



Full wwPDB X-ray Structure Validation Report ⓘ

Nov 29, 2023 – 06:05 PM EST

PDB ID : 8SZ3
Title : Structure of human beta 1,3-N-acetylglucosaminyltransferase 2 with compound 7j
Authors : Sudom, A.; Min, X.
Deposited on : 2023-05-26
Resolution : 2.32 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 : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.36
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.36

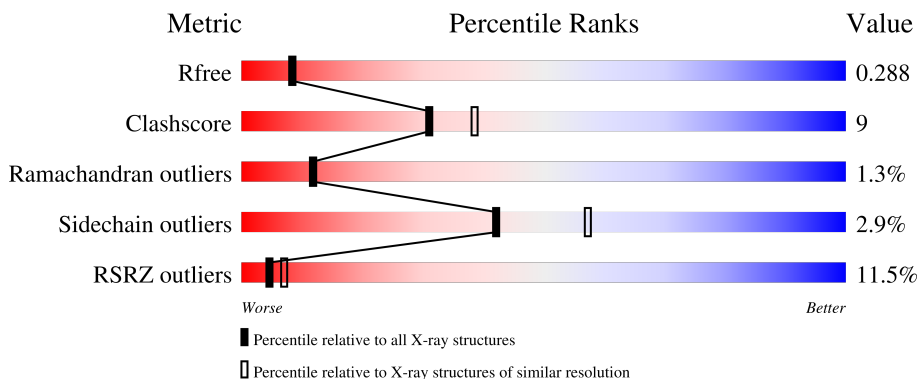
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION



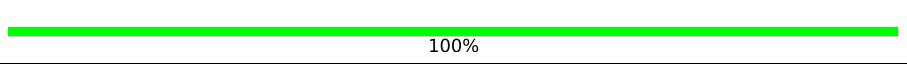
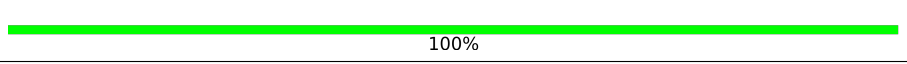
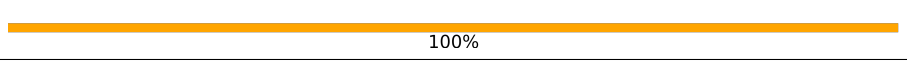
The reported resolution of this entry is 2.32 Å.

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}	130704	5974 (2.34-2.30)
Clashscore	141614	6604 (2.34-2.30)
Ramachandran outliers	138981	6523 (2.34-2.30)
Sidechain outliers	138945	6523 (2.34-2.30)
RSRZ outliers	127900	5855 (2.34-2.30)

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	397	
1	B	397	
2	C	2	
2	D	2	
2	E	2	

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
2	F	2	 50% 50%

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
2	NAG	C	2	-	-	-	X

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 5550 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 N-acetylglucosaminide beta-1,3-N-acetylglucosaminyltransferase 2.

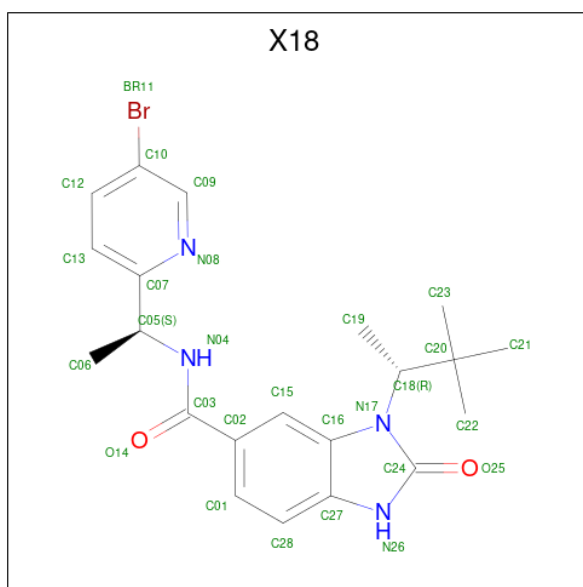
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	319	2639	1698	453	476	12	0	0	0
1	B	323	2668	1718	457	481	12	0	0	0

- 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
			Total	C	N	O			
2	C	2	28	16	2	10	0	0	0
2	D	2	28	16	2	10	0	0	0
2	E	2	28	16	2	10	0	0	0
2	F	2	28	16	2	10	0	0	0

- Molecule 3 is N-[(1S)-1-(5-bromopyridin-2-yl)ethyl]-3-[(2R)-3,3-dimethylbutan-2-yl]-2-oxo-2,3-dihydro-1H-benzimidazole-5-carboxamide (three-letter code: X18) (formula: C₂₁H₂₅BrN₄O₂) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
			Total	Br	C	N			O
3	A	1	Total	Br	C	N	O	0	0
			28	1	21	4	2		
3	B	1	Total	Br	C	N	O	0	0
			28	1	21	4	2		

- Molecule 4 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: $C_2H_6O_2$).



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

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	31	Total 31	O 31	0	0
5	B	36	Total 36	O 36	0	0

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

Chain C:  100%

MAG1
MAG2

- 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 E:  100%

MAG1
MAG2

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

Chain F:  50% 50%

MAG1
MAG2

4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	82.38Å 76.41Å 128.02Å 90.00° 102.58° 90.00°	Depositor
Resolution (Å)	29.14 – 2.32 29.14 – 2.32	Depositor EDS
% Data completeness (in resolution range)	97.9 (29.14-2.32) 98.3 (29.14-2.32)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.38 (at 2.31Å)	Xtrriage
Refinement program	PHENIX 1.20.1_4487	Depositor
R, R_{free}	0.261 , 0.287 0.262 , 0.288	Depositor DCC
R_{free} test set	1629 reflections (4.89%)	wwPDB-VP
Wilson B-factor (Å ²)	35.2	Xtrriage
Anisotropy	0.864	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 48.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.52$, $\langle L^2 \rangle = 0.36$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	5550	wwPDB-VP
Average B, all atoms (Å ²)	46.0	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 51.48 % 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 5.5750e-05. 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: X18, EDO, 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	0.28	0/2710	0.52	0/3668
1	B	0.26	0/2740	0.52	0/3710
All	All	0.27	0/5450	0.52	0/7378

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [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	2639	0	2582	54	0
1	B	2668	0	2616	44	0
2	C	28	0	25	0	0
2	D	28	0	25	0	0
2	E	28	0	25	1	0
2	F	28	0	25	0	0
3	A	28	0	0	1	0
3	B	28	0	0	1	0
4	A	4	0	6	0	0
4	B	4	0	6	2	0
5	A	31	0	0	2	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	B	36	0	0	1	0
All	All	5550	0	5310	98	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 9.

All (98) 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:354:ARG:NH2	5:A:501:HOH:O	2.01	0.92
1:A:322:ILE:HD11	1:A:342:LYS:HB3	1.56	0.86
1:A:335:TYR:HA	1:A:338:MET:HE2	1.65	0.78
1:B:335:TYR:HA	1:B:338:MET:HE2	1.70	0.74
1:B:357:ASP:OD2	1:B:363:LYS:NZ	2.21	0.74
1:A:340:LEU:HD13	1:A:347:PRO:HG3	1.69	0.73
1:A:302:PRO:HB2	1:A:347:PRO:HD2	1.79	0.65
1:A:145:LEU:HB3	1:A:241:VAL:HG12	1.80	0.64
1:A:141:LYS:HG2	1:A:237:ASP:HB3	1.80	0.63
1:B:360:GLU:O	1:B:362:ASN:N	2.31	0.63
1:B:371:ASP:OD1	1:B:371:ASP:N	2.32	0.62
1:A:91:SER:HB2	1:B:395:LEU:HD21	1.83	0.61
1:B:102:VAL:HA	1:B:105:VAL:HG12	1.81	0.61
1:B:141:LYS:HG3	1:B:237:ASP:HB3	1.82	0.61
1:A:360:GLU:HG2	1:A:361:LYS:H	1.65	0.60
1:A:366:ILE:H	1:A:366:ILE:HD12	1.67	0.60
1:B:262:LEU:HD21	1:B:270:LEU:HD12	1.84	0.59
1:A:322:ILE:HD12	1:A:343:LEU:HG	1.84	0.59
1:A:367:CYS:HA	1:A:370:VAL:HG23	1.84	0.58
1:B:259:LEU:HA	1:B:262:LEU:HD22	1.85	0.58
1:B:268:LYS:HD3	1:B:269:ASP:HB2	1.84	0.58
1:A:337:GLY:HA2	1:A:340:LEU:HD12	1.86	0.58
1:B:272:ILE:HD12	1:B:350:HIS:HD2	1.73	0.54
1:A:228:LEU:HB3	1:A:320:TYR:HB2	1.88	0.54
1:B:272:ILE:HD12	1:B:350:HIS:CD2	2.45	0.52
1:B:362:ASN:O	1:B:362:ASN:ND2	2.43	0.51
1:A:365:ASN:HD21	1:A:367:CYS:HB2	1.75	0.51
1:B:259:LEU:HD21	1:B:310:LEU:HD21	1.93	0.51
1:A:284:ASP:HB3	1:A:287:LEU:HG	1.91	0.51
1:B:272:ILE:HG22	1:B:348:GLU:HB3	1.93	0.50
1:A:319:LEU:O	1:A:323:THR:HG23	2.12	0.50
1:B:133:ASP:OD2	1:B:134:GLN:N	2.45	0.50

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:284:ASP:HB3	1:B:287:LEU:HG	1.92	0.50
1:A:128:TYR:CE2	1:A:222:LEU:HD21	2.46	0.50
1:A:285:LYS:HE3	1:A:286:LYS:HD3	1.94	0.49
1:B:144:LEU:HB3	1:B:176:VAL:HG22	1.93	0.49
1:B:319:LEU:O	1:B:323:THR:HG23	2.12	0.49
1:A:147:ALA:HB1	1:A:181:LEU:HD11	1.93	0.49
1:A:272:ILE:HD11	1:A:310:LEU:HD23	1.94	0.49
1:B:189:ASP:OD2	1:B:214:ARG:NH1	2.40	0.49
1:A:358:ILE:HG22	1:A:363:LYS:HG2	1.95	0.49
1:A:358:ILE:HG23	1:A:359:GLU:HG2	1.93	0.49
1:A:141:LYS:NZ	1:A:239:GLU:HG2	2.28	0.49
1:B:147:ALA:HB1	1:B:181:LEU:HD11	1.94	0.48
1:A:260:ASN:C	1:A:262:LEU:H	2.15	0.48
1:A:101:ARG:NH1	1:A:105:VAL:HG11	2.28	0.48
1:B:99:ASP:O	1:B:102:VAL:HG22	2.13	0.48
1:B:149:LYS:NZ	5:B:504:HOH:O	2.47	0.48
1:A:263:SER:O	1:A:266:LYS:N	2.47	0.48
1:B:137:LYS:O	1:B:177:VAL:HG11	2.14	0.47
1:A:376:HIS:CD2	1:A:377:SER:HB3	2.49	0.47
1:A:319:LEU:O	1:A:322:ILE:HG22	2.15	0.47
1:B:162:ARG:HG2	1:B:178:ARG:CZ	2.45	0.47
1:B:354:ARG:NH1	1:B:358:ILE:HD12	2.31	0.46
1:A:162:ARG:HG2	1:A:178:ARG:CZ	2.46	0.46
1:B:137:LYS:HA	1:B:137:LYS:HD3	1.77	0.46
1:A:220:LEU:HD21	3:A:401:X18:C24	2.46	0.46
1:A:258:TYR:O	1:A:262:LEU:HG	2.16	0.46
1:A:281:PRO:HB3	1:A:291:ILE:HB	1.97	0.46
1:B:189:ASP:OD2	1:B:214:ARG:HD2	2.16	0.46
1:A:270:LEU:HD11	1:A:272:ILE:HD13	1.98	0.45
1:B:140:LYS:HE2	1:B:140:LYS:HB3	1.74	0.45
1:B:376:HIS:CD2	1:B:377:SER:HB3	2.51	0.45
1:A:99:ASP:O	1:A:102:VAL:HG22	2.16	0.45
1:B:157:ARG:NE	4:B:402:EDO:H12	2.31	0.45
1:A:360:GLU:HG2	1:A:361:LYS:N	2.30	0.45
1:A:254:HIS:NE2	1:A:371:ASP:O	2.50	0.45
1:B:109:PHE:HA	1:B:112:LEU:HD12	1.99	0.45
1:B:251:ASN:O	1:B:255:ILE:HG12	2.17	0.44
1:A:366:ILE:HG12	1:A:389:GLN:HB3	2.00	0.44
1:A:140:LYS:HB3	1:A:140:LYS:HE3	1.62	0.44
1:A:96:CYS:HA	1:A:125:CYS:HB2	2.00	0.44
1:B:220:LEU:HD21	3:B:401:X18:C24	2.48	0.44

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:133:ASP:OD1	1:A:134:GLN:N	2.51	0.43
1:B:148:ILE:HB	1:B:180:PHE:CD1	2.53	0.43
1:A:149:LYS:NZ	5:A:507:HOH:O	2.52	0.43
1:A:272:ILE:HA	1:A:348:GLU:O	2.18	0.43
1:A:358:ILE:HG23	1:A:359:GLU:N	2.33	0.43
1:A:148:ILE:HB	1:A:180:PHE:CD1	2.54	0.42
1:B:342:LYS:HB2	1:B:342:LYS:HE2	1.85	0.42
1:A:110:ASN:HA	1:A:117:LYS:HE2	2.01	0.42
1:A:368:SER:O	1:A:372:LEU:HD23	2.18	0.42
1:A:260:ASN:C	1:A:262:LEU:N	2.73	0.42
1:A:147:ALA:O	1:A:243:LYS:HA	2.19	0.42
2:E:1:NAG:H61	2:E:2:NAG:N2	2.34	0.42
1:A:251:ASN:O	1:A:255:ILE:HG12	2.19	0.41
1:A:360:GLU:CG	1:A:361:LYS:H	2.32	0.41
1:B:242:PHE:CZ	1:B:250:VAL:HG11	2.56	0.41
1:A:58:TYR:O	1:A:62:GLU:HG2	2.21	0.41
1:A:376:HIS:HA	1:A:377:SER:HA	1.77	0.41
1:B:165:TRP:CE3	1:B:250:VAL:HG22	2.56	0.41
1:A:211:TRP:HB2	1:A:213:TYR:CE1	2.55	0.41
1:B:142:PRO:HB3	1:B:177:VAL:HG23	2.03	0.41
1:B:157:ARG:O	1:B:161:ILE:HG13	2.21	0.41
1:B:96:CYS:HA	1:B:125:CYS:HB2	2.03	0.41
1:B:319:LEU:O	1:B:322:ILE:HG22	2.21	0.40
1:B:390:LEU:HD12	1:B:390:LEU:HA	1.97	0.40
1:B:154:HIS:CD2	4:B:402:EDO:H11	2.57	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	313/397 (79%)	295 (94%)	13 (4%)	5 (2%)	9 8

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	317/397 (80%)	298 (94%)	16 (5%)	3 (1%)	17	19
All	All	630/794 (79%)	593 (94%)	29 (5%)	8 (1%)	12	12

All (8) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	360	GLU
1	B	361	LYS
1	A	359	GLU
1	B	360	GLU
1	A	261	SER
1	A	357	ASP
1	B	359	GLU
1	A	267	ALA

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	294/362 (81%)	285 (97%)	9 (3%)	40	55
1	B	298/362 (82%)	290 (97%)	8 (3%)	44	60
All	All	592/724 (82%)	575 (97%)	17 (3%)	42	57

All (17) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	64	GLU
1	A	101	ARG
1	A	141	LYS
1	A	169	SER
1	A	221	SER
1	A	285	LYS
1	A	343	LEU
1	A	360	GLU

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	A	363	LYS
1	B	94	ASN
1	B	110	ASN
1	B	169	SER
1	B	266	LYS
1	B	268	LYS
1	B	360	GLU
1	B	361	LYS
1	B	370	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	365	ASN
1	B	391	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

8 monosaccharides are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	NAG	C	1	1,2	14,14,15	0.47	0	17,19,21	0.58	0
2	NAG	C	2	2	14,14,15	0.44	0	17,19,21	0.55	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	NAG	D	1	1,2	14,14,15	0.30	0	17,19,21	0.45	0
2	NAG	D	2	2	14,14,15	0.40	0	17,19,21	0.54	0
2	NAG	E	1	1,2	14,14,15	0.22	0	17,19,21	0.94	2 (11%)
2	NAG	E	2	2	14,14,15	0.75	0	17,19,21	0.92	1 (5%)
2	NAG	F	1	1,2	14,14,15	0.30	0	17,19,21	0.50	0
2	NAG	F	2	2	14,14,15	0.42	0	17,19,21	0.64	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
2	NAG	C	1	1,2	-	0/6/23/26	0/1/1/1
2	NAG	C	2	2	-	0/6/23/26	0/1/1/1
2	NAG	D	1	1,2	-	0/6/23/26	0/1/1/1
2	NAG	D	2	2	-	0/6/23/26	0/1/1/1
2	NAG	E	1	1,2	-	1/6/23/26	0/1/1/1
2	NAG	E	2	2	-	4/6/23/26	0/1/1/1
2	NAG	F	1	1,2	-	0/6/23/26	0/1/1/1
2	NAG	F	2	2	-	0/6/23/26	0/1/1/1

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	E	1	NAG	C1-O5-C5	2.42	115.47	112.19
2	E	2	NAG	C2-N2-C7	2.25	126.10	122.90
2	E	1	NAG	C2-N2-C7	2.11	125.90	122.90
2	F	2	NAG	C1-O5-C5	2.02	114.93	112.19

There are no chirality outliers.

All (5) torsion outliers are listed below:

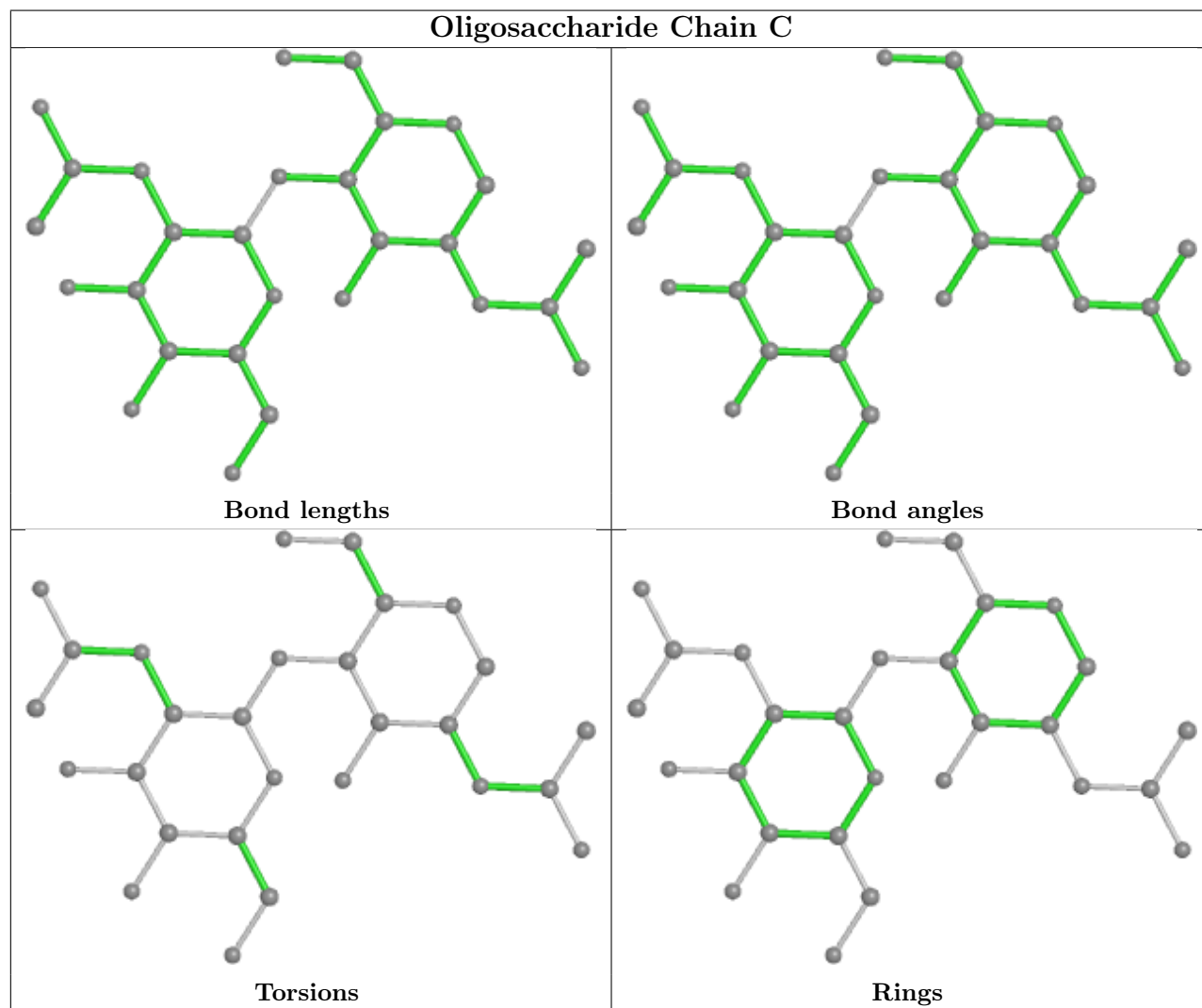
Mol	Chain	Res	Type	Atoms
2	E	2	NAG	C4-C5-C6-O6
2	E	2	NAG	O5-C5-C6-O6
2	E	2	NAG	C1-C2-N2-C7
2	E	1	NAG	C3-C2-N2-C7
2	E	2	NAG	C3-C2-N2-C7

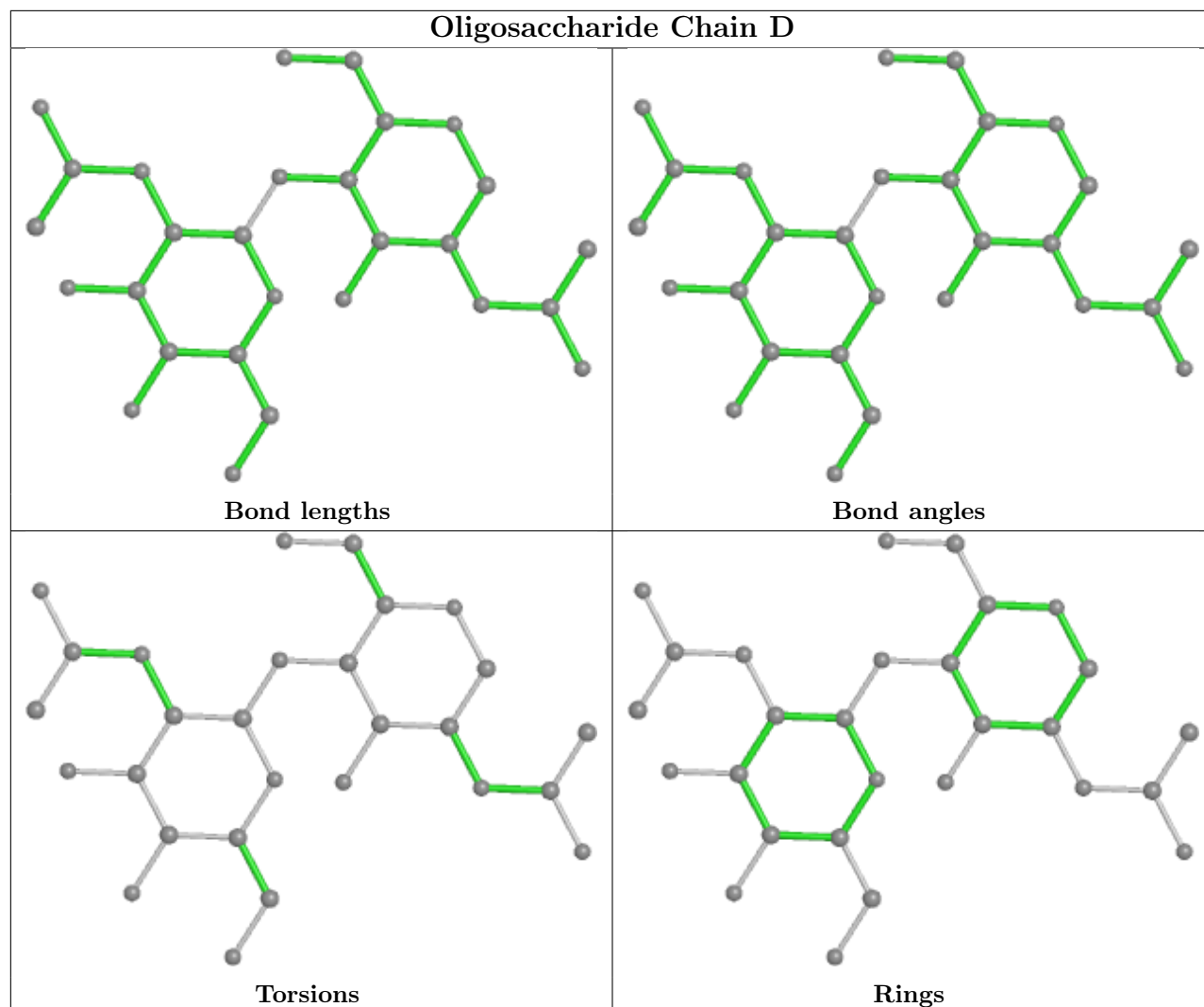
There are no ring outliers.

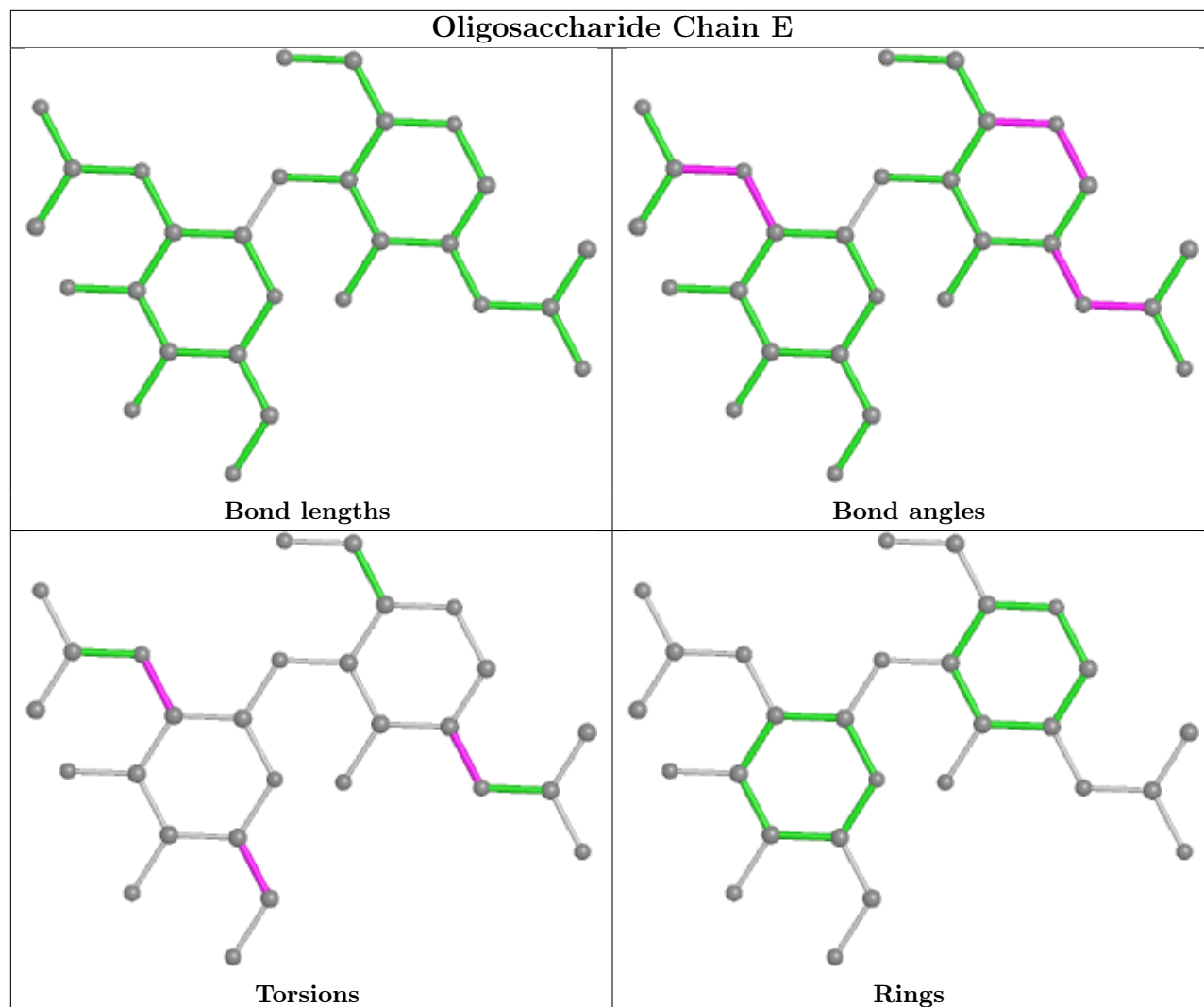
2 monomers are involved in 1 short contact:

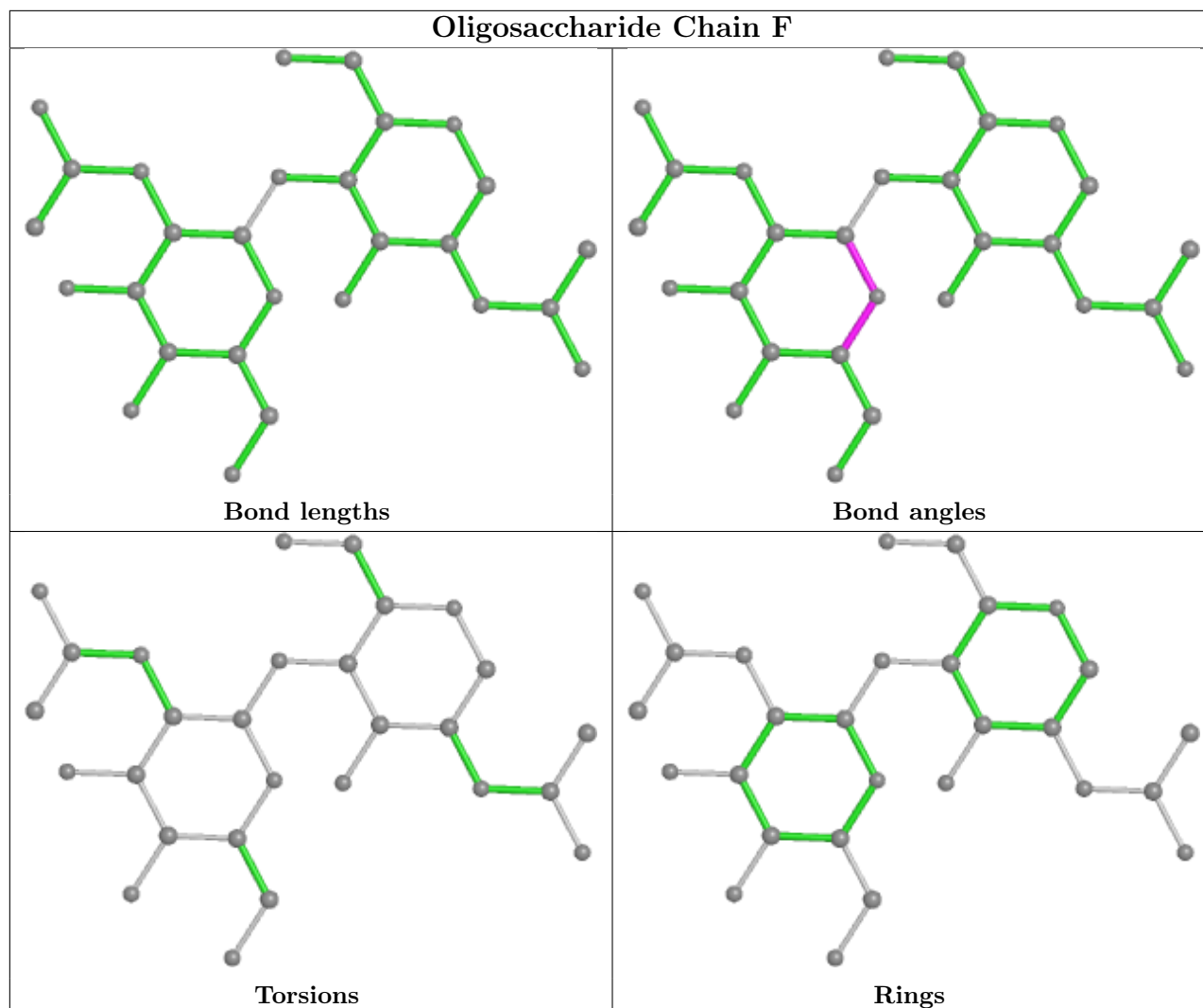
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	E	1	NAG	1	0
2	E	2	NAG	1	0

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](#)

4 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
4	EDO	A	402	-	3,3,3	0.43	0	2,2,2	0.42	0
3	X18	B	401	-	28,30,30	2.53	9 (32%)	40,45,45	1.69	9 (22%)
4	EDO	B	402	-	3,3,3	0.43	0	2,2,2	0.38	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	X18	A	401	-	28,30,30	2.50	9 (32%)	40,45,45	1.92	10 (25%)

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
4	EDO	A	402	-	-	0/1/1/1	-
3	X18	B	401	-	-	1/22/22/22	0/3/3/3
4	EDO	B	402	-	-	0/1/1/1	-
3	X18	A	401	-	-	1/22/22/22	0/3/3/3

All (18) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	401	X18	C03-N04	6.96	1.49	1.34
3	B	401	X18	C03-N04	6.93	1.49	1.34
3	B	401	X18	C24-N26	6.15	1.43	1.37
3	A	401	X18	C24-N26	6.02	1.43	1.37
3	B	401	X18	C27-N26	5.17	1.48	1.38
3	A	401	X18	C27-N26	5.04	1.48	1.38
3	B	401	X18	C16-N17	4.56	1.49	1.40
3	A	401	X18	C16-N17	4.41	1.49	1.40
3	B	401	X18	C02-C03	2.72	1.55	1.50
3	A	401	X18	C02-C03	2.71	1.55	1.50
3	A	401	X18	O14-C03	-2.50	1.18	1.23
3	B	401	X18	O14-C03	-2.47	1.18	1.23
3	B	401	X18	C24-N17	2.45	1.44	1.38
3	A	401	X18	C24-N17	2.41	1.44	1.38
3	A	401	X18	O25-C24	-2.39	1.18	1.23
3	B	401	X18	O25-C24	-2.29	1.18	1.23
3	A	401	X18	BR11-C10	2.29	1.94	1.90
3	B	401	X18	BR11-C10	2.24	1.94	1.90

All (19) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	401	X18	C09-N08-C07	5.95	122.29	117.95
3	A	401	X18	C05-C07-N08	4.99	120.83	116.01
3	A	401	X18	C09-N08-C07	4.94	121.55	117.95
3	A	401	X18	C13-C07-C05	-4.77	117.53	121.97

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	401	X18	C27-N26-C24	-4.48	107.58	110.28
3	B	401	X18	C27-N26-C24	-3.94	107.90	110.28
3	A	401	X18	C16-N17-C24	-3.28	106.87	109.25
3	B	401	X18	C16-N17-C24	-3.09	107.01	109.25
3	B	401	X18	C15-C16-C27	-2.84	119.06	121.53
3	A	401	X18	C15-C16-C27	-2.68	119.20	121.53
3	B	401	X18	C27-C16-N17	2.42	108.44	106.47
3	B	401	X18	C10-C09-N08	-2.39	119.26	122.38
3	A	401	X18	O25-C24-N26	-2.35	125.40	127.50
3	A	401	X18	C27-C16-N17	2.34	108.37	106.47
3	B	401	X18	C15-C16-N17	2.34	132.50	128.50
3	A	401	X18	C15-C16-N17	2.29	132.43	128.50
3	A	401	X18	C10-C09-N08	-2.17	119.54	122.38
3	B	401	X18	O25-C24-N26	-2.08	125.64	127.50
3	B	401	X18	C05-C07-N08	2.04	117.99	116.01

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	401	X18	C19-C18-N17-C16
3	B	401	X18	C19-C18-N17-C16

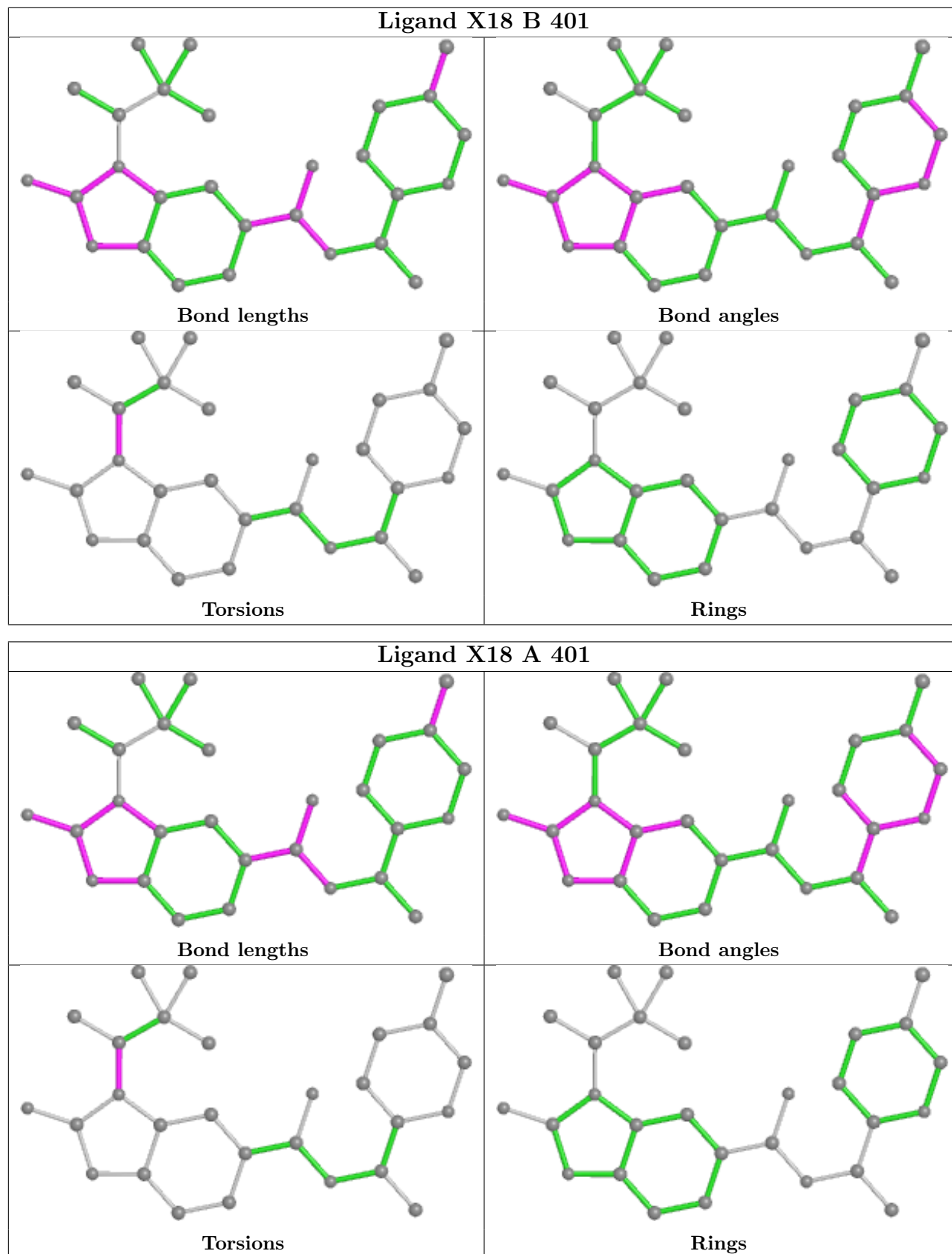
There are no ring outliers.

3 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	401	X18	1	0
4	B	402	EDO	2	0
3	A	401	X18	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 [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	319/397 (80%)	1.01	42 (13%) 3 4	26, 48, 71, 95	0
1	B	323/397 (81%)	0.86	32 (9%) 7 10	24, 45, 65, 88	0
All	All	642/794 (80%)	0.93	74 (11%) 4 7	24, 46, 69, 95	0

All (74) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	360	GLU	7.8
1	B	360	GLU	6.2
1	A	344	GLY	4.9
1	A	285	LYS	4.8
1	B	397	CYS	4.8
1	A	262	LEU	4.6
1	A	286	LYS	4.0
1	A	358	ILE	3.9
1	A	69	GLN	3.8
1	A	356	PHE	3.8
1	A	396	LYS	3.8
1	A	279	ALA	3.7
1	B	361	LYS	3.6
1	A	299	LEU	3.5
1	B	74	LEU	3.5
1	A	268	LYS	3.5
1	A	147	ALA	3.4
1	A	56	GLU	3.4
1	B	279	ALA	3.3
1	B	56	GLU	3.3
1	B	299	LEU	3.2
1	B	328	LEU	3.2
1	A	361	LYS	3.2
1	A	260	ASN	3.0

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	B	100	LEU	3.0
1	B	358	ILE	3.0
1	A	269	ASP	2.9
1	B	221	SER	2.9
1	A	244	GLY	2.9
1	A	139	ALA	2.9
1	B	329	TYR	2.8
1	A	290	TYR	2.7
1	B	75	SER	2.7
1	A	276	ILE	2.7
1	A	369	TYR	2.7
1	A	259	LEU	2.6
1	B	262	LEU	2.6
1	B	147	ALA	2.6
1	B	286	LYS	2.6
1	A	148	ILE	2.6
1	A	364	ASN	2.6
1	B	285	LYS	2.6
1	B	139	ALA	2.5
1	A	71	ASN	2.5
1	A	261	SER	2.5
1	A	257	ASN	2.5
1	A	287	LEU	2.5
1	B	356	PHE	2.4
1	B	369	TYR	2.4
1	A	200	PHE	2.4
1	B	321	HIS	2.4
1	A	395	LEU	2.3
1	B	255	ILE	2.3
1	B	228	LEU	2.2
1	A	179	VAL	2.2
1	A	221	SER	2.2
1	B	335	TYR	2.2
1	B	181	LEU	2.2
1	B	276	ILE	2.2
1	B	269	ASP	2.2
1	A	370	VAL	2.2
1	B	257	ASN	2.2
1	A	70	TYR	2.1
1	A	146	LEU	2.1
1	A	237	ASP	2.1
1	B	372	LEU	2.1

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	A	359	GLU	2.1
1	A	368	SER	2.1
1	A	366	ILE	2.1
1	B	237	ASP	2.1
1	B	345	LEU	2.0
1	B	264	LYS	2.0
1	A	68	ARG	2.0
1	A	97	GLU	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](#)

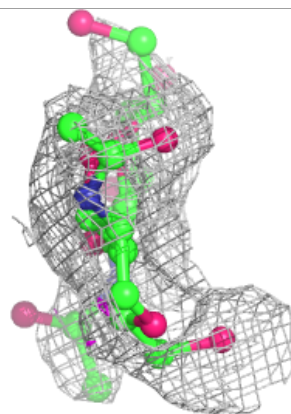
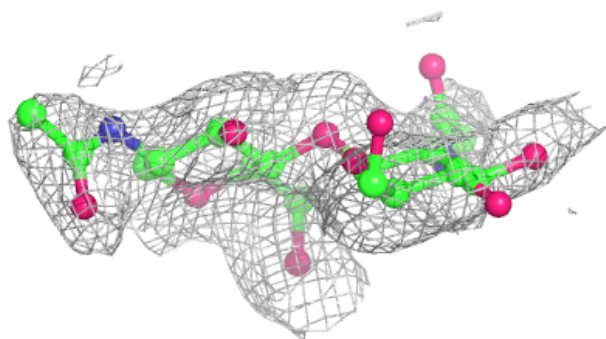
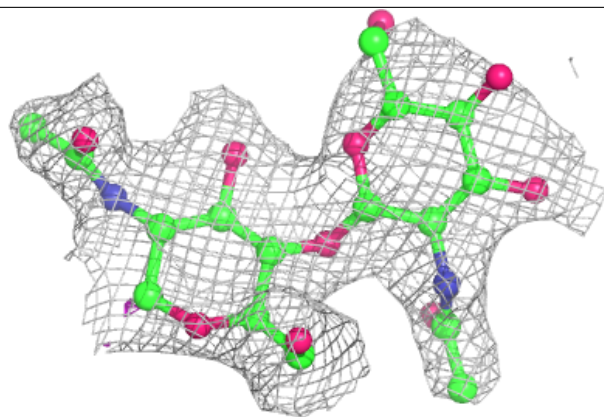
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists 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	NAG	E	1	14/15	0.61	0.36	59,63,70,75	0
2	NAG	D	2	14/15	0.69	0.35	43,56,64,65	0
2	NAG	C	2	14/15	0.78	0.46	64,70,76,77	0
2	NAG	C	1	14/15	0.79	0.27	47,56,61,64	0
2	NAG	F	2	14/15	0.82	0.23	41,47,50,54	0
2	NAG	E	2	14/15	0.84	0.49	67,71,75,77	0
2	NAG	F	1	14/15	0.89	0.14	35,37,41,43	0
2	NAG	D	1	14/15	0.90	0.14	42,43,47,51	0

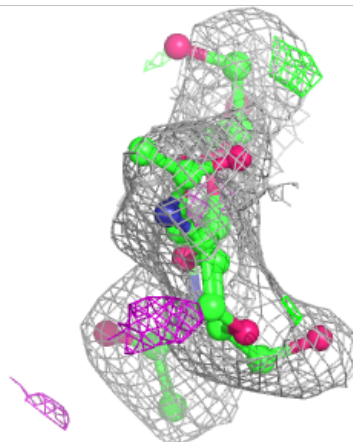
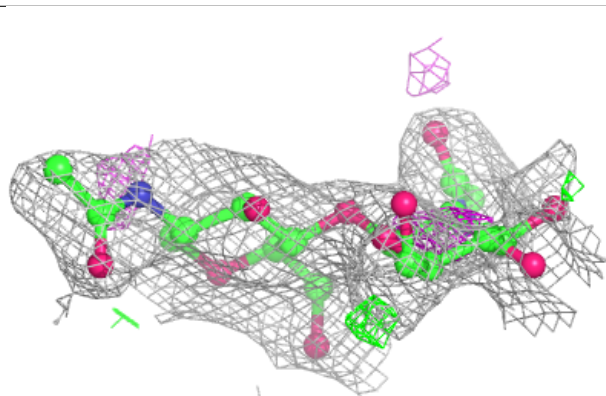
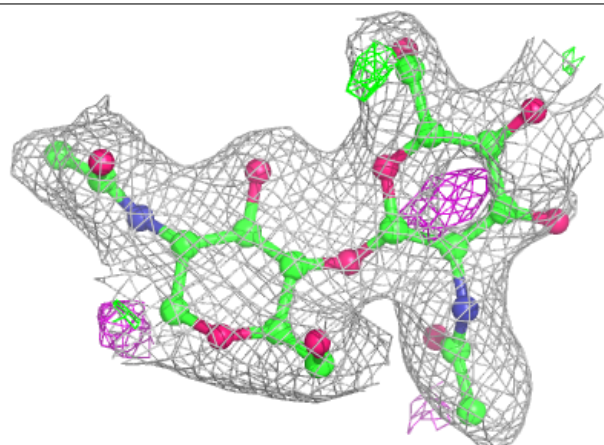
The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

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)

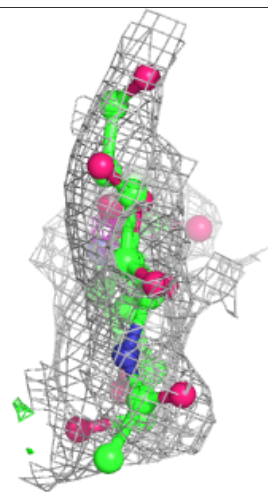
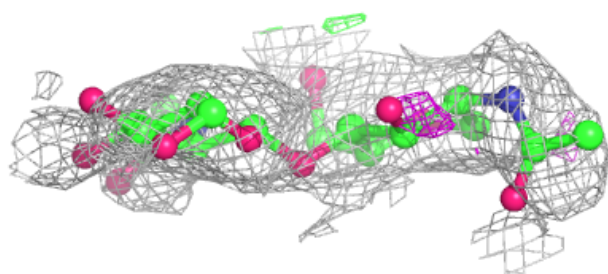
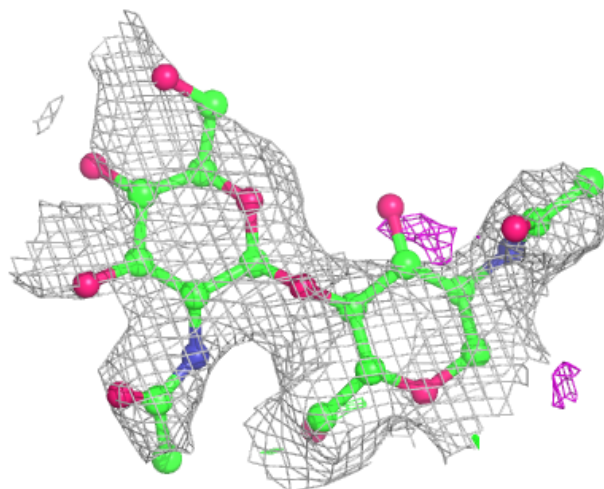
**Electron density around Chain D:**

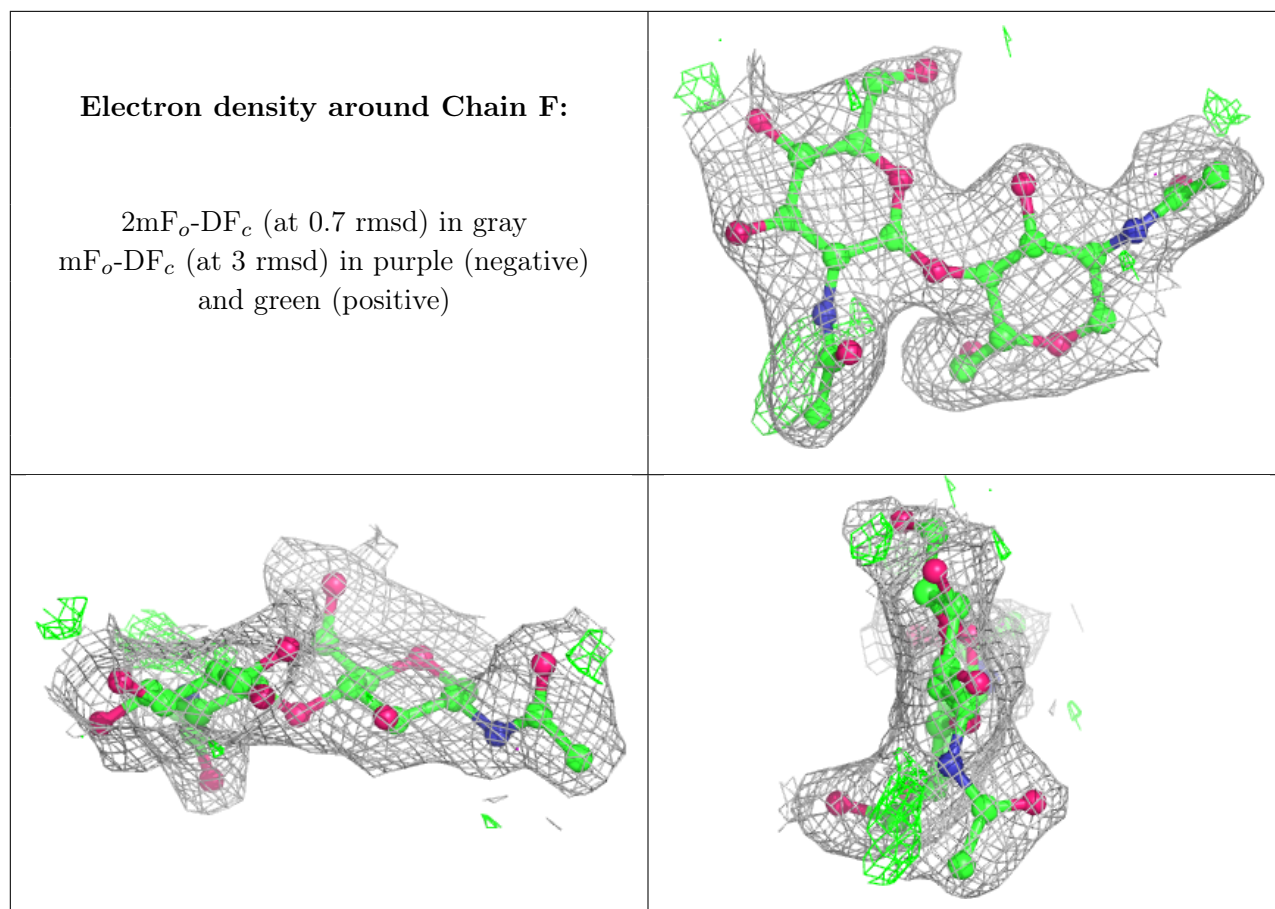
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



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)





6.4 Ligands [i](#)

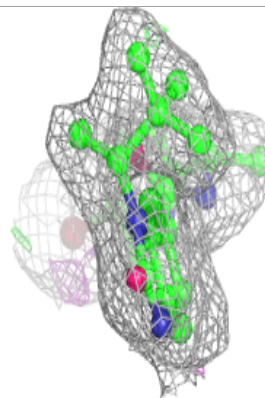
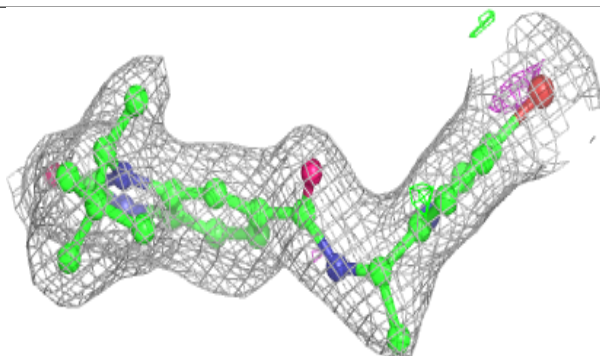
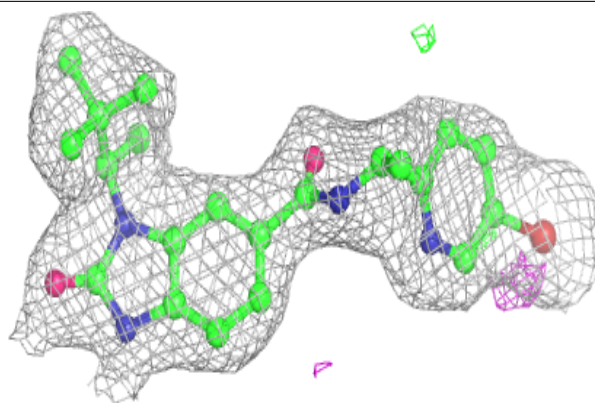
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	EDO	A	402	4/4	0.86	0.23	24,27,30,31	0
3	X18	A	401	28/28	0.89	0.17	21,28,42,67	0
4	EDO	B	402	4/4	0.91	0.20	24,30,33,42	0
3	X18	B	401	28/28	0.93	0.16	23,28,38,58	0

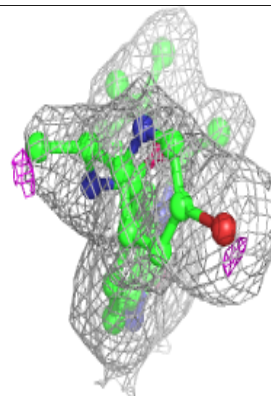
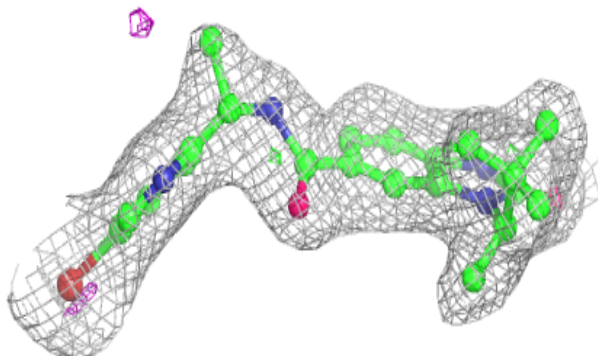
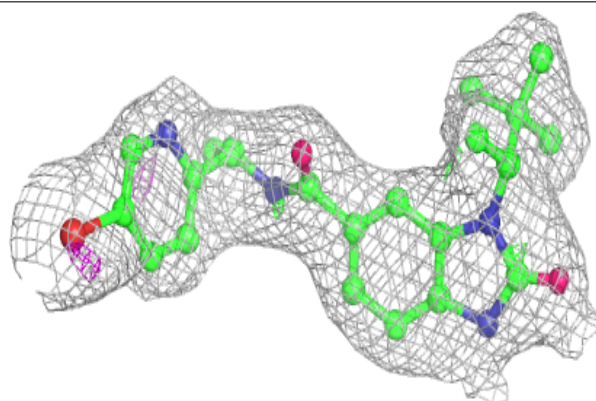
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around X18 A 401:

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

**Electron density around X18 B 401:**

$2mF_o-DF_c$ (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.