



wwPDB X-ray Structure Validation Summary Report ⓘ

Jun 26, 2024 – 01:37 AM EDT

PDB ID : 6YDX
Title : Insulin-regulated aminopeptidase complexed with a macrocyclic peptidic inhibitor
Authors : Mpakali, A.; Saridakis, E.; Giastas, P.; Stratikos, E.
Deposited on : 2020-03-21
Resolution : 3.20 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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 : 2.37.1
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) : 2.37.1

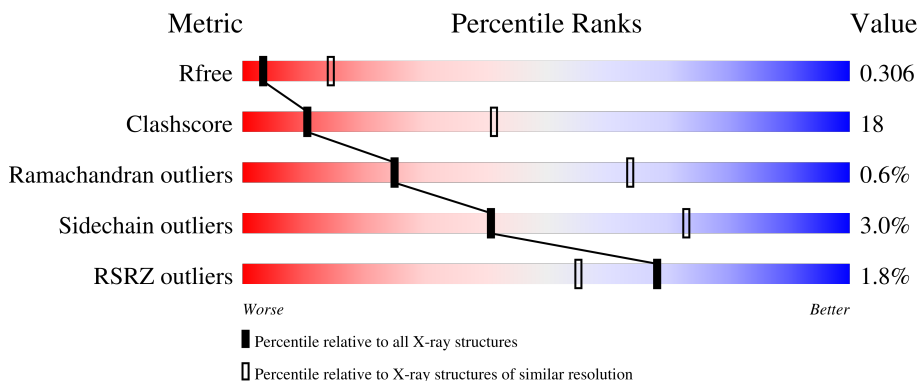
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.20 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.



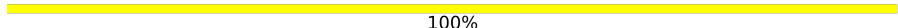
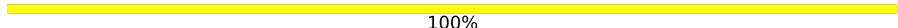
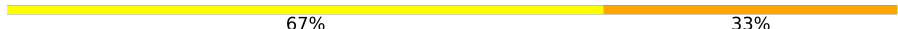

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	1133 (3.20-3.20)
Clashscore	141614	1253 (3.20-3.20)
Ramachandran outliers	138981	1234 (3.20-3.20)
Sidechain outliers	138945	1233 (3.20-3.20)
RSRZ outliers	127900	1095 (3.20-3.20)

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	912	 2% 55% 37% • 6%
1	B	912	 % 58% 34% • 6%
2	C	2	 100%
2	E	2	 100%
2	F	2	 50% 50%

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Mol	Chain	Length	Quality of chain
2	G	2	 100%
2	I	2	 100%
3	D	3	 67%
3	H	3	 33%

2 Entry composition [i](#)

There are 13 unique types of molecules in this entry. The entry contains 14298 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 Leucyl-cystinyl aminopeptidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	856	6868	4448	1118	1276	26	0	4	0
1	B	853	6827	4422	1113	1266	26	0	0	0

There are 82 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	124	MET	-	initiating methionine	UNP Q9UIQ6
A	125	GLY	-	expression tag	UNP Q9UIQ6
A	126	ILE	-	expression tag	UNP Q9UIQ6
A	127	LEU	-	expression tag	UNP Q9UIQ6
A	128	PRO	-	expression tag	UNP Q9UIQ6
A	129	SER	-	expression tag	UNP Q9UIQ6
A	130	PRO	-	expression tag	UNP Q9UIQ6
A	131	GLY	-	expression tag	UNP Q9UIQ6
A	132	ASN	-	expression tag	UNP Q9UIQ6
A	133	PRO	-	expression tag	UNP Q9UIQ6
A	134	ALA	-	expression tag	UNP Q9UIQ6
A	135	LEU	-	expression tag	UNP Q9UIQ6
A	136	LEU	-	expression tag	UNP Q9UIQ6
A	137	SER	-	expression tag	UNP Q9UIQ6
A	138	LEU	-	expression tag	UNP Q9UIQ6
A	139	VAL	-	expression tag	UNP Q9UIQ6
A	140	SER	-	expression tag	UNP Q9UIQ6
A	141	LEU	-	expression tag	UNP Q9UIQ6
A	142	LEU	-	expression tag	UNP Q9UIQ6
A	143	SER	-	expression tag	UNP Q9UIQ6
A	144	VAL	-	expression tag	UNP Q9UIQ6
A	145	LEU	-	expression tag	UNP Q9UIQ6
A	146	LEU	-	expression tag	UNP Q9UIQ6
A	147	MET	-	expression tag	UNP Q9UIQ6
A	148	GLY	-	expression tag	UNP Q9UIQ6

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Chain	Residue	Modelled	Actual	Comment	Reference
A	149	CYS	-	expression tag	UNP Q9UIQ6
A	150	VAL	-	expression tag	UNP Q9UIQ6
A	151	ALA	-	expression tag	UNP Q9UIQ6
A	152	GLU	-	expression tag	UNP Q9UIQ6
A	153	THR	-	expression tag	UNP Q9UIQ6
A	154	GLY	-	expression tag	UNP Q9UIQ6
A	1026	ARG	-	expression tag	UNP Q9UIQ6
A	1027	THR	-	expression tag	UNP Q9UIQ6
A	1028	GLU	-	expression tag	UNP Q9UIQ6
A	1029	THR	-	expression tag	UNP Q9UIQ6
A	1030	SER	-	expression tag	UNP Q9UIQ6
A	1031	GLN	-	expression tag	UNP Q9UIQ6
A	1032	VAL	-	expression tag	UNP Q9UIQ6
A	1033	ALA	-	expression tag	UNP Q9UIQ6
A	1034	PRO	-	expression tag	UNP Q9UIQ6
A	1035	ALA	-	expression tag	UNP Q9UIQ6
B	124	MET	-	initiating methionine	UNP Q9UIQ6
B	125	GLY	-	expression tag	UNP Q9UIQ6
B	126	ILE	-	expression tag	UNP Q9UIQ6
B	127	LEU	-	expression tag	UNP Q9UIQ6
B	128	PRO	-	expression tag	UNP Q9UIQ6
B	129	SER	-	expression tag	UNP Q9UIQ6
B	130	PRO	-	expression tag	UNP Q9UIQ6
B	131	GLY	-	expression tag	UNP Q9UIQ6
B	132	ASN	-	expression tag	UNP Q9UIQ6
B	133	PRO	-	expression tag	UNP Q9UIQ6
B	134	ALA	-	expression tag	UNP Q9UIQ6
B	135	LEU	-	expression tag	UNP Q9UIQ6
B	136	LEU	-	expression tag	UNP Q9UIQ6
B	137	SER	-	expression tag	UNP Q9UIQ6
B	138	LEU	-	expression tag	UNP Q9UIQ6
B	139	VAL	-	expression tag	UNP Q9UIQ6
B	140	SER	-	expression tag	UNP Q9UIQ6
B	141	LEU	-	expression tag	UNP Q9UIQ6
B	142	LEU	-	expression tag	UNP Q9UIQ6
B	143	SER	-	expression tag	UNP Q9UIQ6
B	144	VAL	-	expression tag	UNP Q9UIQ6
B	145	LEU	-	expression tag	UNP Q9UIQ6
B	146	LEU	-	expression tag	UNP Q9UIQ6
B	147	MET	-	expression tag	UNP Q9UIQ6
B	148	GLY	-	expression tag	UNP Q9UIQ6
B	149	CYS	-	expression tag	UNP Q9UIQ6

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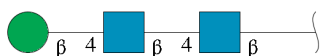
Chain	Residue	Modelled	Actual	Comment	Reference
B	150	VAL	-	expression tag	UNP Q9UIQ6
B	151	ALA	-	expression tag	UNP Q9UIQ6
B	152	GLU	-	expression tag	UNP Q9UIQ6
B	153	THR	-	expression tag	UNP Q9UIQ6
B	154	GLY	-	expression tag	UNP Q9UIQ6
B	1026	ARG	-	expression tag	UNP Q9UIQ6
B	1027	THR	-	expression tag	UNP Q9UIQ6
B	1028	GLU	-	expression tag	UNP Q9UIQ6
B	1029	THR	-	expression tag	UNP Q9UIQ6
B	1030	SER	-	expression tag	UNP Q9UIQ6
B	1031	GLN	-	expression tag	UNP Q9UIQ6
B	1032	VAL	-	expression tag	UNP Q9UIQ6
B	1033	ALA	-	expression tag	UNP Q9UIQ6
B	1034	PRO	-	expression tag	UNP Q9UIQ6
B	1035	ALA	-	expression tag	UNP Q9UIQ6

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



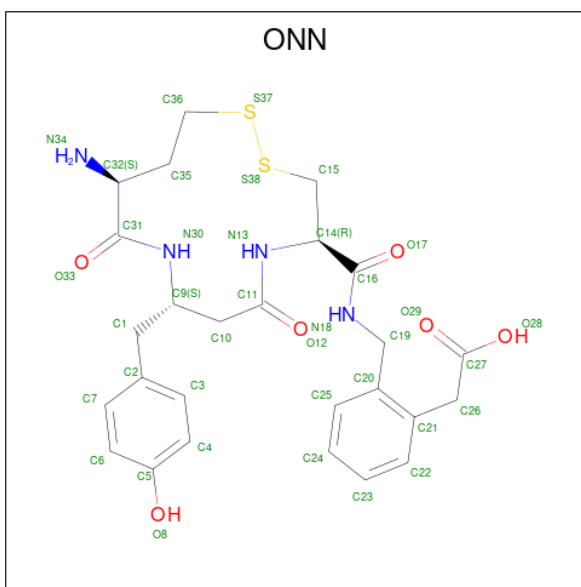
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
2	C	2	28	16	2	10	0	0	0
2	E	2	28	16	2	10	0	0	0
2	F	2	28	16	2	10	0	0	0
2	G	2	28	16	2	10	0	0	0
2	I	2	28	16	2	10	0	0	0

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



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	D	3	Total	C	N	O	0	0	0
			39	22	2	15			
3	H	3	Total	C	N	O	0	0	0
			39	22	2	15			

- Molecule 4 is 2-[2-[[[(4 {R},8 {S},11 {S})-11-azanyl-8-[(4-hydroxyphenyl)methyl]-6,10-bis(oxidanylidene)-1,2-dithia-5,9-diazacyclotridec-4-yl]carbonylamino]methyl]phenyl]ethanoic acid (three-letter code: ONN) (formula: C₂₆H₃₂N₄O₆S₂) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	N	O	S	0	1
			76	52	8	12	4		
4	B	1	Total	C	N	O	S	0	1
			76	52	8	12	4		

- Molecule 5 is ZINC ION (three-letter code: ZN) (formula: Zn).

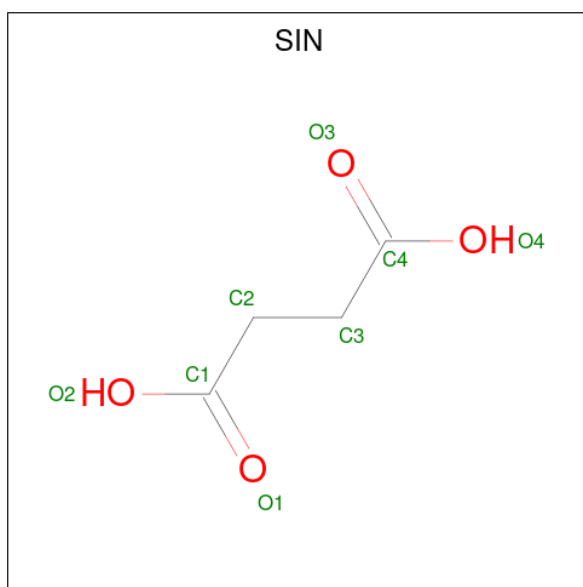
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	1	Total	Zn	0	0
			1	1		
5	B	1	Total	Zn	0	0
			1	1		

- Molecule 6 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: C₈H₁₅NO₆).



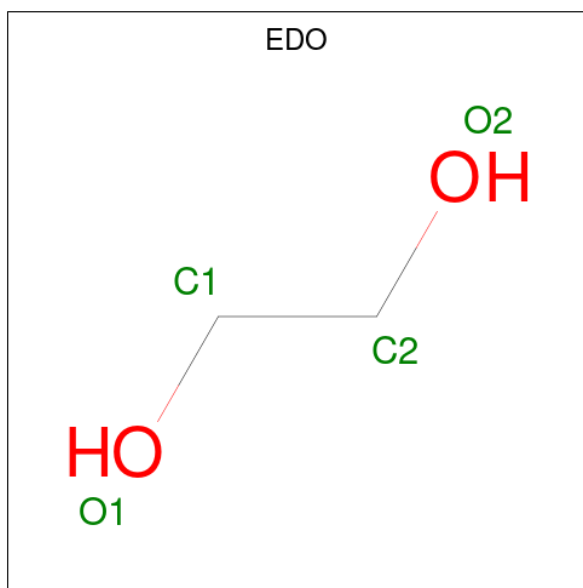
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
6	A	1	Total 14	8	1	5	0	0
6	A	1	Total 14	8	1	5	0	0
6	A	1	Total 14	8	1	5	0	0
6	A	1	Total 14	8	1	5	0	0
6	A	1	Total 14	8	1	5	0	0
6	B	1	Total 14	8	1	5	0	0
6	B	1	Total 14	8	1	5	0	0
6	B	1	Total 14	8	1	5	0	0
6	B	1	Total 14	8	1	5	0	0
6	B	1	Total 14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

- Molecule 7 is SUCCINIC ACID (three-letter code: SIN) (formula: C₄H₆O₄).



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

- Molecule 8 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C₂H₆O₂).



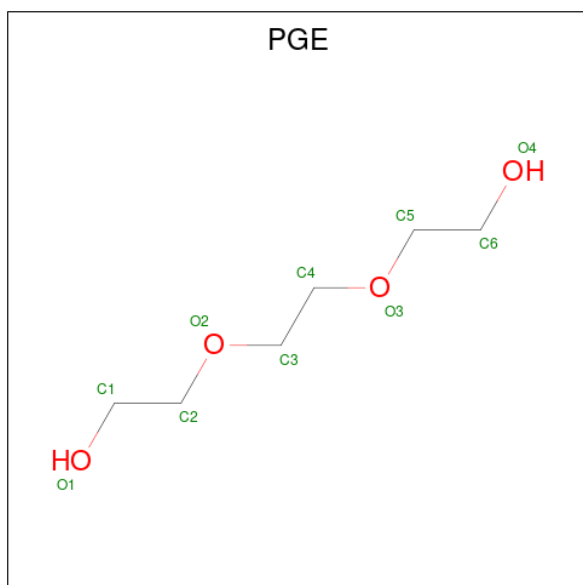
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
8	A	1	Total	C	O	0	0
			4	2	2		
8	A	1	Total	C	O	0	0
			4	2	2		
8	B	1	Total	C	O	0	0
			4	2	2		

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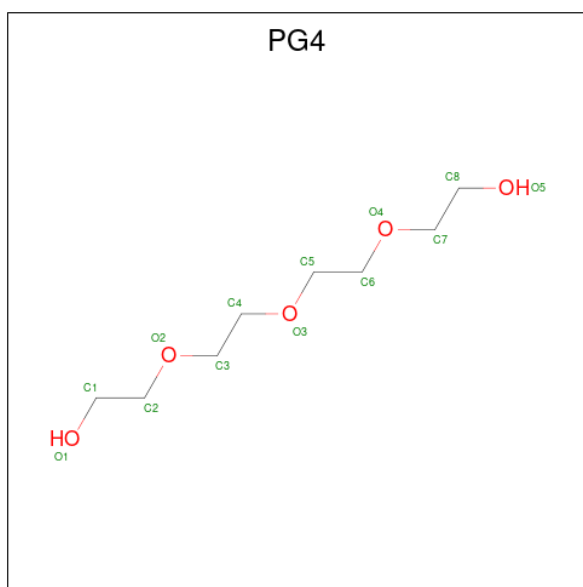
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
8	B	1	Total	C	O	0	0
			4	2	2		
8	B	1	Total	C	O	0	0
			4	2	2		

- Molecule 9 is TRIETHYLENE GLYCOL (three-letter code: PGE) (formula: $C_6H_{14}O_4$).



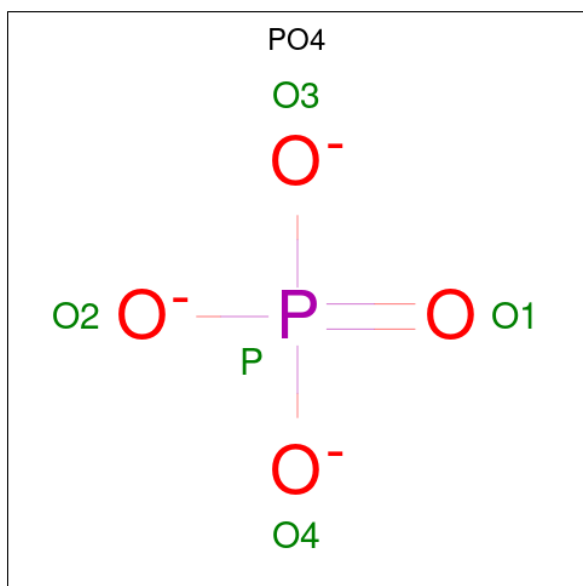
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
9	A	1	Total	C	O	0	0
			10	6	4		

- Molecule 10 is TETRAETHYLENE GLYCOL (three-letter code: PG4) (formula: $C_8H_{18}O_5$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
10	A	1	Total	C	O	0	0
			13	8	5		

- Molecule 11 is PHOSPHATE ION (three-letter code: PO4) (formula: O_4P).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
11	A	1	Total	O	P	0	0
			5	4	1		

- Molecule 12 is DI(HYDROXYETHYL)ETHER (three-letter code: PEG) (formula: $C_4H_{10}O_3$).



Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
12	B	1	Total	C O	0	0
			7	4 3		

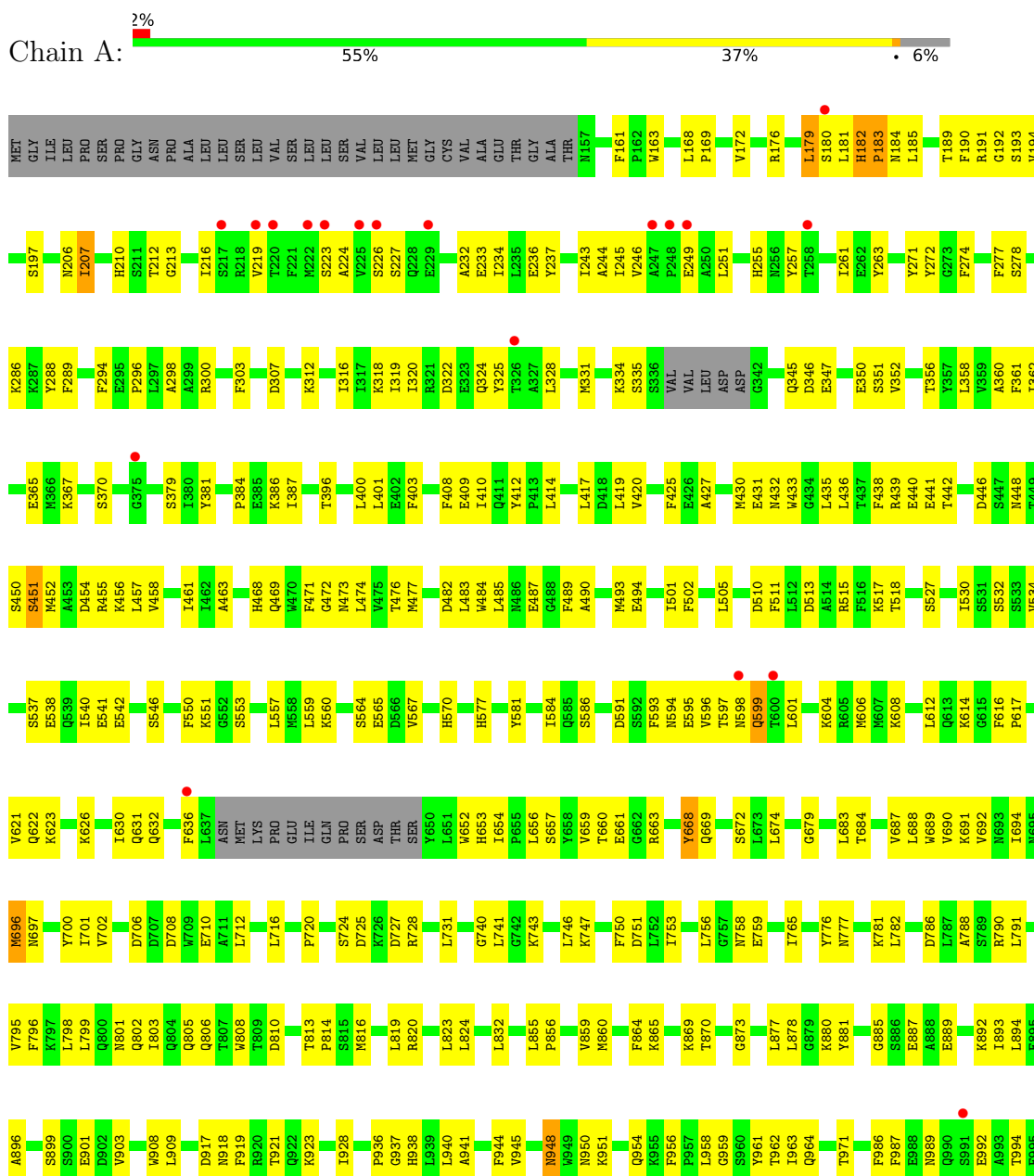
- Molecule 13 is water.

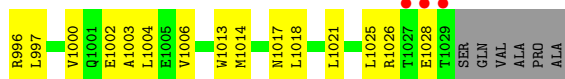
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
13	A	11	Total	O	0	0
			11	11		
13	B	17	Total	O	0	0
			17	17		

3 Residue-property plots

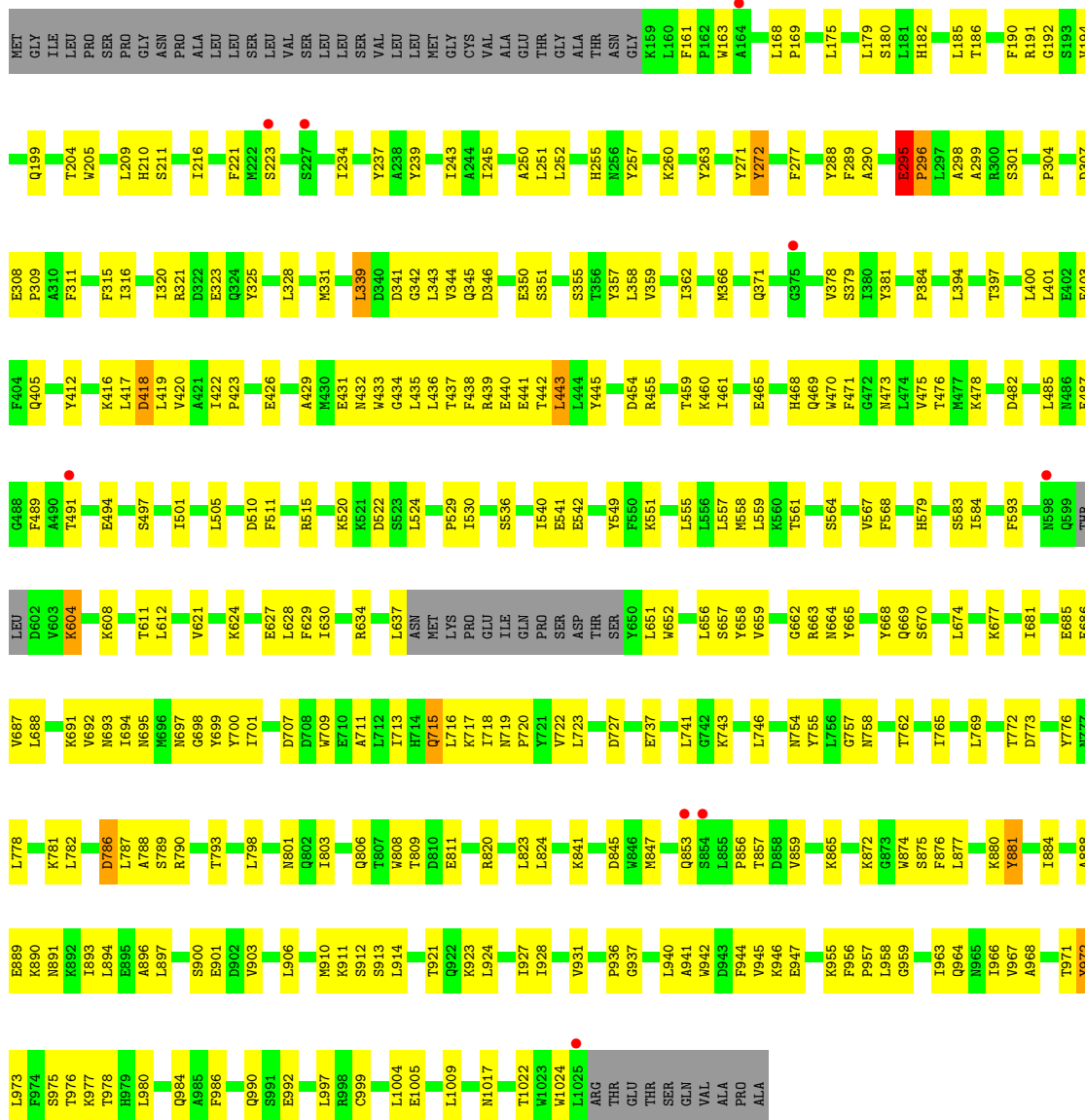
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density.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

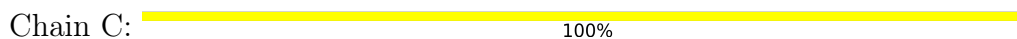




• Molecule 1: Leucyl-cystinyl aminopeptidase



• 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 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

- 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 I:  100%

MAG1
MAG2

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

Chain D:  67% 33%

MAG1
MAG2
BMA3

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

Chain H:  33% 67%

MAG1
MAG2
BMA3

4 Data and refinement statistics i

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	73.42Å 118.63Å 141.39Å 90.00° 102.77° 90.00°	Depositor
Resolution (Å)	45.96 – 3.20 45.96 – 3.01	Depositor EDS
% Data completeness (in resolution range)	81.7 (45.96-3.20) 69.8 (45.96-3.01)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.45 (at 3.01Å)	Xtrriage
Refinement program	PHENIX 1.17.1_3660	Depositor
R, R_{free}	0.277 , 0.314 0.271 , 0.306	Depositor DCC
R_{free} test set	1597 reflections (4.87%)	wwPDB-VP
Wilson B-factor (Å ²)	56.3	Xtrriage
Anisotropy	0.116	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 31.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.45$, $\langle L^2 \rangle = 0.27$	Xtrriage
Estimated twinning fraction	0.028 for h,-k,-h-l	Xtrriage
F_o, F_c correlation	0.83	EDS
Total number of atoms	14298	wwPDB-VP
Average B, all atoms (Å ²)	38.0	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 25.17 % 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 3.3379e-03. 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: BMA, EDO, PG4, ZN, ONN, SIN, PEG, NAG, PO4, PGE

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	0.40	0/7047	0.69	5/9566 (0.1%)
1	B	0.40	1/6994 (0.0%)	0.70	3/9498 (0.0%)
All	All	0.40	1/14041 (0.0%)	0.70	8/19064 (0.0%)

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	B	0	1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	881	TYR	CD1-CE1	-5.92	1.30	1.39

The worst 5 of 8 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	295	GLU	C-N-CD	-9.98	98.65	120.60
1	A	408	PHE	CB-CG-CD2	-7.16	115.79	120.80
1	A	408	PHE	CB-CG-CD1	6.53	125.37	120.80
1	B	400	LEU	CB-CG-CD2	-6.10	100.63	111.00
1	A	207	ILE	CG1-CB-CG2	-6.05	98.10	111.40

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	295	GLU	Peptide

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	6868	0	6703	261	0
1	B	6827	0	6664	240	0
2	C	28	0	25	1	0
2	E	28	0	25	3	0
2	F	28	0	25	1	0
2	G	28	0	25	0	0
2	I	28	0	25	0	0
3	D	39	0	34	2	0
3	H	39	0	34	3	0
4	A	76	0	0	3	0
4	B	76	0	0	3	0
5	A	1	0	0	0	0
5	B	1	0	0	0	0
6	A	70	0	64	6	0
6	B	70	0	65	0	0
7	A	8	0	4	0	0
8	A	8	0	12	1	0
8	B	12	0	18	0	0
9	A	10	0	14	0	0
10	A	13	0	18	0	0
11	A	5	0	0	0	0
12	B	7	0	10	1	0
13	A	11	0	0	0	0
13	B	17	0	0	1	0
All	All	14298	0	13765	517	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 18.

The worst 5 of 517 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:B:168:LEU:HD13	1:B:210:HIS:CE1	1.81	1.15
1:B:695:ASN:N	1:B:727:ASP:OD1	1.83	1.11
1:A:482:ASP:HB3	1:A:485:LEU:HD12	1.37	1.07
1:A:207:ILE:HG22	1:A:245:ILE:HB	1.47	0.97
1:B:717:LYS:HE2	1:B:754:ASN:HB2	1.47	0.96

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	854/912 (94%)	811 (95%)	36 (4%)	7 (1%)	19	58
1	B	847/912 (93%)	813 (96%)	30 (4%)	4 (0%)	29	67
All	All	1701/1824 (93%)	1624 (96%)	66 (4%)	11 (1%)	25	64

5 of 11 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	296	PRO
1	B	664	ASN
1	A	697	ASN
1	A	425	PHE
1	A	918	ASN

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	742/813 (91%)	722 (97%)	20 (3%)	44	75
1	B	738/813 (91%)	714 (97%)	24 (3%)	38	71
All	All	1480/1626 (91%)	1436 (97%)	44 (3%)	41	73

5 of 44 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	489	PHE
1	B	755	TYR
1	B	510	ASP
1	B	604	LYS
1	B	789	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 6 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	777	ASN
1	B	891	ASN
1	B	990	GLN
1	A	948	ASN
1	A	733	ASN

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](#)

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	0.34	0	17,19,21	0.61	0
2	NAG	C	2	2	14,14,15	2.16	2 (14%)	17,19,21	1.74	3 (17%)
3	NAG	D	1	1,3	14,14,15	1.07	1 (7%)	17,19,21	1.64	3 (17%)
3	NAG	D	2	3	14,14,15	0.16	0	17,19,21	0.62	0
3	BMA	D	3	3	11,11,12	1.17	2 (18%)	15,15,17	1.08	1 (6%)
2	NAG	E	1	1,2	14,14,15	1.83	2 (14%)	17,19,21	1.33	2 (11%)
2	NAG	E	2	2	14,14,15	0.84	2 (14%)	17,19,21	1.00	1 (5%)
2	NAG	F	1	1,2	14,14,15	0.38	0	17,19,21	0.93	1 (5%)
2	NAG	F	2	2	14,14,15	0.91	1 (7%)	17,19,21	0.80	0
2	NAG	G	1	1,2	14,14,15	0.94	2 (14%)	17,19,21	1.18	1 (5%)
2	NAG	G	2	2	14,14,15	0.94	1 (7%)	17,19,21	0.40	0
3	NAG	H	1	1,3	14,14,15	1.25	1 (7%)	17,19,21	1.90	4 (23%)
3	NAG	H	2	3	14,14,15	0.68	1 (7%)	17,19,21	1.19	1 (5%)
3	BMA	H	3	3	11,11,12	0.91	1 (9%)	15,15,17	1.66	5 (33%)
2	NAG	I	1	1,2	14,14,15	1.26	1 (7%)	17,19,21	2.19	5 (29%)
2	NAG	I	2	2	14,14,15	1.17	1 (7%)	17,19,21	2.65	2 (11%)

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	-	3/6/23/26	0/1/1/1
3	NAG	D	1	1,3	-	3/6/23/26	0/1/1/1
3	NAG	D	2	3	-	3/6/23/26	0/1/1/1
3	BMA	D	3	3	-	2/2/19/22	0/1/1/1
2	NAG	E	1	1,2	-	3/6/23/26	0/1/1/1
2	NAG	E	2	2	-	2/6/23/26	0/1/1/1
2	NAG	F	1	1,2	-	1/6/23/26	0/1/1/1
2	NAG	F	2	2	-	0/6/23/26	0/1/1/1
2	NAG	G	1	1,2	-	1/6/23/26	0/1/1/1
2	NAG	G	2	2	-	2/6/23/26	0/1/1/1
3	NAG	H	1	1,3	-	0/6/23/26	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	NAG	H	2	3	-	2/6/23/26	0/1/1/1
3	BMA	H	3	3	-	1/2/19/22	0/1/1/1
2	NAG	I	1	1,2	-	3/6/23/26	0/1/1/1
2	NAG	I	2	2	-	4/6/23/26	0/1/1/1

The worst 5 of 18 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	2	NAG	O5-C1	7.61	1.55	1.43
2	E	1	NAG	O5-C1	5.81	1.53	1.43
3	H	1	NAG	O5-C1	-4.31	1.36	1.43
2	I	2	NAG	O5-C1	4.00	1.50	1.43
2	E	1	NAG	C1-C2	3.46	1.57	1.52

The worst 5 of 29 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	I	2	NAG	C2-N2-C7	9.50	136.43	122.90
2	I	1	NAG	C2-N2-C7	5.68	130.99	122.90
3	H	1	NAG	O4-C4-C5	-5.40	95.89	109.30
3	D	1	NAG	C2-N2-C7	4.70	129.60	122.90
2	C	2	NAG	C2-N2-C7	4.34	129.09	122.90

There are no chirality outliers.

5 of 30 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	F	1	NAG	C3-C2-N2-C7
2	I	2	NAG	C8-C7-N2-C2
2	I	2	NAG	O7-C7-N2-C2
2	I	2	NAG	C4-C5-C6-O6
2	I	1	NAG	O5-C5-C6-O6

There are no ring outliers.

8 monomers are involved in 10 short contacts:

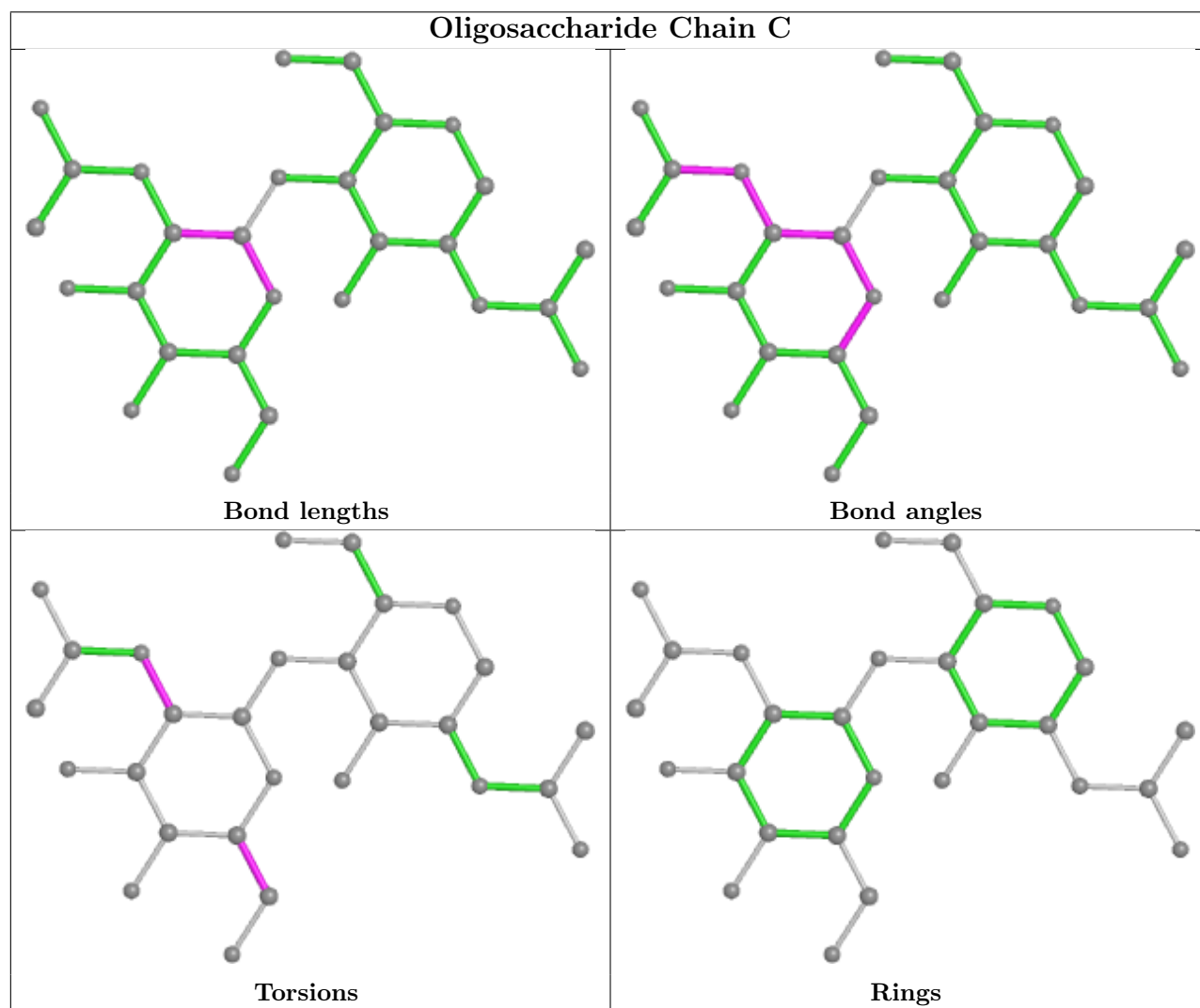
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	E	1	NAG	1	0
2	C	1	NAG	1	0
3	D	1	NAG	2	0

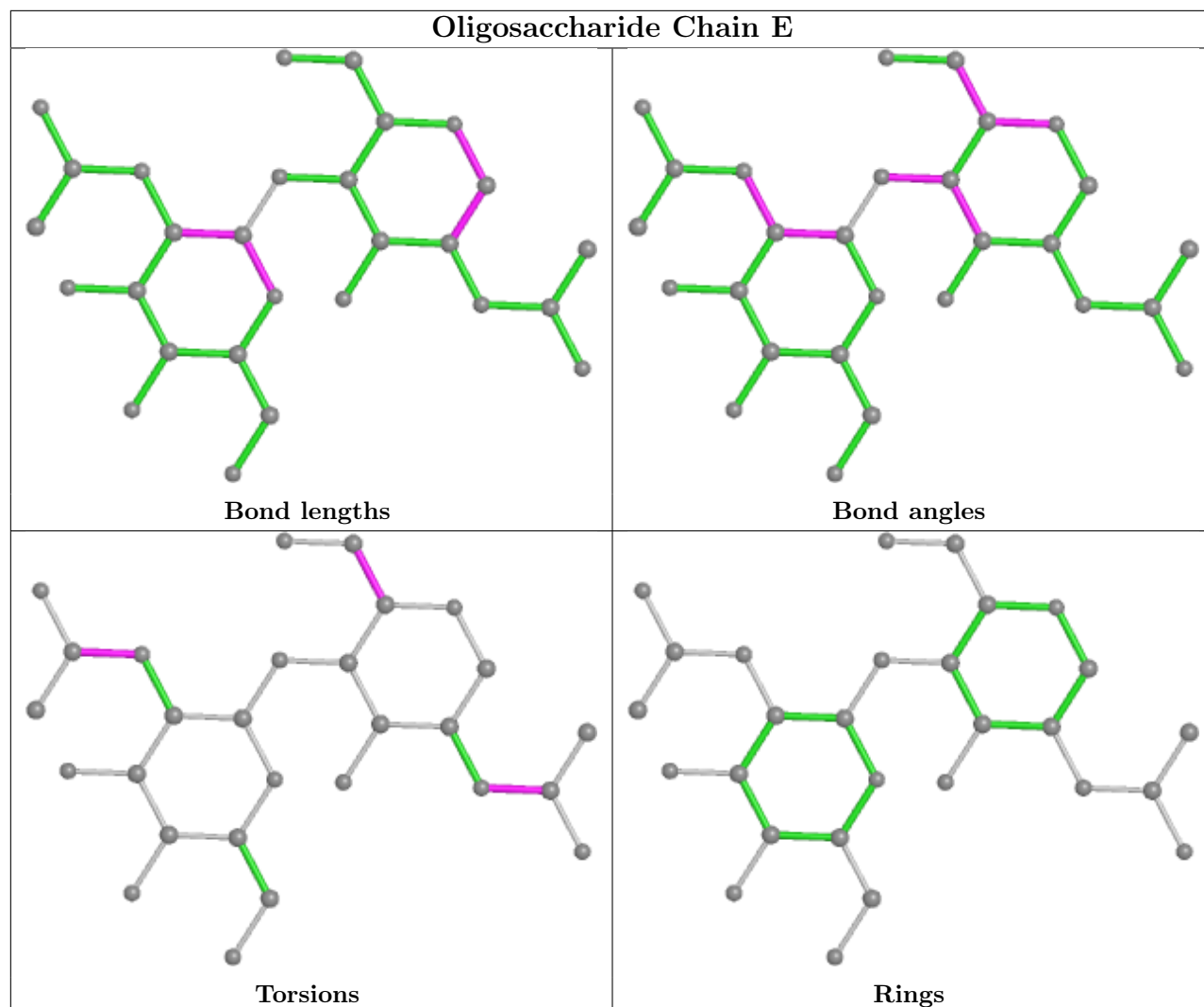
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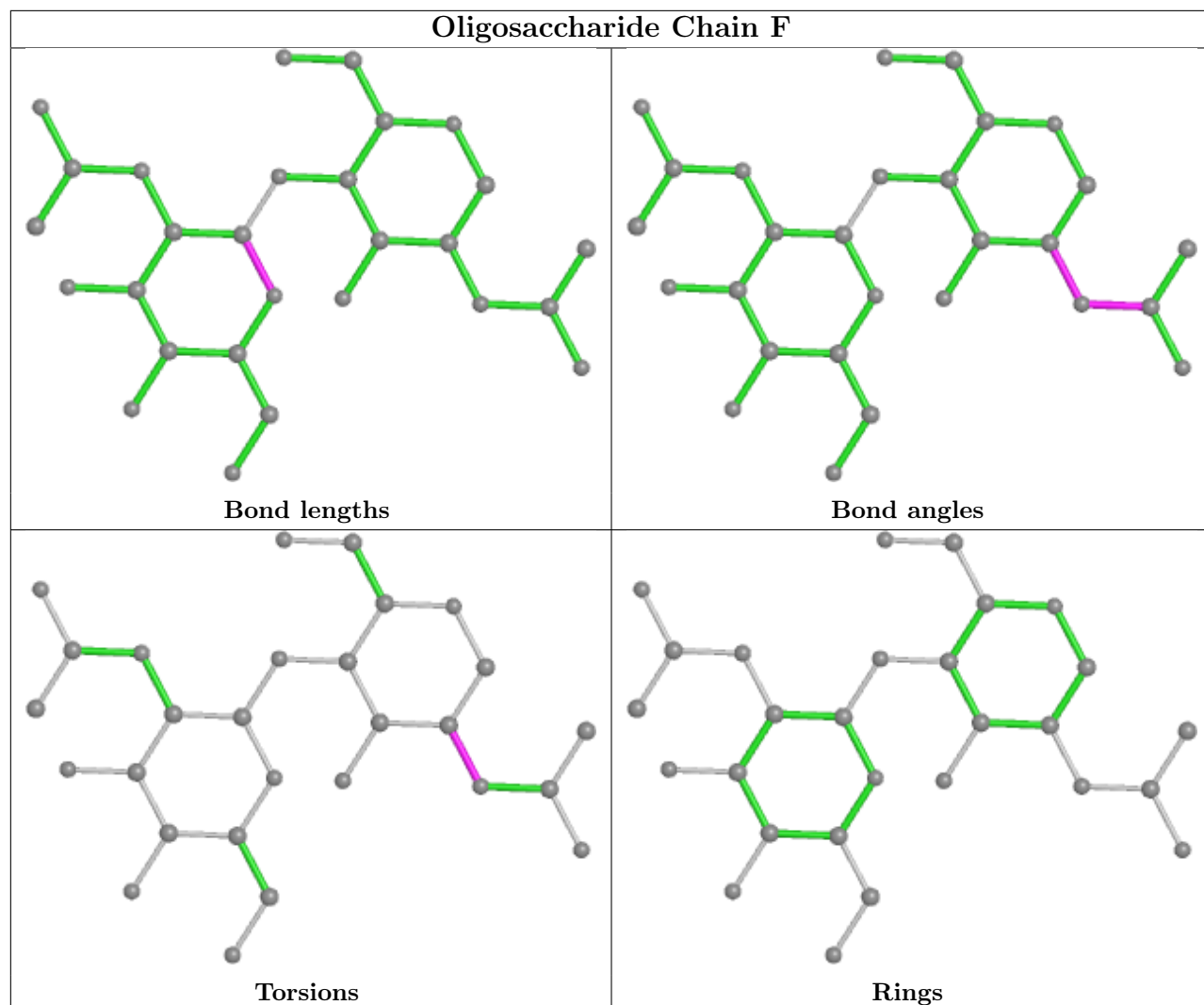
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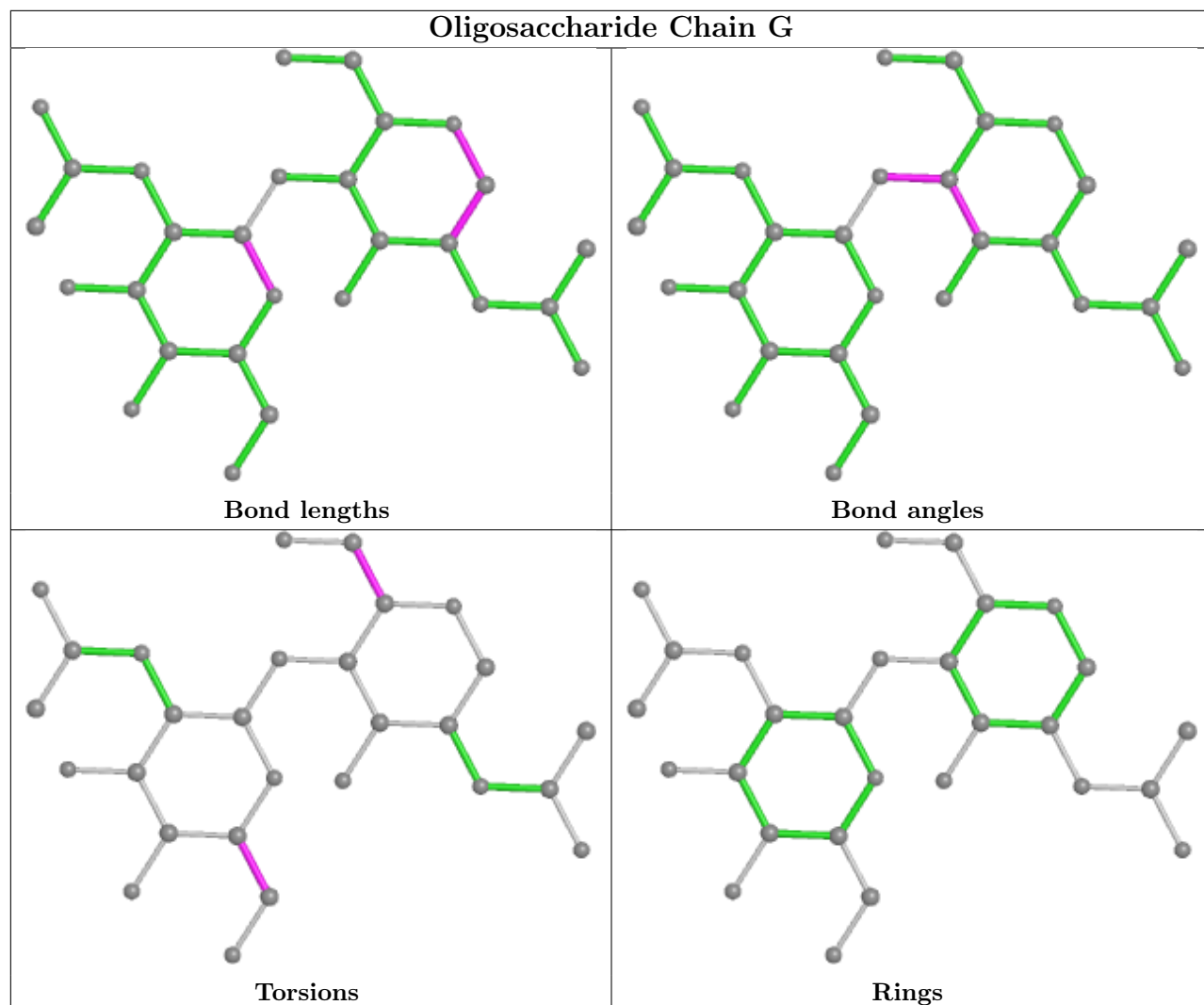
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	E	2	NAG	2	0
3	D	2	NAG	1	0
3	H	2	NAG	2	0
3	H	3	BMA	1	0
2	F	1	NAG	1	0

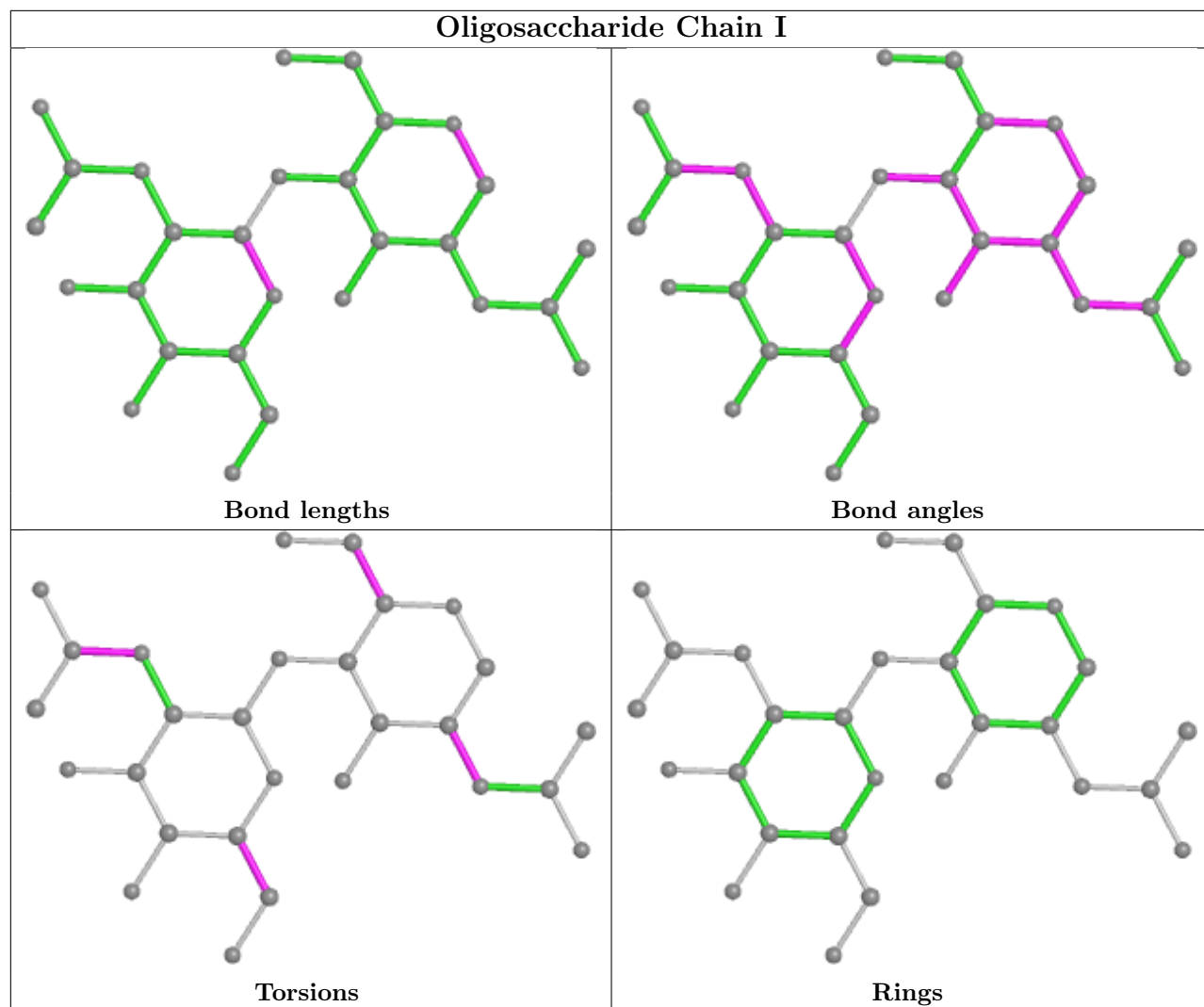
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.

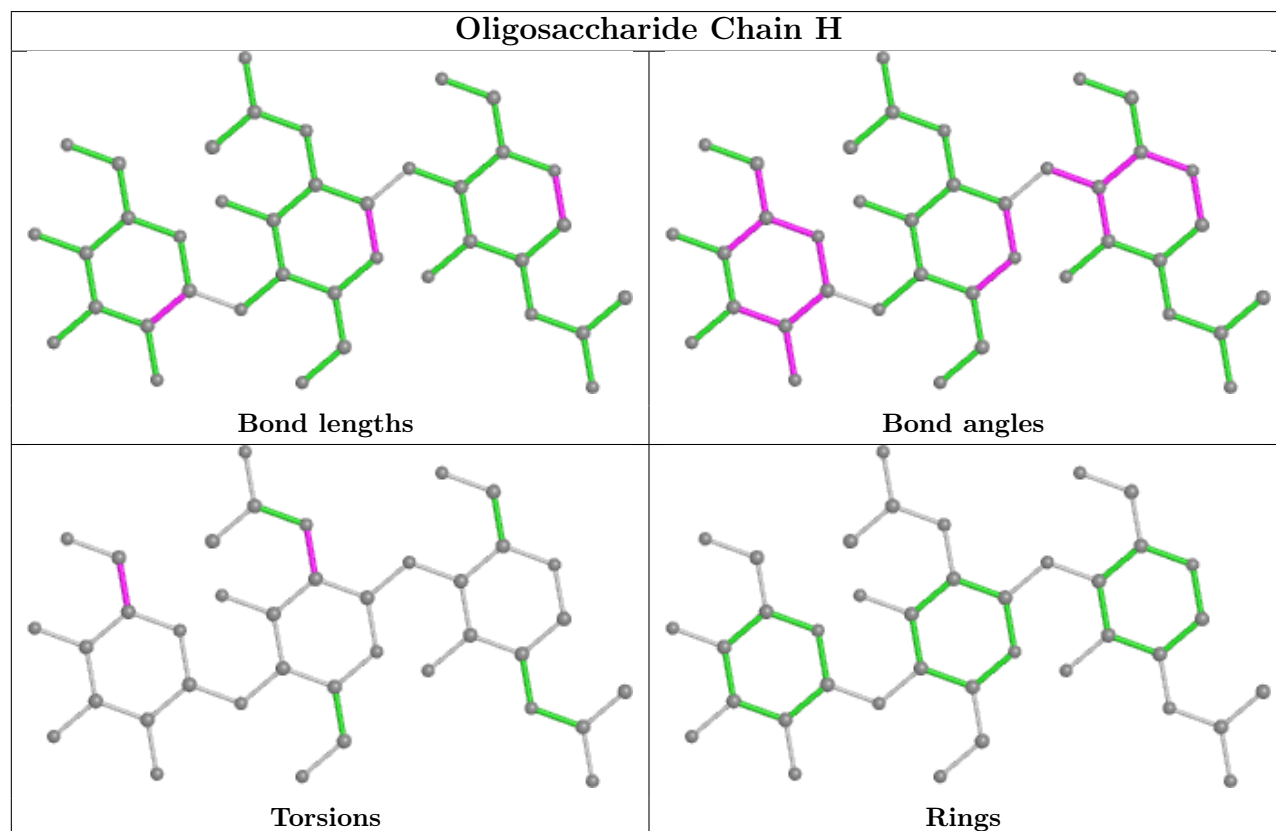
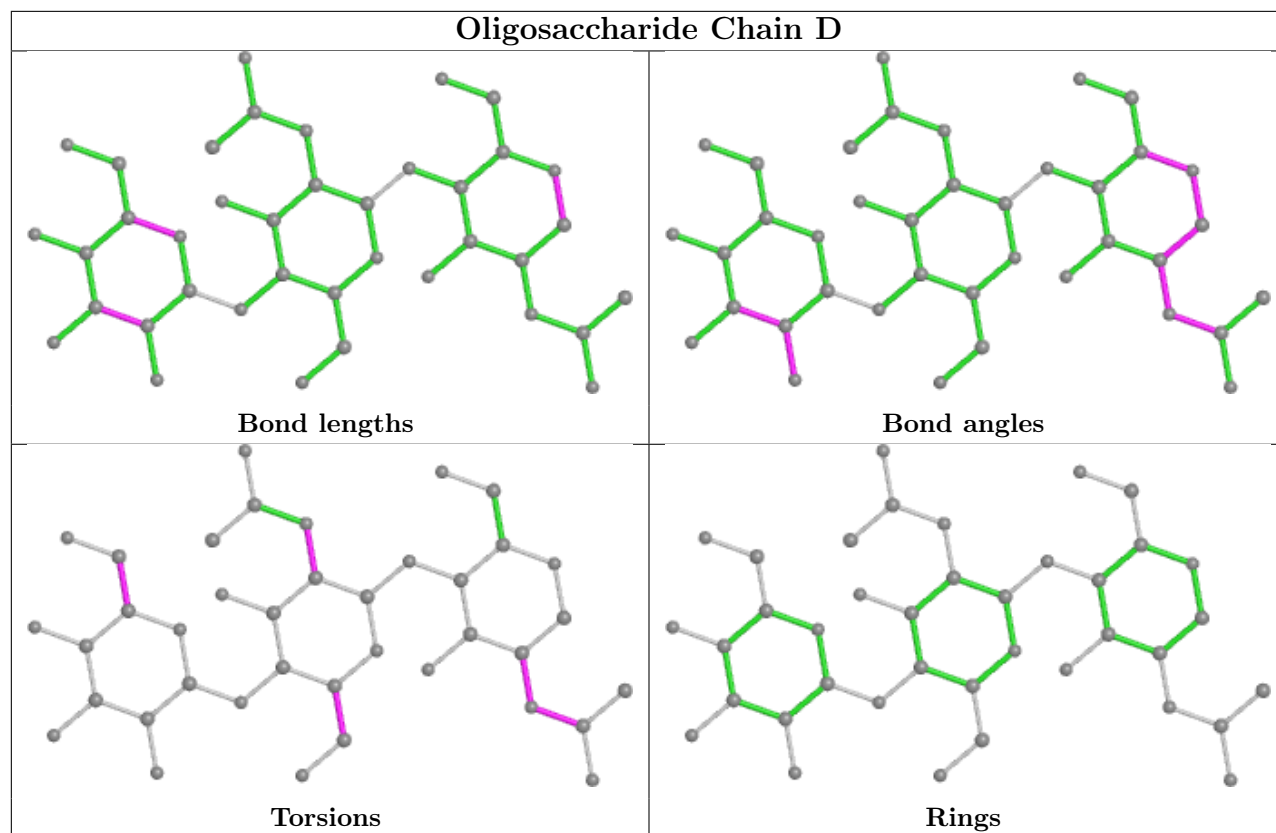












5.6 Ligand geometry [i](#)

Of 26 ligands modelled in this entry, 2 are monoatomic - leaving 24 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	NAG	A	1105	1	14,14,15	0.90	1 (7%)	17,19,21	0.67	0
6	NAG	A	1115	1	14,14,15	1.66	2 (14%)	17,19,21	1.14	2 (11%)
4	ONN	A	1101[B]	5	40,40,40	2.85	12 (30%)	52,53,53	1.97	11 (21%)
4	ONN	A	1101[A]	5	40,40,40	2.88	12 (30%)	52,53,53	1.78	13 (25%)
11	PO4	A	1122	-	4,4,4	0.87	0	6,6,6	0.61	0
12	PEG	B	1118	-	6,6,6	0.48	0	5,5,5	0.38	0
6	NAG	A	1112	1	14,14,15	1.86	2 (14%)	17,19,21	1.31	2 (11%)
7	SIN	A	1117	-	7,7,7	1.06	0	8,8,8	1.79	4 (50%)
6	NAG	B	1105	1	14,14,15	0.88	1 (7%)	17,19,21	1.30	2 (11%)
6	NAG	B	1114	1	14,14,15	0.28	0	17,19,21	1.32	2 (11%)
6	NAG	A	1116	1	14,14,15	1.95	2 (14%)	17,19,21	2.54	4 (23%)
6	NAG	B	1110	1	14,14,15	0.43	0	17,19,21	0.66	0
8	EDO	B	1116	-	3,3,3	0.46	0	2,2,2	0.35	0
8	EDO	A	1119	-	3,3,3	0.54	0	2,2,2	0.26	0
4	ONN	B	1101[A]	5	40,40,40	2.84	11 (27%)	52,53,53	1.70	11 (21%)
4	ONN	B	1101[B]	5	40,40,40	2.88	13 (32%)	52,53,53	1.85	9 (17%)
6	NAG	A	1106	1	14,14,15	0.74	0	17,19,21	1.26	2 (11%)
9	PGE	A	1120	-	9,9,9	0.55	0	8,8,8	0.60	0
8	EDO	B	1115	-	3,3,3	0.51	0	2,2,2	0.28	0
8	EDO	B	1117	-	3,3,3	0.51	0	2,2,2	0.22	0
6	NAG	B	1113	1	14,14,15	0.44	0	17,19,21	0.67	0
6	NAG	B	1106	1	14,14,15	1.55	1 (7%)	17,19,21	1.61	3 (17%)
10	PG4	A	1121	-	12,12,12	0.53	0	11,11,11	0.26	0
8	EDO	A	1118	-	3,3,3	0.39	0	2,2,2	0.70	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	NAG	A	1105	1	-	0/6/23/26	0/1/1/1
6	NAG	A	1115	1	-	4/6/23/26	0/1/1/1
4	ONN	A	1101[B]	5	-	15/41/41/41	0/2/3/3
4	ONN	A	1101[A]	5	-	19/41/41/41	0/2/3/3
12	PEG	B	1118	-	-	2/4/4/4	-
6	NAG	A	1112	1	-	3/6/23/26	0/1/1/1
7	SIN	A	1117	-	-	1/5/5/5	-
6	NAG	B	1105	1	-	0/6/23/26	0/1/1/1
6	NAG	B	1114	1	-	2/6/23/26	0/1/1/1
6	NAG	A	1116	1	-	1/6/23/26	0/1/1/1
6	NAG	B	1110	1	-	2/6/23/26	0/1/1/1
8	EDO	B	1116	-	-	0/1/1/1	-
8	EDO	A	1119	-	-	0/1/1/1	-
4	ONN	B	1101[A]	5	-	14/41/41/41	0/2/3/3
4	ONN	B	1101[B]	5	-	19/41/41/41	0/2/3/3
6	NAG	A	1106	1	-	3/6/23/26	0/1/1/1
9	PGE	A	1120	-	-	6/7/7/7	-
8	EDO	B	1115	-	-	0/1/1/1	-
8	EDO	B	1117	-	-	1/1/1/1	-
6	NAG	B	1113	1	-	3/6/23/26	0/1/1/1
6	NAG	B	1106	1	-	1/6/23/26	0/1/1/1
10	PG4	A	1121	-	-	8/10/10/10	-
8	EDO	A	1118	-	-	0/1/1/1	-

The worst 5 of 57 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	1101[B]	ONN	C7-C6	7.97	1.53	1.38
4	A	1101[B]	ONN	C7-C6	7.88	1.53	1.38
4	A	1101[A]	ONN	C7-C6	7.86	1.53	1.38
4	B	1101[A]	ONN	C7-C6	7.69	1.52	1.38
4	B	1101[A]	ONN	C4-C5	7.52	1.53	1.38

The worst 5 of 65 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	1101[B]	ONN	C10-C9-N30	-7.75	101.14	110.11
6	A	1116	NAG	C1-C2-N2	-6.83	98.82	110.49
4	A	1101[B]	ONN	C9-C10-C11	-6.60	103.14	112.44
4	B	1101[A]	ONN	C10-C9-N30	-6.60	102.47	110.11

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	1101[B]	ONN	C10-C9-N30	-5.92	103.25	110.11

There are no chirality outliers.

5 of 104 torsion outliers are listed below:

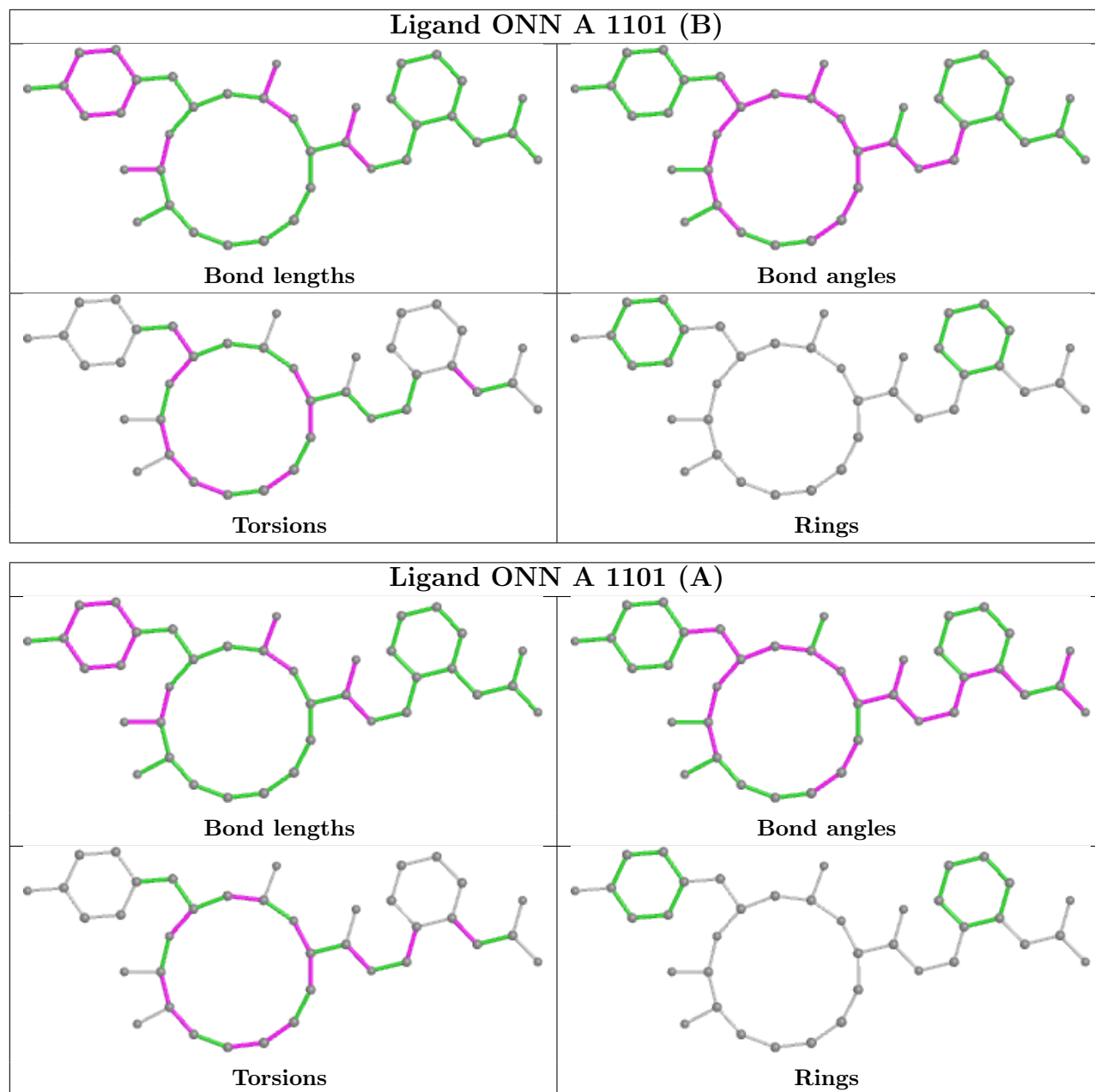
Mol	Chain	Res	Type	Atoms
4	A	1101[A]	ONN	C16-C14-C15-S38
4	A	1101[A]	ONN	N13-C14-C15-S38
4	A	1101[A]	ONN	C16-C14-N13-C11
4	A	1101[A]	ONN	N30-C31-C32-C35
4	A	1101[A]	ONN	O33-C31-C32-C35

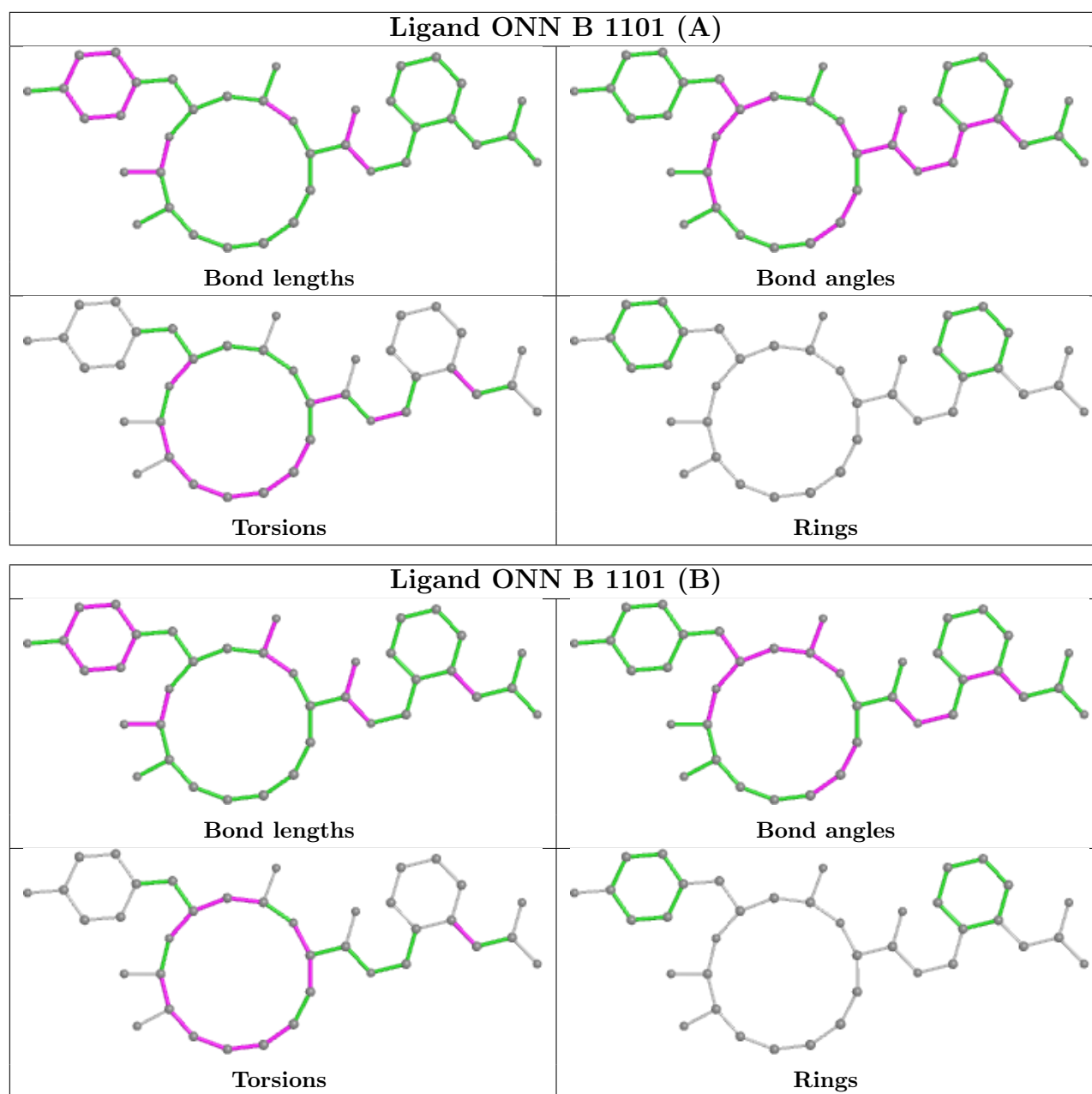
There are no ring outliers.

9 monomers are involved in 14 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	A	1115	NAG	1	0
4	A	1101[B]	ONN	3	0
12	B	1118	PEG	1	0
6	A	1112	NAG	2	0
6	A	1116	NAG	1	0
4	B	1101[A]	ONN	1	0
4	B	1101[B]	ONN	2	0
6	A	1106	NAG	2	0
8	A	1118	EDO	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 [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	856/912 (93%)	-0.11	22 (2%) 56 40	17, 38, 64, 103	0
1	B	853/912 (93%)	-0.11	9 (1%) 80 69	18, 34, 53, 90	0
All	All	1709/1824 (93%)	-0.11	31 (1%) 68 55	17, 36, 59, 103	0

The worst 5 of 31 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	223	SER	4.4
1	A	247	ALA	4.4
1	A	248	PRO	4.0
1	B	164	ALA	3.5
1	A	1029	THR	3.5

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.

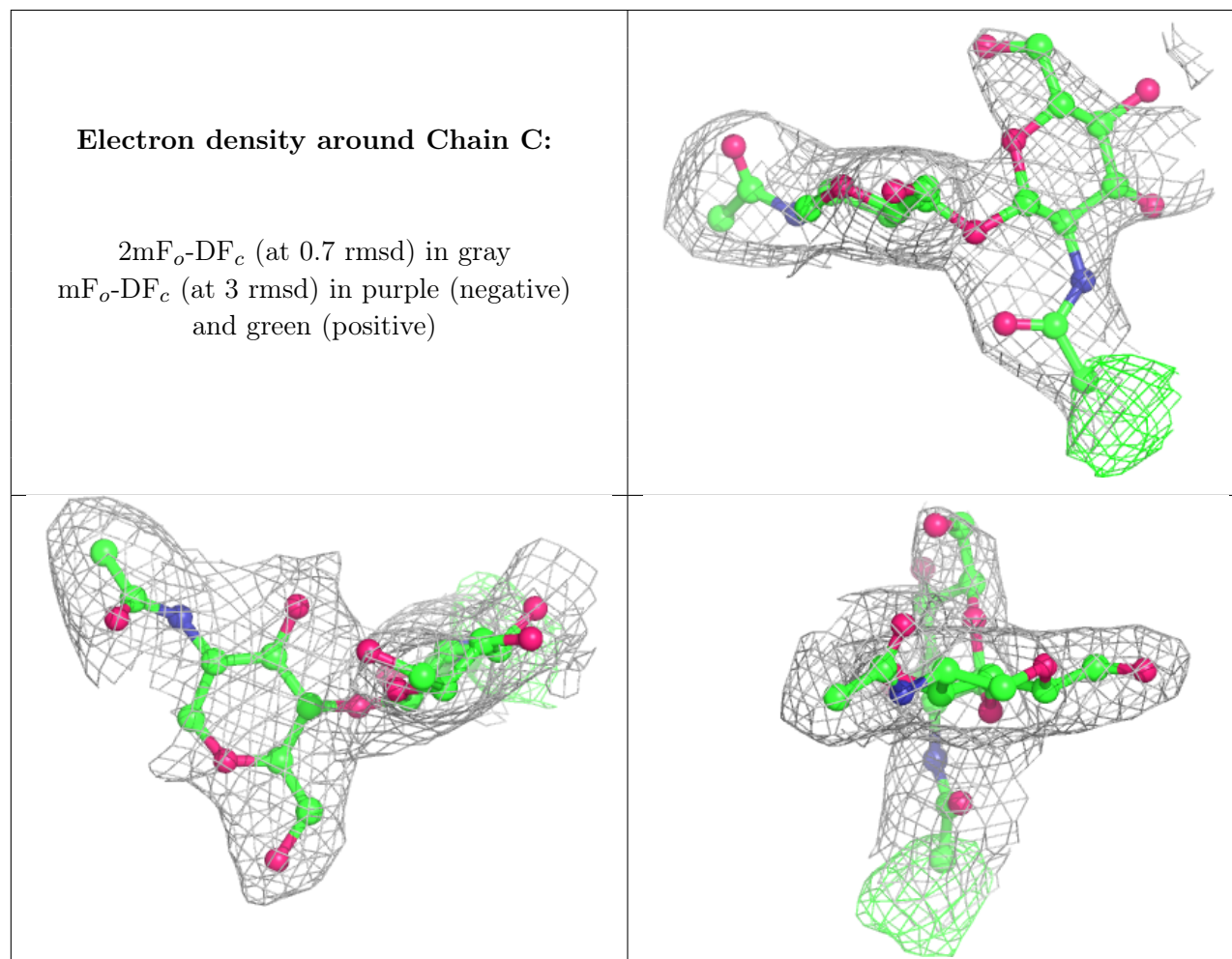
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	NAG	C	2	14/15	0.67	0.30	58,60,61,61	0
2	NAG	G	2	14/15	0.67	0.29	63,70,79,80	0
2	NAG	I	1	14/15	0.79	0.24	54,54,55,55	0
3	BMA	D	3	11/12	0.80	0.21	74,75,75,75	0
2	NAG	F	2	14/15	0.81	0.17	66,66,67,67	0

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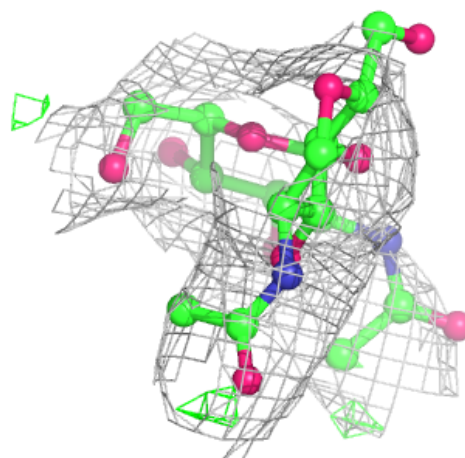
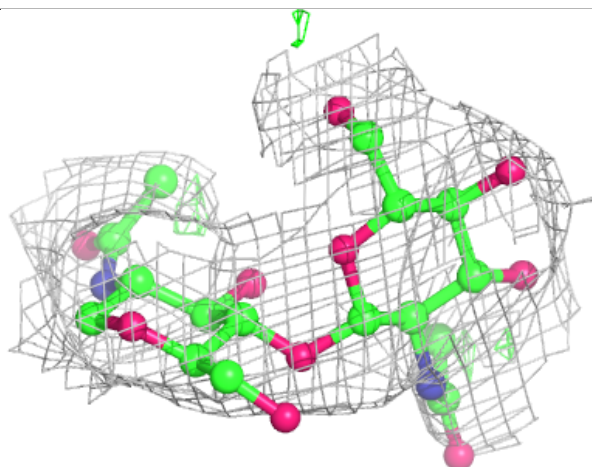
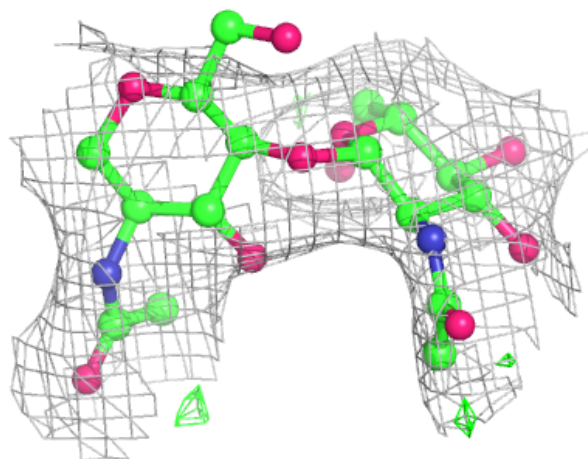
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
2	NAG	E	2	14/15	0.83	0.16	70,71,73,73	0
2	NAG	G	1	14/15	0.84	0.26	54,61,72,73	0
3	NAG	D	1	14/15	0.85	0.34	71,78,82,83	0
3	NAG	D	2	14/15	0.85	0.29	67,72,74,75	0
2	NAG	E	1	14/15	0.85	0.16	69,73,80,81	0
2	NAG	I	2	14/15	0.86	0.14	54,55,55,55	0
2	NAG	C	1	14/15	0.88	0.14	46,54,59,62	0
2	NAG	F	1	14/15	0.89	0.20	56,56,57,57	0
3	NAG	H	2	14/15	0.89	0.19	50,50,51,51	0
3	NAG	H	1	14/15	0.91	0.17	41,42,43,43	0
3	BMA	H	3	11/12	0.91	0.16	53,54,54,54	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.



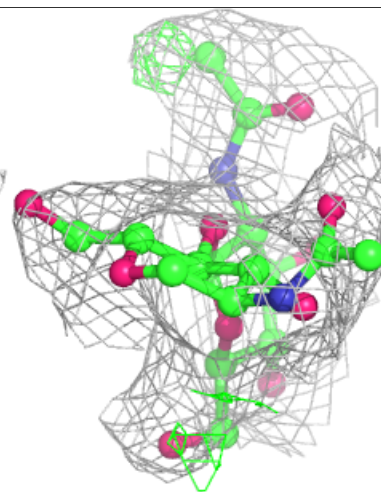
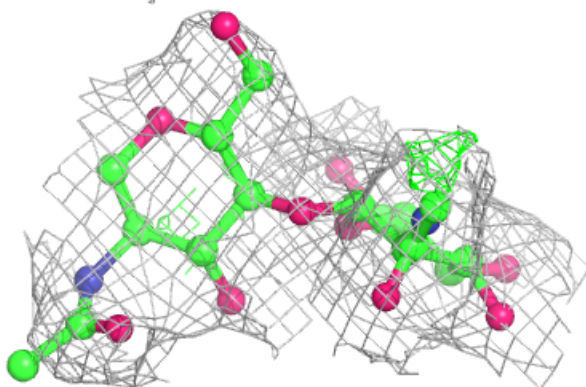
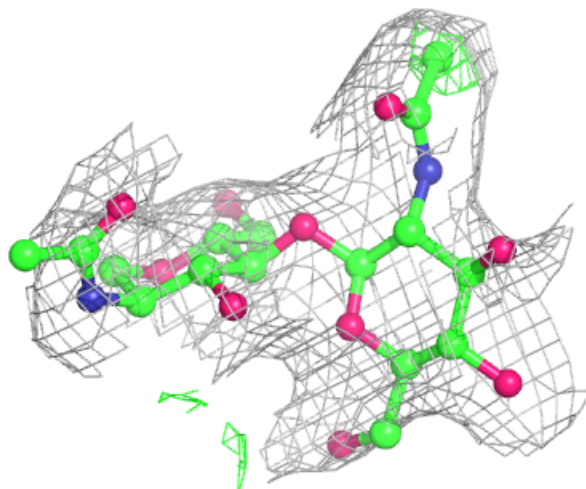
Electron density around Chain E:

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



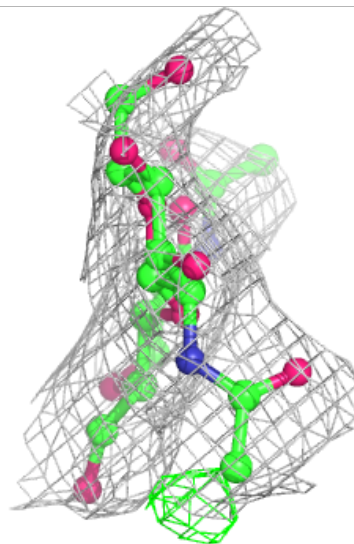
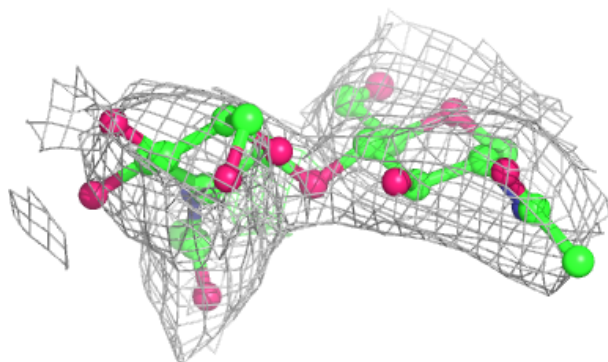
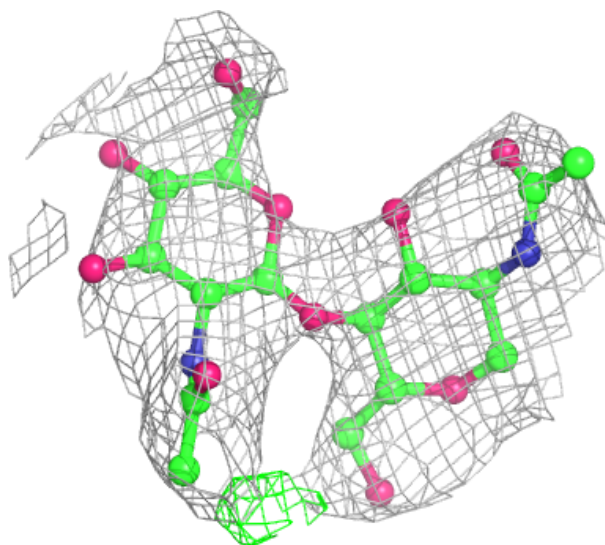
Electron density around Chain F:

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



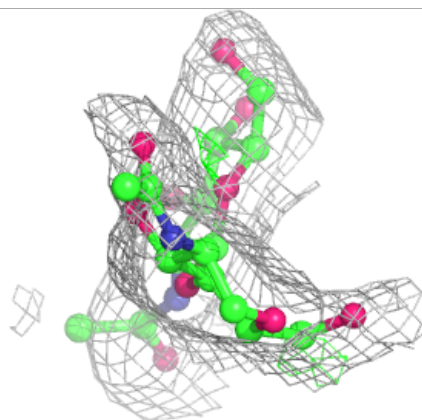
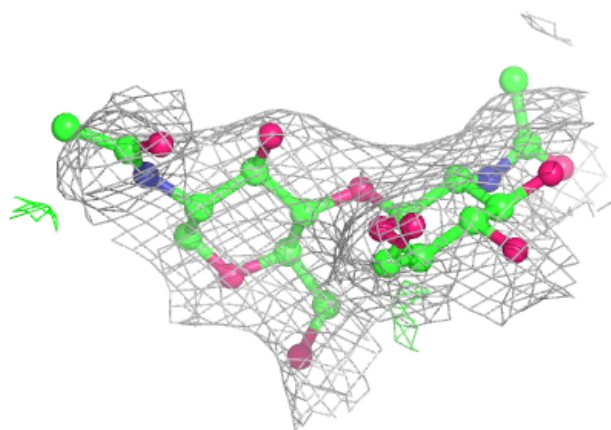
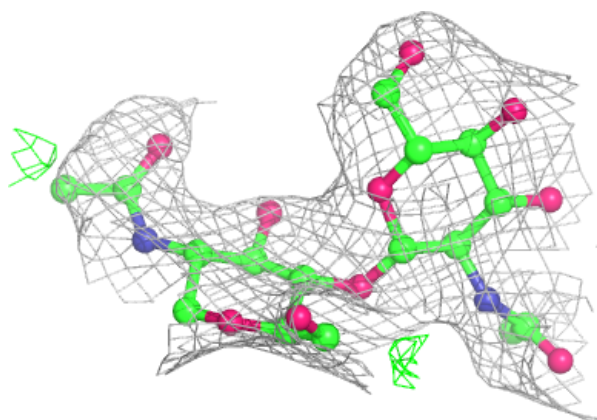
Electron density around Chain G:

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



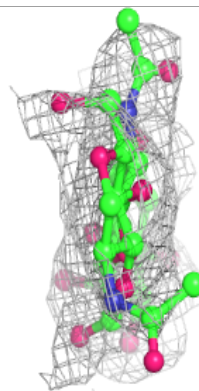
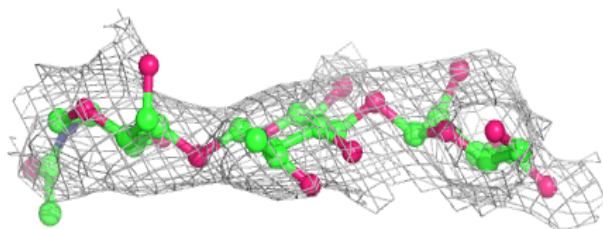
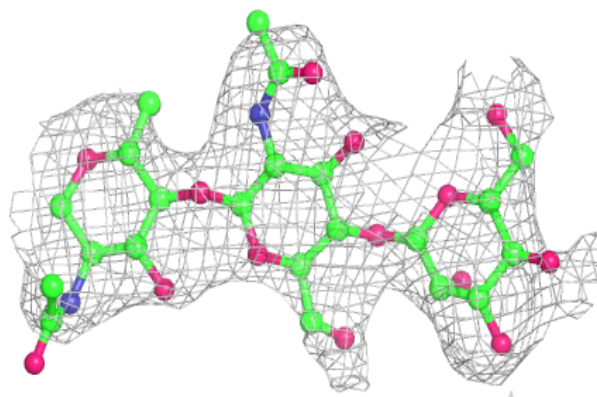
Electron density around Chain I:

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

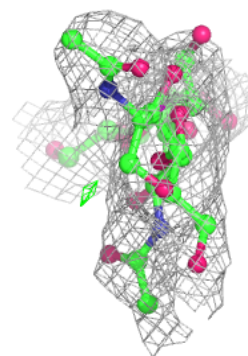
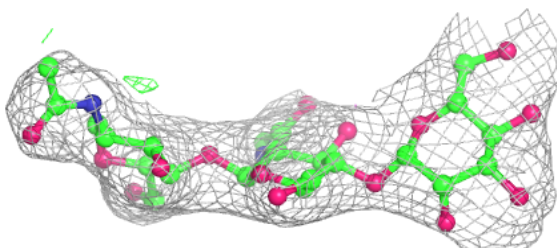
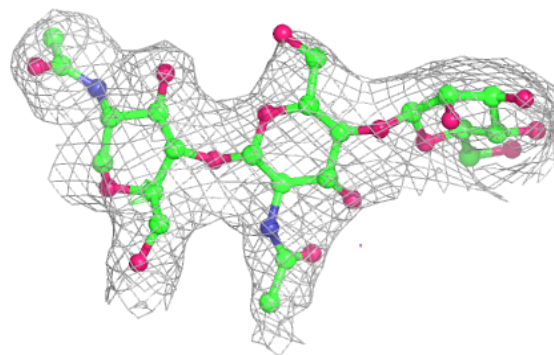


Electron density around Chain D:

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

**Electron density around Chain H:**

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



6.4 Ligands

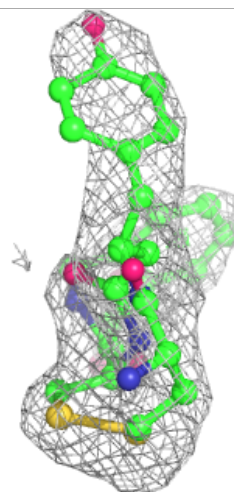
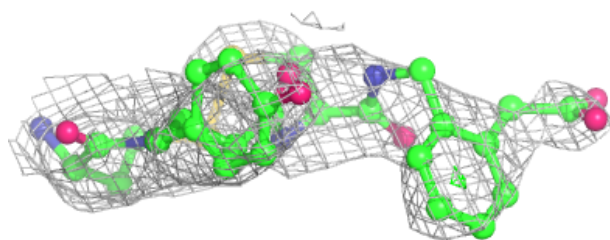
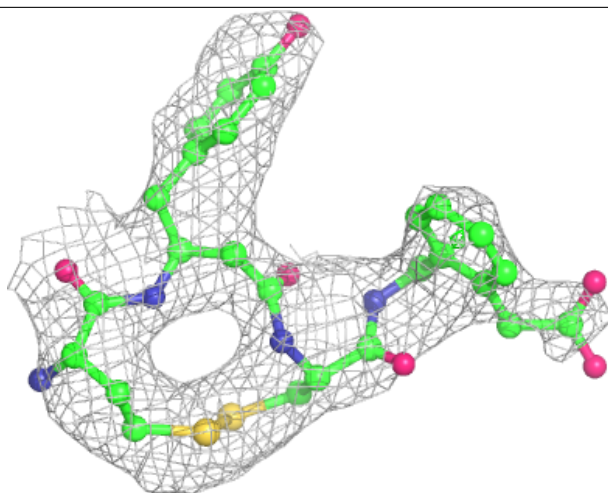
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
6	NAG	B	1110	14/15	0.68	0.30	58,59,59,59	0
6	NAG	A	1116	14/15	0.73	0.28	75,76,77,77	0
6	NAG	A	1112	14/15	0.74	0.32	50,54,58,64	0
6	NAG	B	1113	14/15	0.75	0.23	60,60,61,61	0
6	NAG	A	1115	14/15	0.78	0.35	57,57,57,57	0
6	NAG	B	1114	14/15	0.79	0.21	49,50,50,50	0
12	PEG	B	1118	7/7	0.81	0.15	56,56,56,56	0
6	NAG	A	1105	14/15	0.82	0.35	77,81,84,85	0
4	ONN	B	1101[A]	38/38	0.86	0.40	33,38,40,46	38
4	ONN	B	1101[B]	38/38	0.86	0.40	40,48,53,59	38
6	NAG	B	1105	14/15	0.87	0.19	52,57,65,66	0
9	PGE	A	1120	10/10	0.88	0.12	41,51,55,60	0
6	NAG	A	1106	14/15	0.88	0.26	55,66,69,69	0
6	NAG	B	1106	14/15	0.90	0.18	55,60,63,64	0
7	SIN	A	1117	8/8	0.90	0.17	38,42,45,48	0
8	EDO	B	1115	4/4	0.90	0.13	36,39,39,41	0
8	EDO	B	1117	4/4	0.90	0.30	24,28,31,33	0
4	ONN	A	1101[A]	38/38	0.90	0.34	33,39,43,48	38
10	PG4	A	1121	13/13	0.90	0.16	41,49,55,56	0
4	ONN	A	1101[B]	38/38	0.90	0.34	33,38,42,48	38
8	EDO	A	1118	4/4	0.92	0.17	35,38,38,40	0
8	EDO	A	1119	4/4	0.95	0.09	26,26,26,26	0
11	PO4	A	1122	5/5	0.95	0.30	59,59,59,59	0
8	EDO	B	1116	4/4	0.95	0.13	37,39,40,41	0
5	ZN	A	1102	1/1	0.98	0.15	49,49,49,49	0
5	ZN	B	1102	1/1	0.99	0.17	35,35,35,35	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.

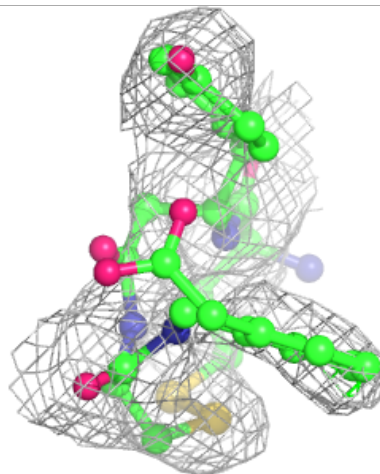
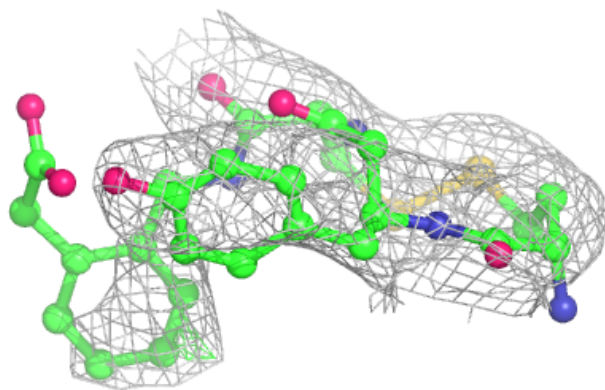
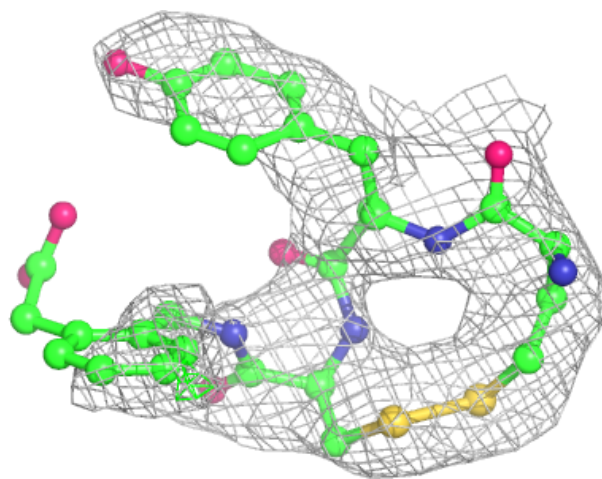
Electron density around ONN B 1101 (A):

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



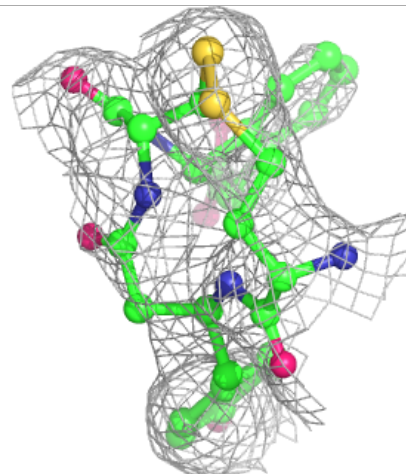
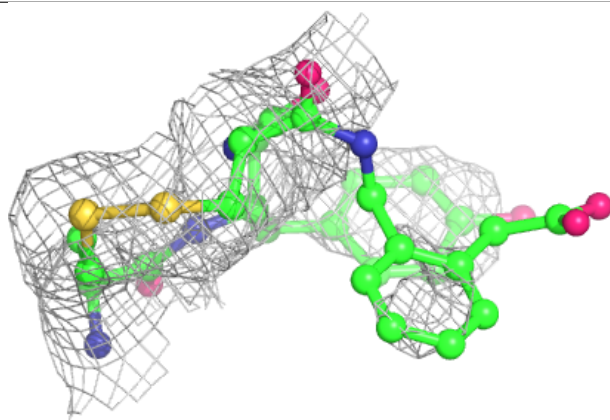
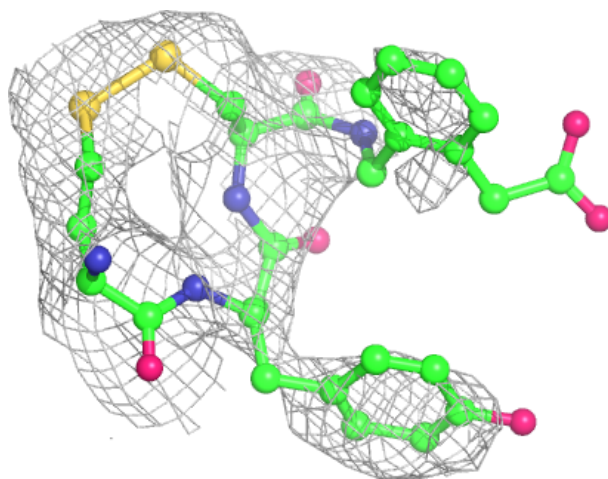
Electron density around ONN B 1101 (B):

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



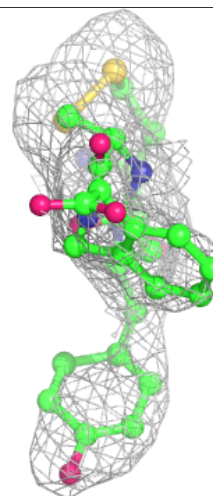
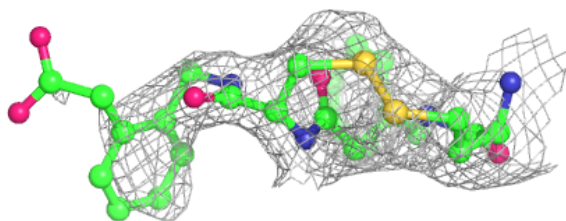
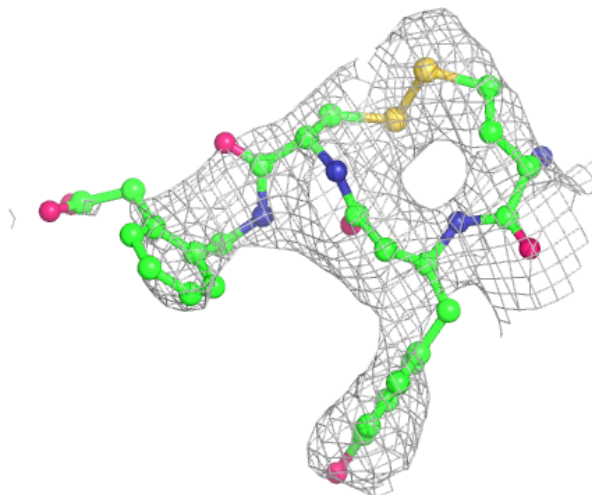
Electron density around ONN A 1101 (A):

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



Electron density around ONN A 1101 (B):

$2mF_o-DF_c$ (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.