0.64	0.11	98,127,141,146	0

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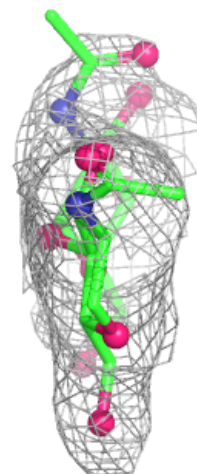
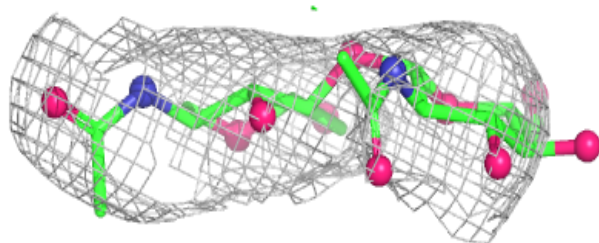
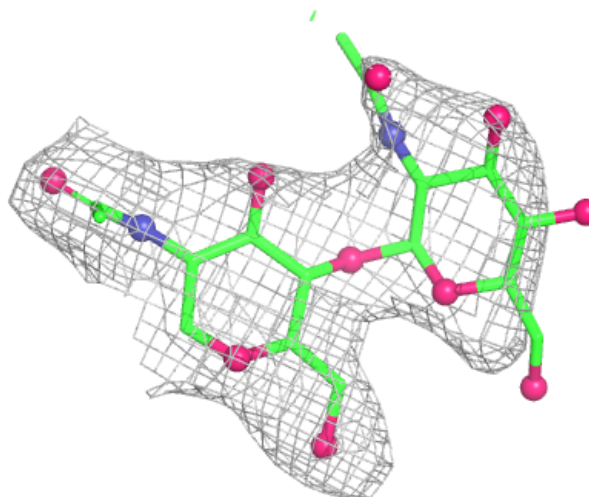
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	NAG	I	2	14/15	0.65	0.11	107,135,138,142	0
2	NAG	H	2	14/15	0.69	0.11	145,151,158,159	0
2	NAG	G	2	14/15	0.73	0.13	75,94,100,101	14
2	NAG	I	1	14/15	0.75	0.10	100,113,129,133	0
2	NAG	F	2	14/15	0.76	0.15	113,122,131,132	0
2	NAG	C	2	14/15	0.77	0.10	90,124,132,135	0
2	NAG	F	1	14/15	0.82	0.11	95,105,125,132	0
2	NAG	C	1	14/15	0.83	0.10	87,111,121,132	0
2	NAG	D	1	14/15	0.85	0.09	74,93,117,125	0
4	NAG	J	1	14/15	0.85	0.11	83,99,109,116	0
3	FUC	E	2	10/11	0.86	0.11	105,111,118,121	0
4	FUL	J	2	10/11	0.86	0.16	91,101,107,124	0
2	NAG	G	1	14/15	0.87	0.13	70,81,93,95	14

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.



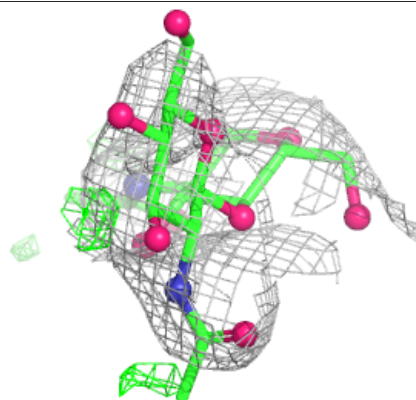
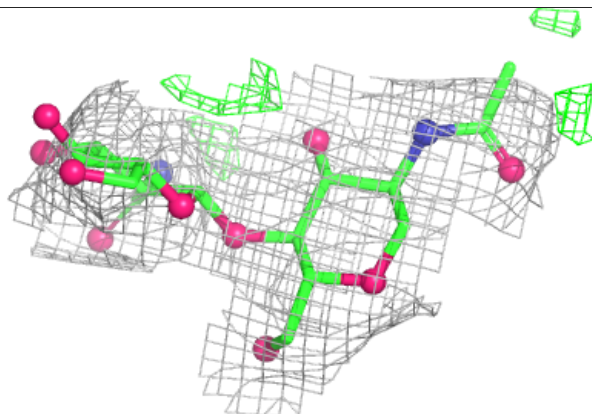
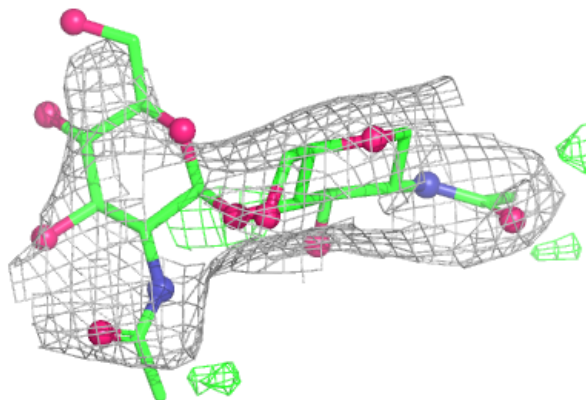
Electron density around Chain D:

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



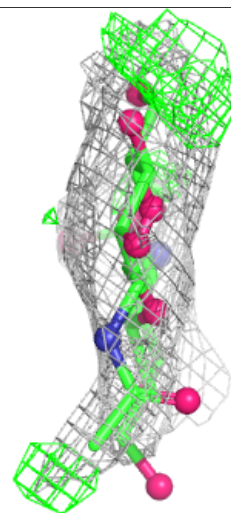
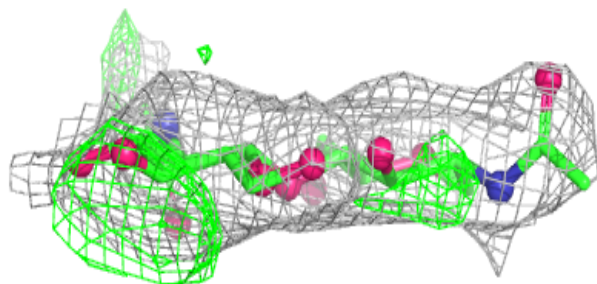
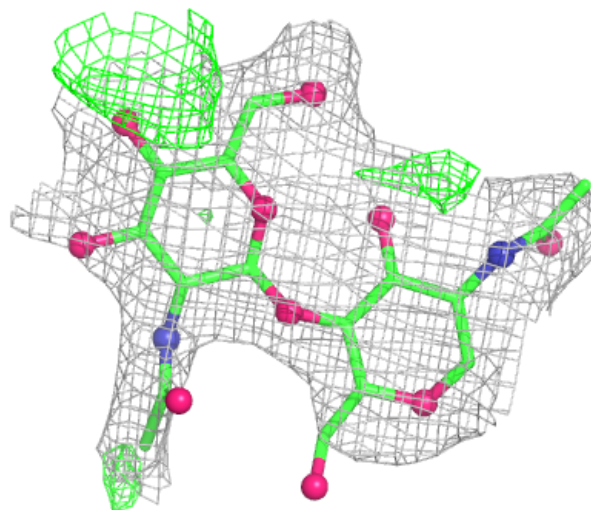
Electron density around Chain F:

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



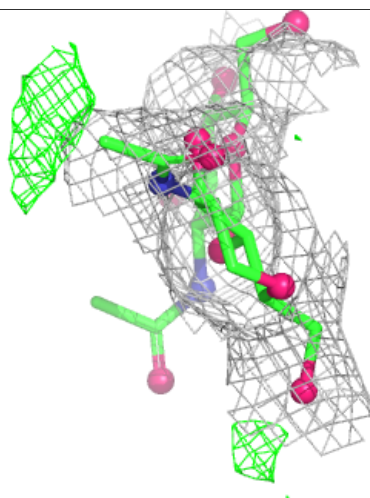
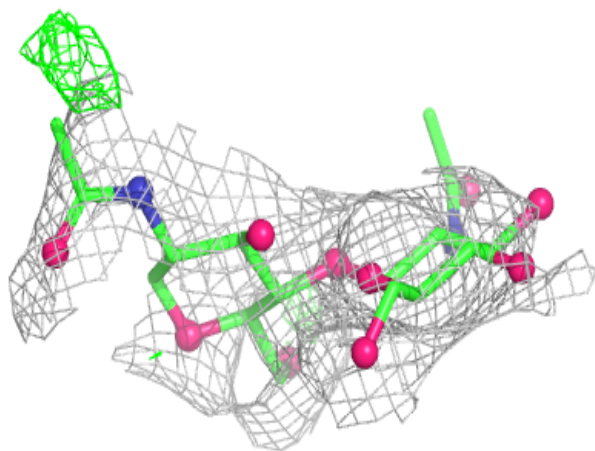
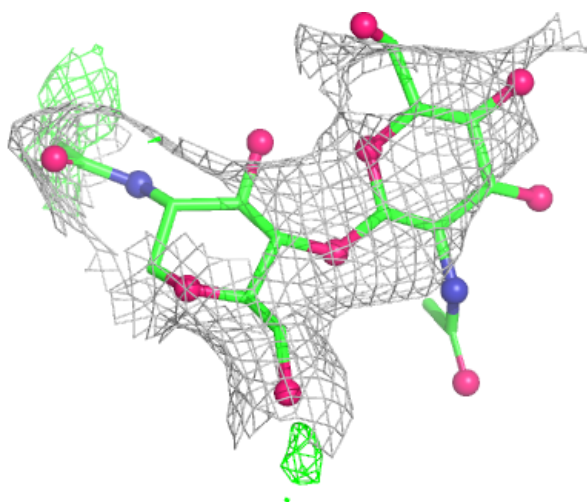
Electron density around Chain G:

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



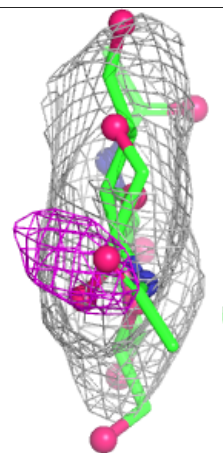
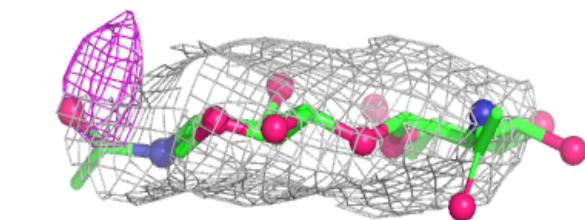
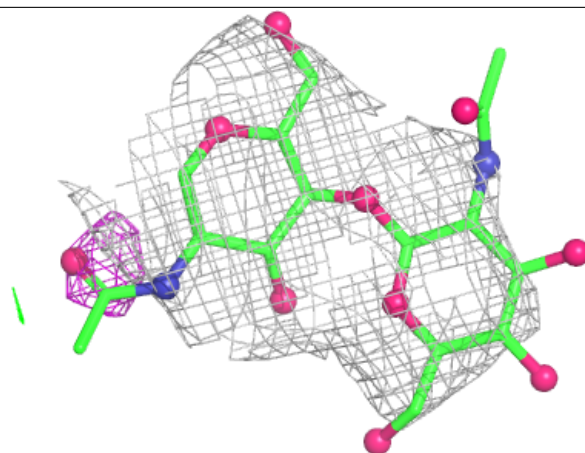
Electron density around Chain H:

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



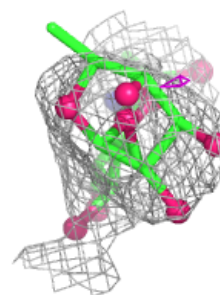
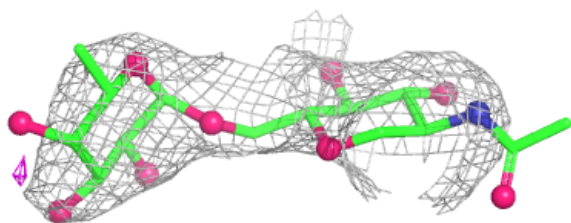
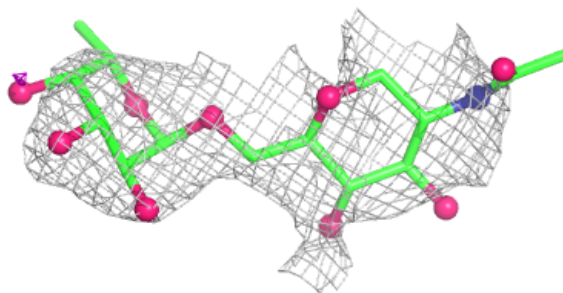
Electron density around Chain I:

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

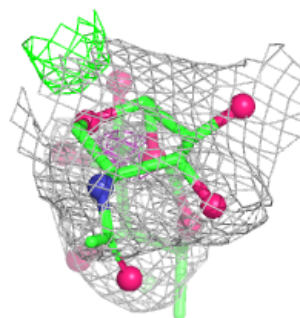
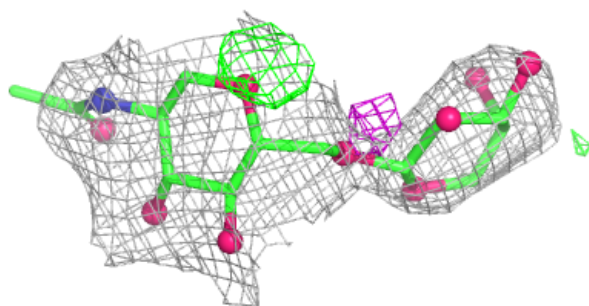
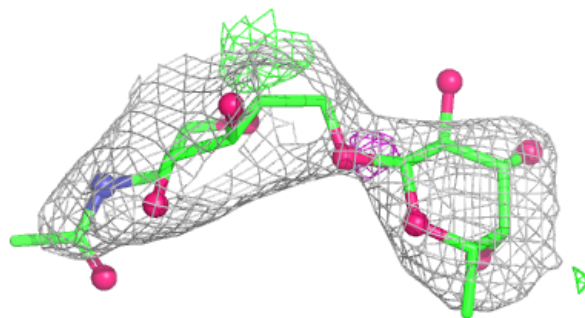


Electron density around Chain E:

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

**Electron density around Chain J:**

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



6.4 Ligands

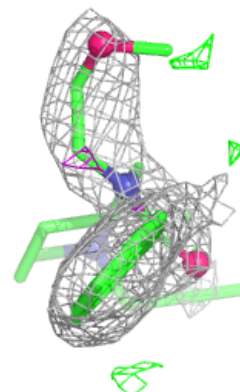
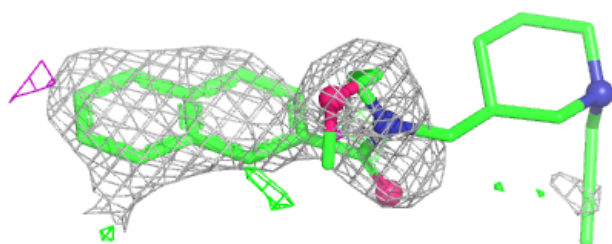
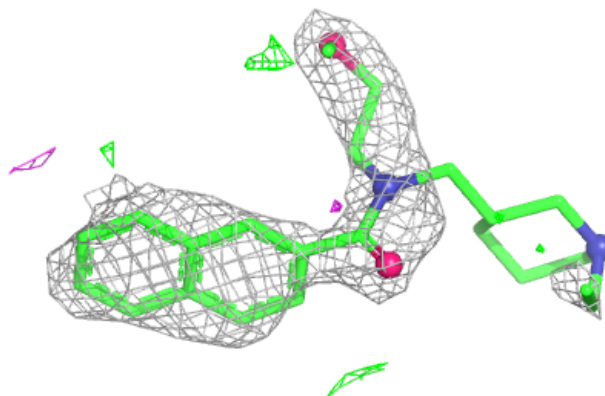
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
5	NAG	B	613	14/15	0.37	0.15	109,129,137,137	0
6	FUL	A	604	10/11	0.51	0.15	109,116,125,133	0
5	NAG	B	601	14/15	0.52	0.12	104,127,134,137	0
5	NAG	B	612	14/15	0.69	0.12	85,105,120,127	0
5	NAG	A	601	14/15	0.71	0.09	86,91,107,108	0
5	NAG	B	607	14/15	0.74	0.11	95,106,113,131	0
7	GOL	A	617	6/6	0.74	0.13	89,97,103,109	0
5	NAG	B	606	14/15	0.77	0.11	93,112,118,119	0
5	NAG	B	609	14/15	0.80	0.11	106,119,133,134	0
9	PEG	A	618	7/7	0.81	0.15	93,96,100,103	0
7	GOL	A	615	6/6	0.84	0.15	74,83,96,96	0
8	6YC	A	616	27/27	0.87	0.18	67,96,117,128	9
8	6YC	B	611	27/27	0.88	0.17	58,79,105,110	27
5	NAG	B	608	14/15	0.88	0.09	81,91,101,105	0
7	GOL	B	610	6/6	0.93	0.11	77,78,93,94	0

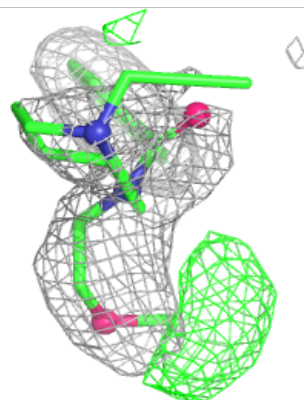
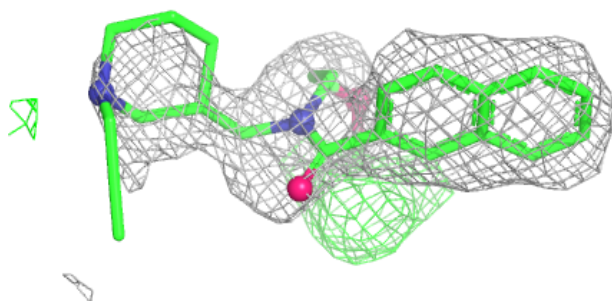
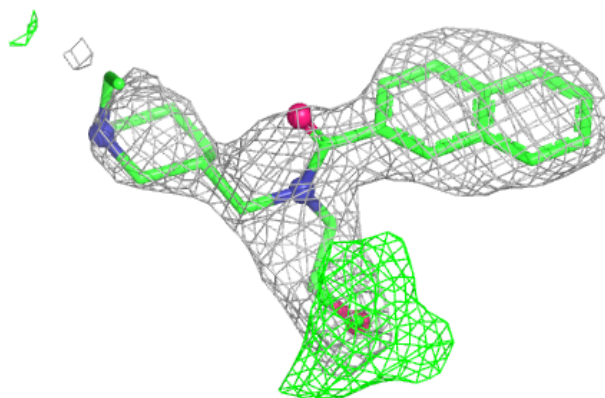
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around 6YC A 616:

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

**Electron density around 6YC B 611:**

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



6.5 Other polymers [i](#)

There are no such residues in this entry.