W O R L D W I D E
wwPDB
P R O T E I N   D A T A   B A N K

wwPDB X-ray Structure Validation Summary Report (i)

Jan 13, 2024 – 03:45 pm GMT

PDB ID	:	6TT3
Title	:	Crystal structure of 'Res_S2 mutant human Angiotensin-1 converting enzyme N-domain in complex with SG6.
Authors	:	Cozier, G.E.; Acharya, K.R.
Deposited on	:	2019-12-23
Resolution	:	1.70 Å(reported)

The following versions of software and data (see references (i)) were used in the production of this report:

|		
MolProbity	:	4.02b-467
Mogul	:	1.8.4, 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 1.70 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.
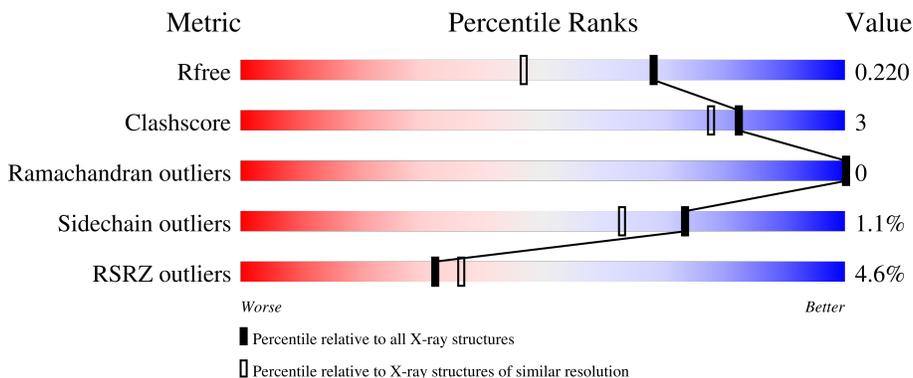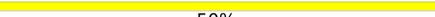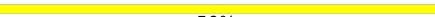

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	4298 (1.70-1.70)
Clashscore	141614	4695 (1.70-1.70)
Ramachandran outliers	138981	4610 (1.70-1.70)
Sidechain outliers	138945	4610 (1.70-1.70)
RSRZ outliers	127900	4222 (1.70-1.70)

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 <=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	629	92%
1	B	629	87% 8%
2	C	2	100%
2	F	2	50% 50%
3	D	4	100%

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Mol	Chain	Length	Quality of chain
4	E	2	50% 50%
4	G	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
12	EDO	B	713	-	-	X	-

2 Entry composition ⓘ

There are 16 unique types of molecules in this entry. The entry contains 21134 atoms, of which 9908 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 Angiotensin-converting enzyme.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	603	Total 9784	C 3212	H 4783	N 855	O 913	S 21	0	11	0
1	B	603	Total 9708	C 3189	H 4746	N 850	O 903	S 20	0	5	0

There are 34 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	9	GLN	ASN	conflict	UNP P12821
A	25	GLN	ASN	conflict	UNP P12821
A	82	GLN	ASN	conflict	UNP P12821
A	117	GLN	ASN	conflict	UNP P12821
A	131	GLN	ASN	conflict	UNP P12821
A	260	THR	SER	conflict	UNP P12821
A	262	SER	GLU	conflict	UNP P12821
A	289	GLN	ASN	conflict	UNP P12821
A	354	GLU	ASP	conflict	UNP P12821
A	357	VAL	SER	conflict	UNP P12821
A	358	VAL	THR	conflict	UNP P12821
A	369	PHE	TYR	conflict	UNP P12821
A	381	GLU	ARG	conflict	UNP P12821
A	431	ASP	GLU	conflict	UNP P12821
A	545	ARG	GLN	conflict	UNP P12821
A	576	LEU	PRO	conflict	UNP P12821
A	629	LEU	-	expression tag	UNP P12821
B	9	GLN	ASN	conflict	UNP P12821
B	25	GLN	ASN	conflict	UNP P12821
B	82	GLN	ASN	conflict	UNP P12821
B	117	GLN	ASN	conflict	UNP P12821
B	131	GLN	ASN	conflict	UNP P12821
B	260	THR	SER	conflict	UNP P12821
B	262	SER	GLU	conflict	UNP P12821
B	289	GLN	ASN	conflict	UNP P12821

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Chain	Residue	Modelled	Actual	Comment	Reference
B	354	GLU	ASP	conflict	UNP P12821
B	357	VAL	SER	conflict	UNP P12821
B	358	VAL	THR	conflict	UNP P12821
B	369	PHE	TYR	conflict	UNP P12821
B	381	GLU	ARG	conflict	UNP P12821
B	431	ASP	GLU	conflict	UNP P12821
B	545	ARG	GLN	conflict	UNP P12821
B	576	LEU	PRO	conflict	UNP P12821
B	629	LEU	-	expression tag	UNP P12821

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	C	2	Total	C	H	N	O	0	0	0
			53	16	25	2	10			
2	F	2	Total	C	H	N	O	0	0	0
			53	16	25	2	10			

- Molecule 3 is an oligosaccharide called beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-b eta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopy ranose.
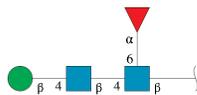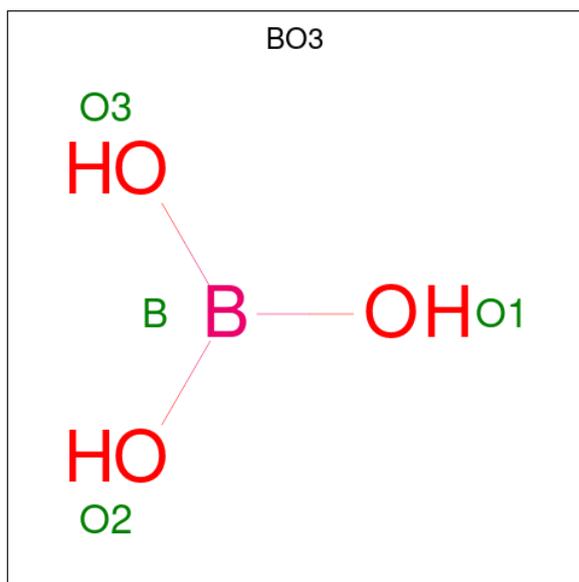

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	D	4	Total	C	H	N	O	0	0	0
			92	28	43	2	19			

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

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
4	E	2	Total 46	C 14	H 22	N O 1 9	0	0	0
4	G	2	Total 46	C 14	H 22	N O 1 9	0	0	0

- Molecule 5 is BORIC ACID (three-letter code: BO3) (formula: BH_3O_3).

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	A	1	Total 7	B 1	H 3	O 3	0	0
5	A	1	Total 7	B 1	H 3	O 3	0	0
5	A	1	Total 7	B 1	H 3	O 3	0	0
5	B	1	Total 7	B 1	H 3	O 3	0	0
5	B	1	Total 7	B 1	H 3	O 3	0	0

- Molecule 6 is ZINC ION (three-letter code: ZN) (formula: Zn).

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

- Molecule 7 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

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

- Molecule 8 is (2 {S})-1-[(2 {S})-2-[[(1 {S})-1-[(2 {S})-1-[(2 {S})-2-azanyl-4-oxidanyl-4-oxid anylidene-butanoyl]pyrrolidin-2-yl]-2-oxidanyl-2-oxidanylidene-ethyl]amino]propanoyl]pyrro lidine-2-carboxylic acid (three-letter code: BJ2) (formula: $C_{18}H_{28}N_4O_8$) (labeled as "Ligand of Interest" by depositor).
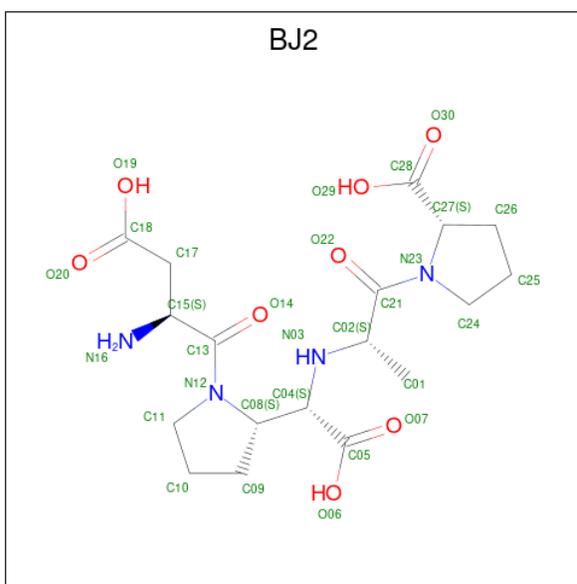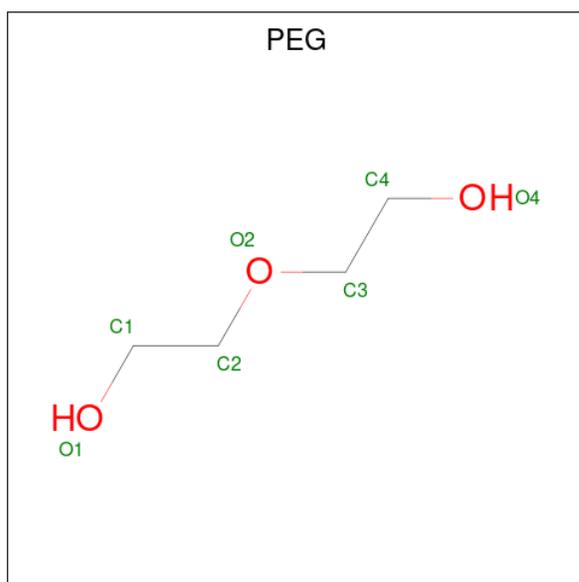

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
8	A	1	Total	C	H	N	O	0	0
			55	18	25	4	8		
8	B	1	Total	C	H	N	O	0	0
			55	18	25	4	8		

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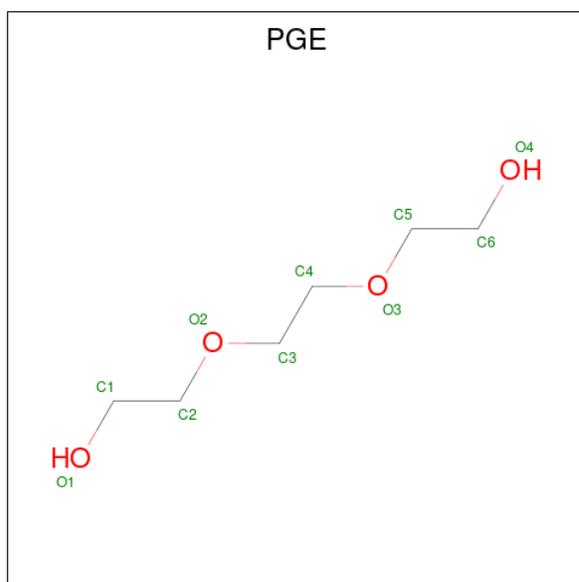
PGE

O4
OH

C5
C6

C4
O2
O3
C3

C1
C2

HO
O1

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
9	A	1	Total	C	H	O	0	0
			24	6	14	4		
9	B	1	Total	C	H	O	0	1
			48	12	28	8		

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

PEG

C4
OH O4

O2
C3

C1
C2

HO
O1

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

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WORLDWIDE
PDB
PROTEIN DATA BANK

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

- Molecule 11 is TETRAETHYLENE GLYCOL (three-letter code: PG4) (formula: $C_8H_{18}O_5$).
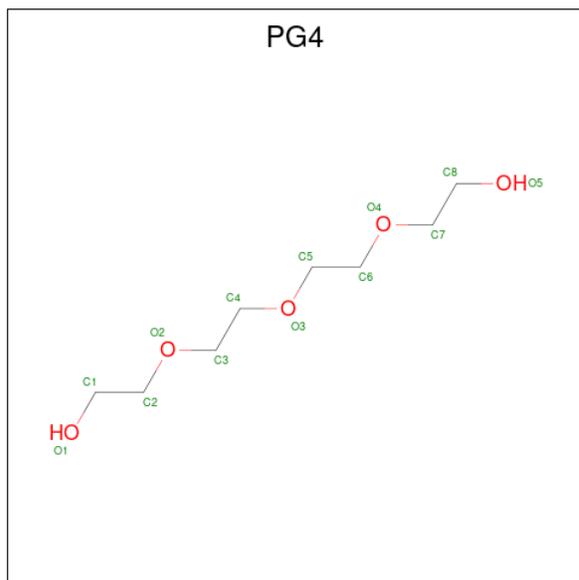
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
11	A	1	Total	C	H	O	0	0
			31	8	18	5		

- Molecule 12 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: $C_2H_6O_2$).
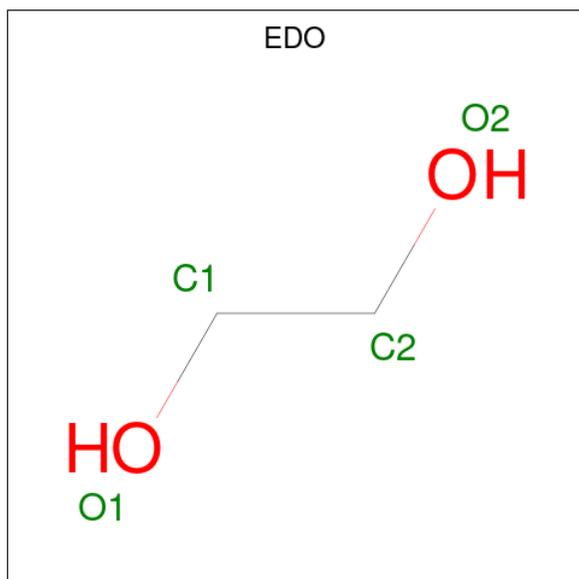
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
12	A	1	Total 10	C 2	H 6	O 2	0	0
12	A	1	Total 10	C 2	H 6	O 2	0	0
12	A	1	Total 20	C 4	H 12	O 4	0	1
12	A	1	Total 10	C 2	H 6	O 2	0	0
12	B	1	Total 10	C 2	H 6	O 2	0	0
12	B	1	Total 10	C 2	H 6	O 2	0	0
12	B	1	Total 10	C 2	H 6	O 2	0	0

- Molecule 13 is BICINE (three-letter code: BCN) (formula: $C_6H_{13}NO_4$).
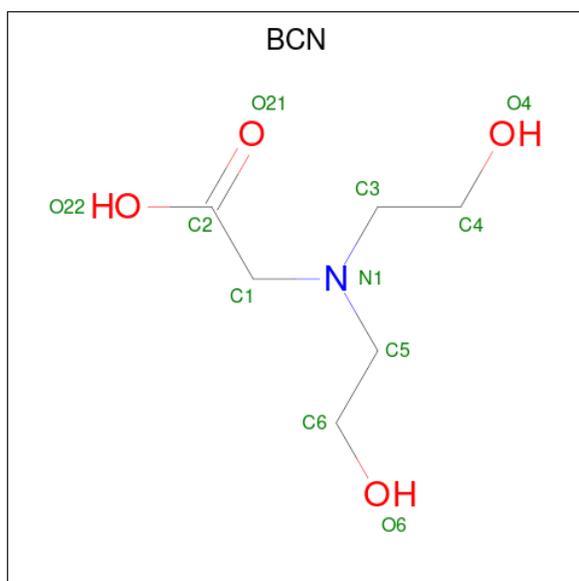
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
13	A	1	Total 23	C 6	H 12	N 1	O 4	0	0
13	A	1	Total 23	C 6	H 12	N 1	O 4	0	0
13	B	1	Total 23	C 6	H 12	N 1	O 4	0	0

- Molecule 14 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
14	A	1	Total Ca 1 1		0	0
14	B	1	Total Ca 1 1		0	0

- Molecule 15 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: $C_8H_{15}NO_6$).
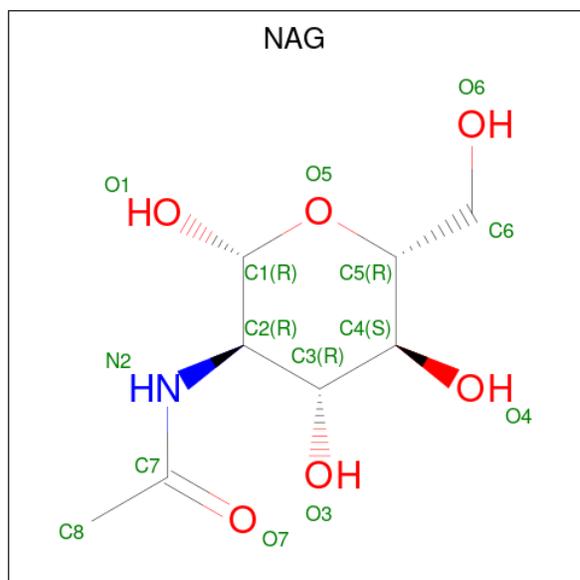
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
15	B	1	Total 27	C 8	H 13	N 1	O 5	0	0

- Molecule 16 is water.

| Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
16	A	539	Total O 545 545		0	7
16	B	338	Total O 343 343		0	5

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.
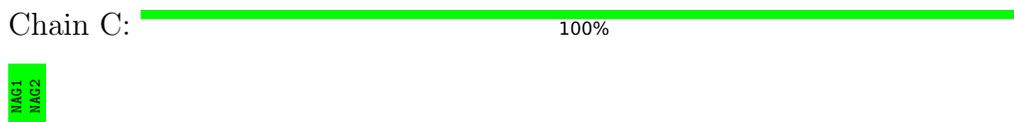
• Molecule 1: Angiotensin-converting enzyme
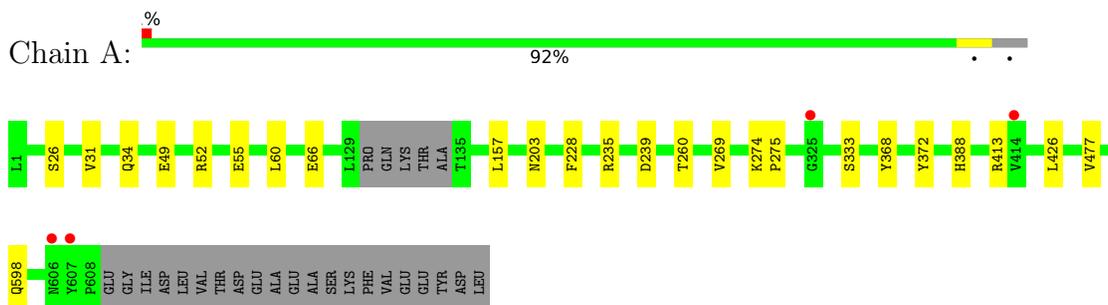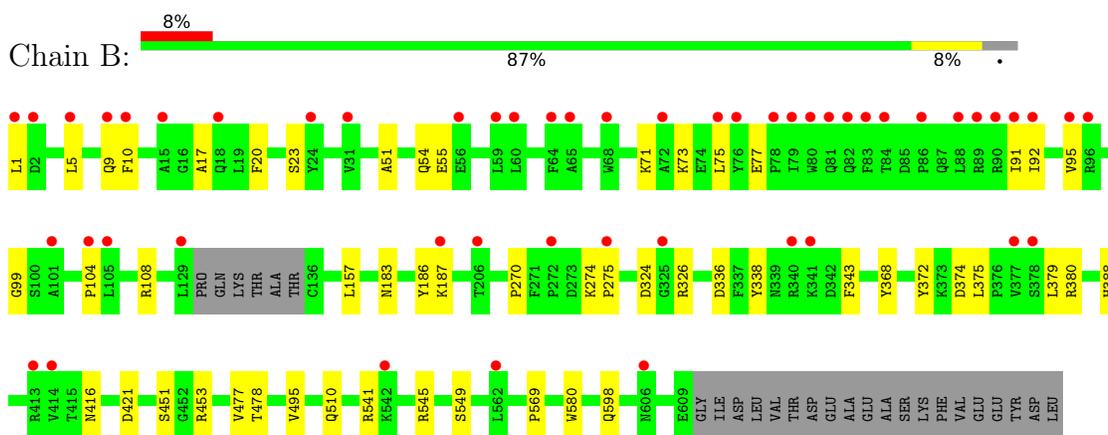
Chain A:

• Molecule 1: Angiotensin-converting enzyme

Chain B:

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

Chain C:

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

Chain F:

NAG1 NAG2

• Molecule 3: beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose

Chain D: 100%

NAG1 NAG2 BMA3 FUC4

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

Chain E: 50%   50%

NAG1 FUC2

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

Chain G: 50%   50%

NAG1 FUC2

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α, β, γ	73.62Å 78.20Å 83.79Å 88.64° 64.35° 74.64°	Depositor
Resolution (Å)	75.11 – 1.70 75.12 – 1.70	Depositor EDS
% Data completeness (in resolution range)	97.2 (75.11-1.70) 97.2 (75.12-1.70)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.56 (at 1.70Å)	Xtriage
Refinement program	PHENIX 1.13_2998, PHENIX 1.13_2998	Depositor
R, R_{free}	0.188 , 0.221 0.187 , 0.220	Depositor DCC
R_{free} test set	2061 reflections (1.19%)	wwPDB-VP
Wilson B-factor (Å^2)	24.3	Xtriage
Anisotropy	0.035	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.37 , 50.5	EDS
L-test for twinning[2]	$< |L| > = 0.50$, $< L^2 > = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.97	EDS
Total number of atoms	21134	wwPDB-VP
Average B, all atoms (Å^2)	38.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.26% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1]Intensities estimated from amplitudes.
[2]Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: NAG, BJ2, FUC, PGE, EDO, PEG, BCN, PG4, CL, ZN, CA, BO3, BMA

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	0.49	0/5169	0.60	0/7038
1	B	0.43	0/5125	0.56	0/6979
All	All	0.46	0/10294	0.58	0/14017

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 ⓘ

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	5001	4783	4764	18	0
1	B	4962	4746	4737	32	0
2	C	28	25	25	0	0
2	F	28	25	25	1	0
3	D	49	43	43	0	0
4	E	24	22	22	0	0
4	G	24	22	22	1	0
5	A	12	9	9	0	0
5	B	8	6	6	0	0
6	A	1	0	0	0	0
6	B	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
7	A	1	0	0	0	0
7	B	1	0	0	0	0
8	A	30	25	0	0	0
8	B	30	25	0	0	0
9	A	10	14	14	0	0
9	B	20	28	28	0	0
10	A	7	10	10	0	0
10	B	7	10	9	0	0
11	A	13	18	18	0	0
12	A	20	30	30	4	0
12	B	12	18	18	4	0
13	A	22	24	22	2	0
13	B	11	12	12	0	0
14	A	1	0	0	0	0
14	B	1	0	0	0	0
15	B	14	13	13	0	0
16	A	545	0	0	4	0
16	B	343	0	0	2	0
All	All	11226	9908	9827	51	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 3.

The worst 5 of 51 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:375:LEU:O	1:B:380:ARG:NH2	2.16	0.79
1:B:55:GLU:OE2	16:B:801:HOH:O	2.03	0.77
1:B:91:ILE:O	1:B:95:VAL:HG23	1.87	0.76
1:B:416:ASN:ND2	2:F:1:NAG:O7	2.23	0.71
1:A:49:GLU:OE1	1:A:52:ARG:NH2	2.24	0.71

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	610/629 (97%)	602 (99%)	8 (1%)	0	100	100
1	B	604/629 (96%)	587 (97%)	17 (3%)	0	100	100
All	All	1214/1258 (96%)	1189 (98%)	25 (2%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	529/541 (98%)	523 (99%)	6 (1%)	73	63
1	B	524/541 (97%)	519 (99%)	5 (1%)	76	67
All	All	1053/1082 (97%)	1042 (99%)	11 (1%)	73	67

5 of 11 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	372	TYR
1	B	388	HIS
1	B	598	GLN
1	B	421	ASP
1	A	388	HIS

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

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

12 monosaccharides are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	#$|Z| > 2$	Counts	RMSZ	#$|Z| > 2$
2	NAG	C	1	2,1	14,14,15	0.41	0	17,19,21	0.59	0
2	NAG	C	2	2	14,14,15	0.38	0	17,19,21	0.43	0
3	NAG	D	1	3,1	14,14,15	0.47	0	17,19,21	0.47	0
3	NAG	D	2	3	14,14,15	0.34	0	17,19,21	0.62	0
3	BMA	D	3	3	11,11,12	0.84	0	15,15,17	0.75	0
3	FUC	D	4	3	10,10,11	0.69	0	14,14,16	0.77	0
4	NAG	E	1	4,1	14,14,15	0.32	0	17,19,21	0.70	0
4	FUC	E	2	4	10,10,11	0.96	1 (10%)	14,14,16	1.50	2 (14%)
2	NAG	F	1	2,1	14,14,15	0.79	1 (7%)	17,19,21	0.56	0
2	NAG	F	2	2	14,14,15	0.25	0	17,19,21	0.50	0
4	NAG	G	1	4,1	14,14,15	0.28	0	17,19,21	0.47	0
4	FUC	G	2	4	10,10,11	0.96	0	14,14,16	1.04	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
2	NAG	C	1	2,1	-	0/6/23/26	0/1/1/1
2	NAG	C	2	2	-	2/6/23/26	0/1/1/1
3	NAG	D	1	3,1	-	0/6/23/26	0/1/1/1
3	NAG	D	2	3	-	0/6/23/26	0/1/1/1
3	BMA	D	3	3	-	0/2/19/22	0/1/1/1
3	FUC	D	4	3	-	-	0/1/1/1
4	NAG	E	1	4,1	-	3/6/23/26	0/1/1/1

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

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	E	2	FUC	C1-C2	2.43	1.57	1.52
2	F	1	NAG	O5-C1	2.14	1.47	1.43

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	E	2	FUC	C1-C2-C3	3.47	113.93	109.67
4	E	2	FUC	O5-C1-C2	3.17	115.67	110.77

There are no chirality outliers.

5 of 14 torsion outliers are listed below:

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

There are no ring outliers.

2 monomers are involved in 2 short contacts:

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

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

Oligosaccharide Chain C

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain F

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain D

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain E

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain G

Bond lengths

Bond angles

Torsions

Rings
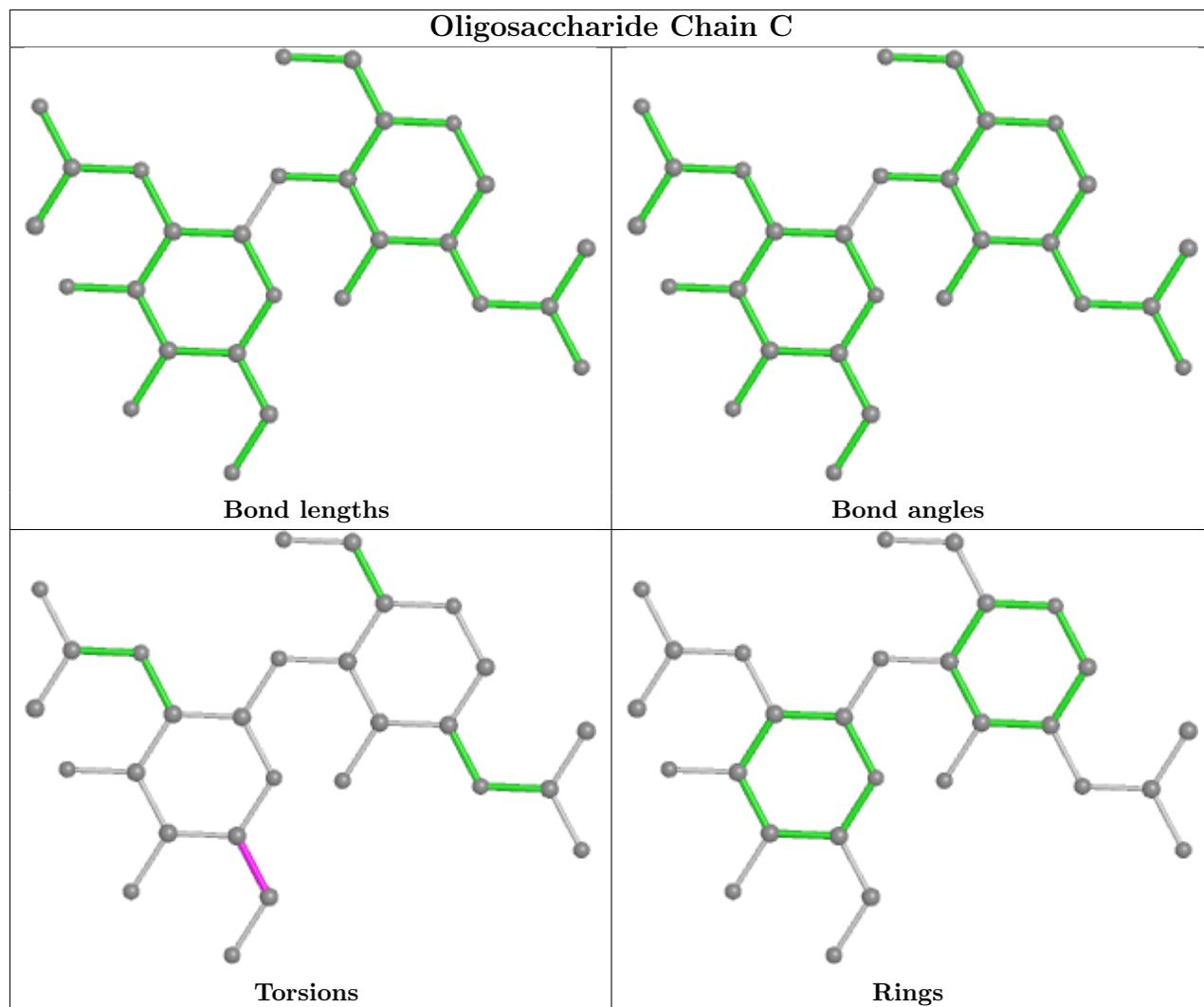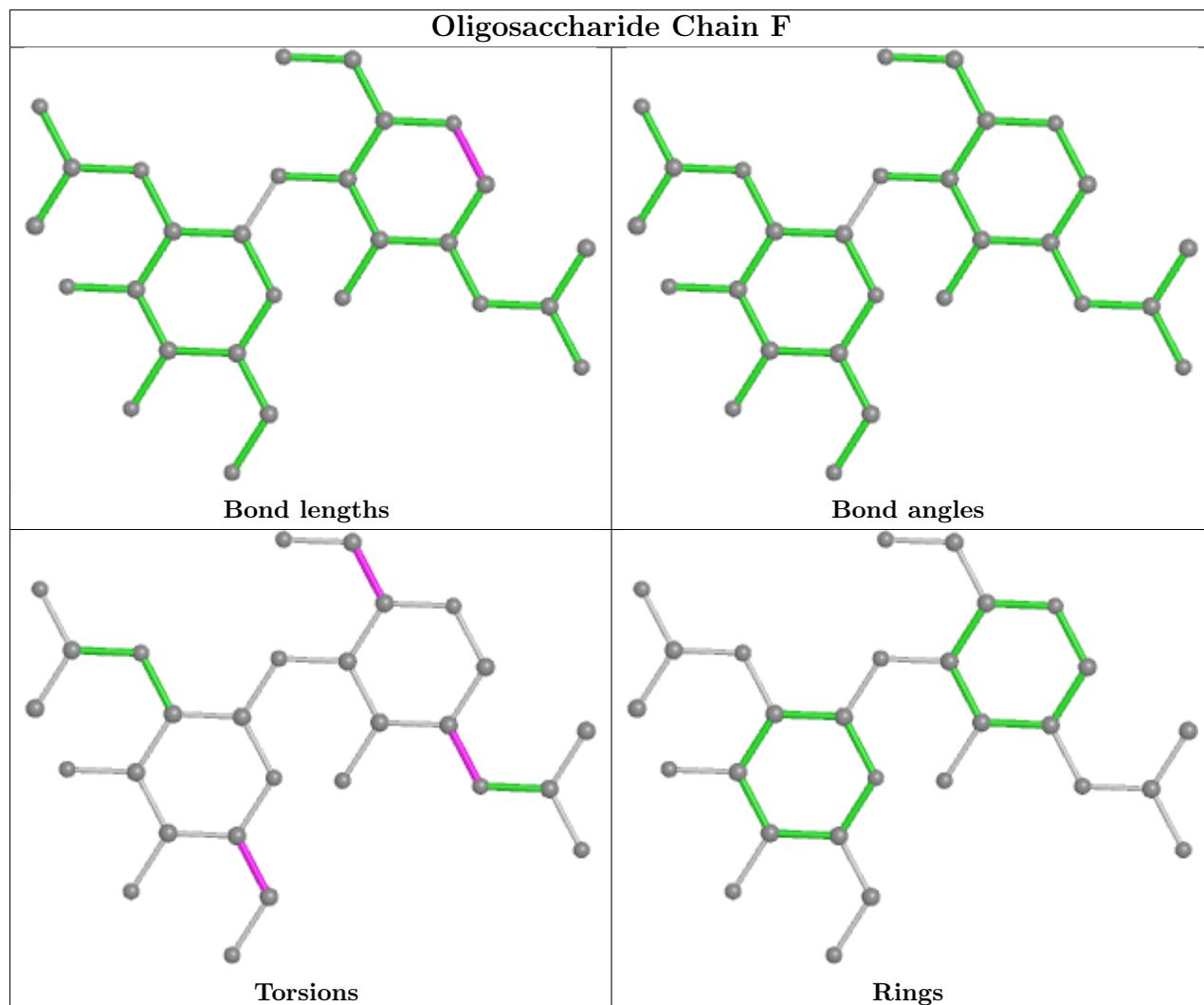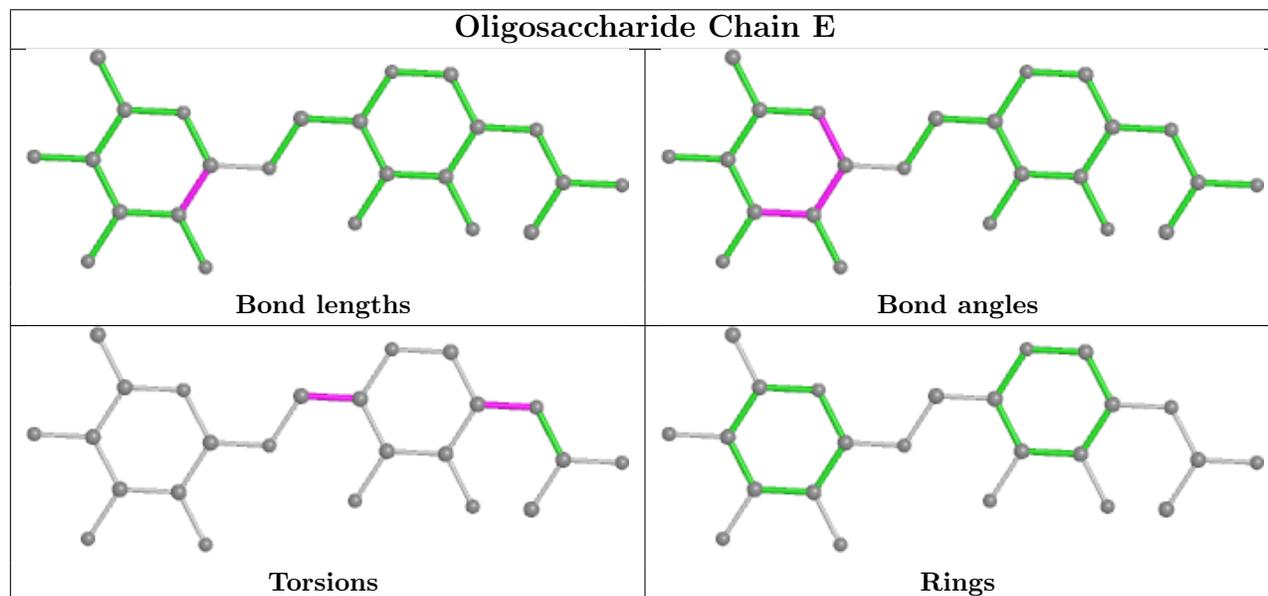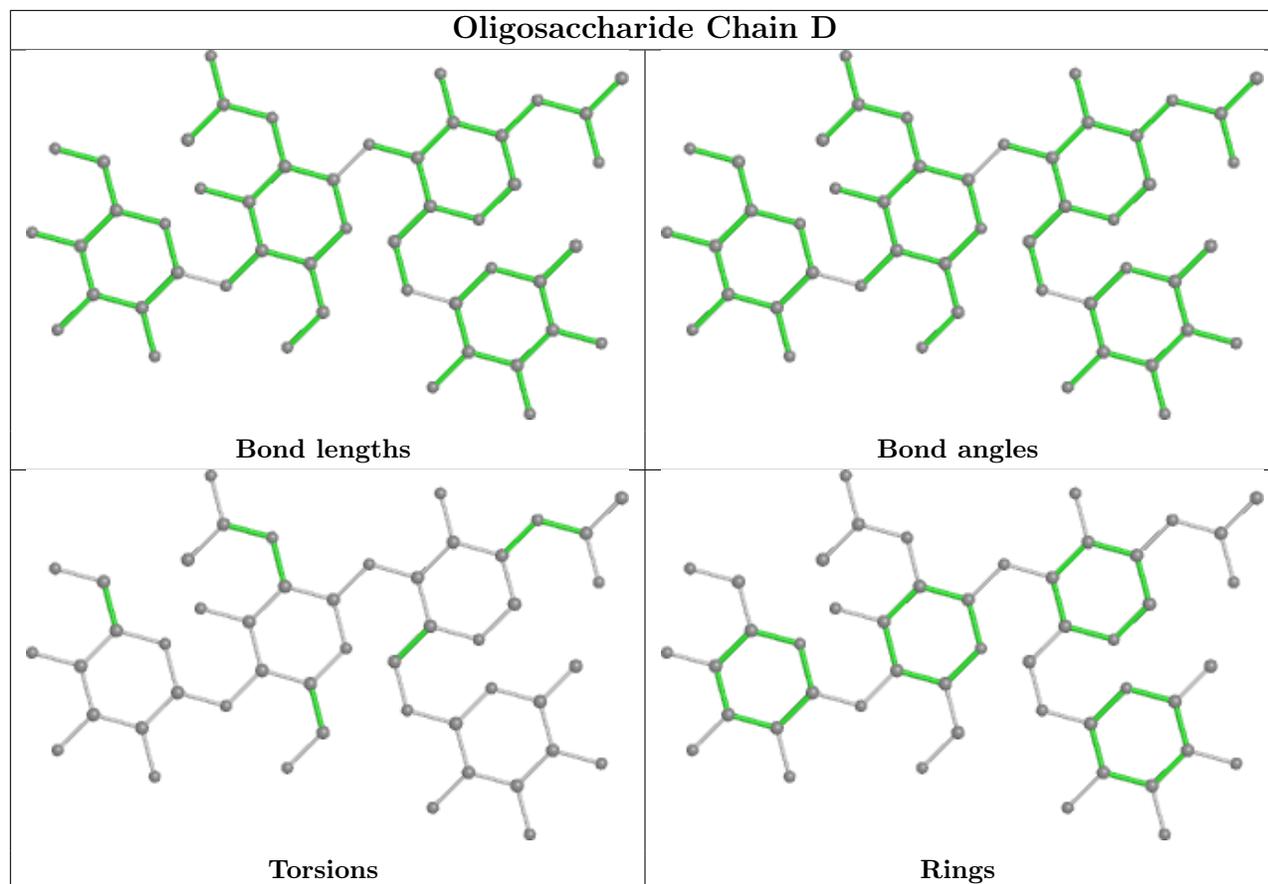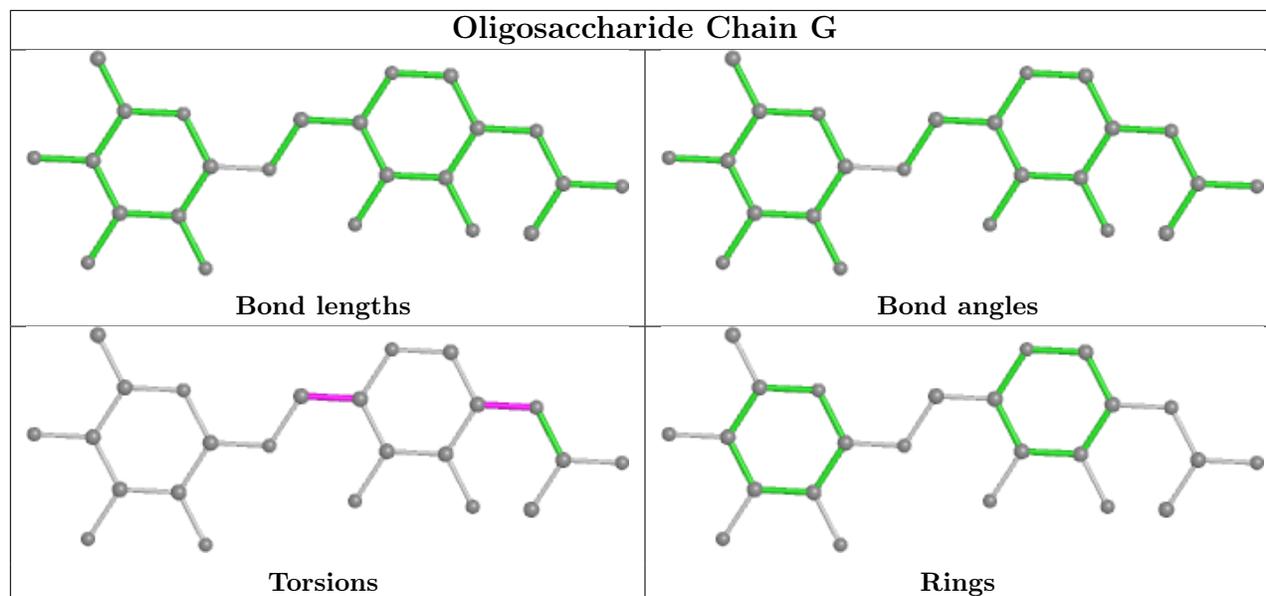
5.6 Ligand geometry ⓘ

Of 31 ligands modelled in this entry, 6 are monoatomic - leaving 25 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
12	EDO	B	713	-	3,3,3	0.55	0	2,2,2	0.13	0
15	NAG	B	701	1	14,14,15	0.95	1 (7%)	17,19,21	0.87	0
12	EDO	B	715	-	3,3,3	0.51	0	2,2,2	0.05	0
13	BCN	B	716	14	10,10,10	1.23	1 (10%)	11,11,11	1.39	2 (18%)
11	PG4	A	717	-	12,12,12	0.56	0	11,11,11	0.43	0
12	EDO	A	719	-	3,3,3	0.51	0	2,2,2	0.27	0
5	BO3	A	710	-	3,3,3	0.47	0	3,3,3	0.06	0
13	BCN	A	722	14	10,10,10	1.15	0	11,11,11	1.16	1 (9%)
12	EDO	A	721	-	3,3,3	0.49	0	2,2,2	0.24	0
8	BJ2	B	710	6,14	30,31,31	3.53	13 (43%)	36,44,44	1.55	6 (16%)
9	PGE	B	711[B]	-	9,9,9	0.30	0	8,8,8	0.33	0
12	EDO	B	714	-	3,3,3	0.51	0	2,2,2	0.27	0
5	BO3	A	709	-	3,3,3	0.39	0	3,3,3	0.42	0
10	PEG	B	712	14	6,6,6	0.50	0	5,5,5	0.28	0
9	PGE	B	711[A]	-	9,9,9	0.33	0	8,8,8	0.26	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	#|Z| > 2	Counts	RMSZ	#|Z| > 2
12	EDO	A	720[B]	-	3,3,3	0.64	0	2,2,2	0.23	0
10	PEG	A	716	-	6,6,6	0.44	0	5,5,5	0.27	0
9	PGE	A	715	-	9,9,9	0.37	0	8,8,8	0.56	0
5	BO3	B	707	-	3,3,3	0.23	0	3,3,3	0.18	0
5	BO3	B	706	-	3,3,3	0.22	0	3,3,3	0.18	0
12	EDO	A	720[A]	-	3,3,3	0.52	0	2,2,2	0.23	0
12	EDO	A	718	-	3,3,3	0.49	0	2,2,2	0.27	0
13	BCN	A	723	14	10,10,10	1.17	1 (10%)	11,11,11	1.09	0
5	BO3	A	711	-	3,3,3	0.22	0	3,3,3	0.14	0
8	BJ2	A	714	6,14	30,31,31	3.32	12 (40%)	36,44,44	1.48	9 (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
12	EDO	B	713	-	-	0/1/1/1	-
15	NAG	B	701	1	-	2/6/23/26	0/1/1/1
12	EDO	B	715	-	-	1/1/1/1	-
13	BCN	B	716	14	-	1/10/10/10	-
11	PG4	A	717	-	-	4/10/10/10	-
12	EDO	A	719	-	-	0/1/1/1	-
13	BCN	A	722	14	-	4/10/10/10	-
12	EDO	A	721	-	-	0/1/1/1	-
8	BJ2	B	710	6,14	-	5/36/56/56	0/2/2/2
9	PGE	B	711[B]	-	-	2/7/7/7	-
12	EDO	B	714	-	-	0/1/1/1	-
10	PEG	B	712	14	-	0/4/4/4	-
9	PGE	B	711[A]	-	-	4/7/7/7	-
12	EDO	A	720[B]	-	-	0/1/1/1	-
10	PEG	A	716	-	-	3/4/4/4	-
9	PGE	A	715	-	-	3/7/7/7	-
12	EDO	A	720[A]	-	-	0/1/1/1	-
12	EDO	A	718	-	-	0/1/1/1	-
13	BCN	A	723	14	-	1/10/10/10	-
8	BJ2	A	714	6,14	-	5/36/56/56	0/2/2/2

The worst 5 of 28 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	A	714	BJ2	C09-C08	-7.83	1.40	1.53
8	A	714	BJ2	C08-N12	7.79	1.57	1.47
8	B	710	BJ2	C08-N12	7.68	1.56	1.47
8	B	710	BJ2	C09-C08	-7.50	1.40	1.53
8	B	710	BJ2	C27-N23	6.02	1.59	1.47

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

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
8	B	710	BJ2	C28-C27-N23	-4.12	103.90	112.26
8	A	714	BJ2	C28-C27-N23	-3.72	104.72	112.26
8	B	710	BJ2	O06-C05-O07	-3.10	117.06	124.09
13	B	716	BCN	C5-N1-C3	-3.01	104.29	111.44
8	B	710	BJ2	C08-C04-N03	-2.92	103.98	109.99

There are no chirality outliers.

5 of 35 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
8	A	714	BJ2	N03-C04-C08-C09
15	B	701	NAG	O5-C5-C6-O6
15	B	701	NAG	C4-C5-C6-O6
9	A	715	PGE	O1-C1-C2-O2
10	A	716	PEG	O1-C1-C2-O2

There are no ring outliers.

4 monomers are involved in 10 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
12	B	713	EDO	4	0
13	A	722	BCN	2	0
12	A	721	EDO	1	0
12	A	720[B]	EDO	3	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 then 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 BJ2 B 710

Bond lengths

Bond angles

Torsions

Rings

Ligand BJ2 A 714

Bond lengths

Bond angles

Torsions

Rings
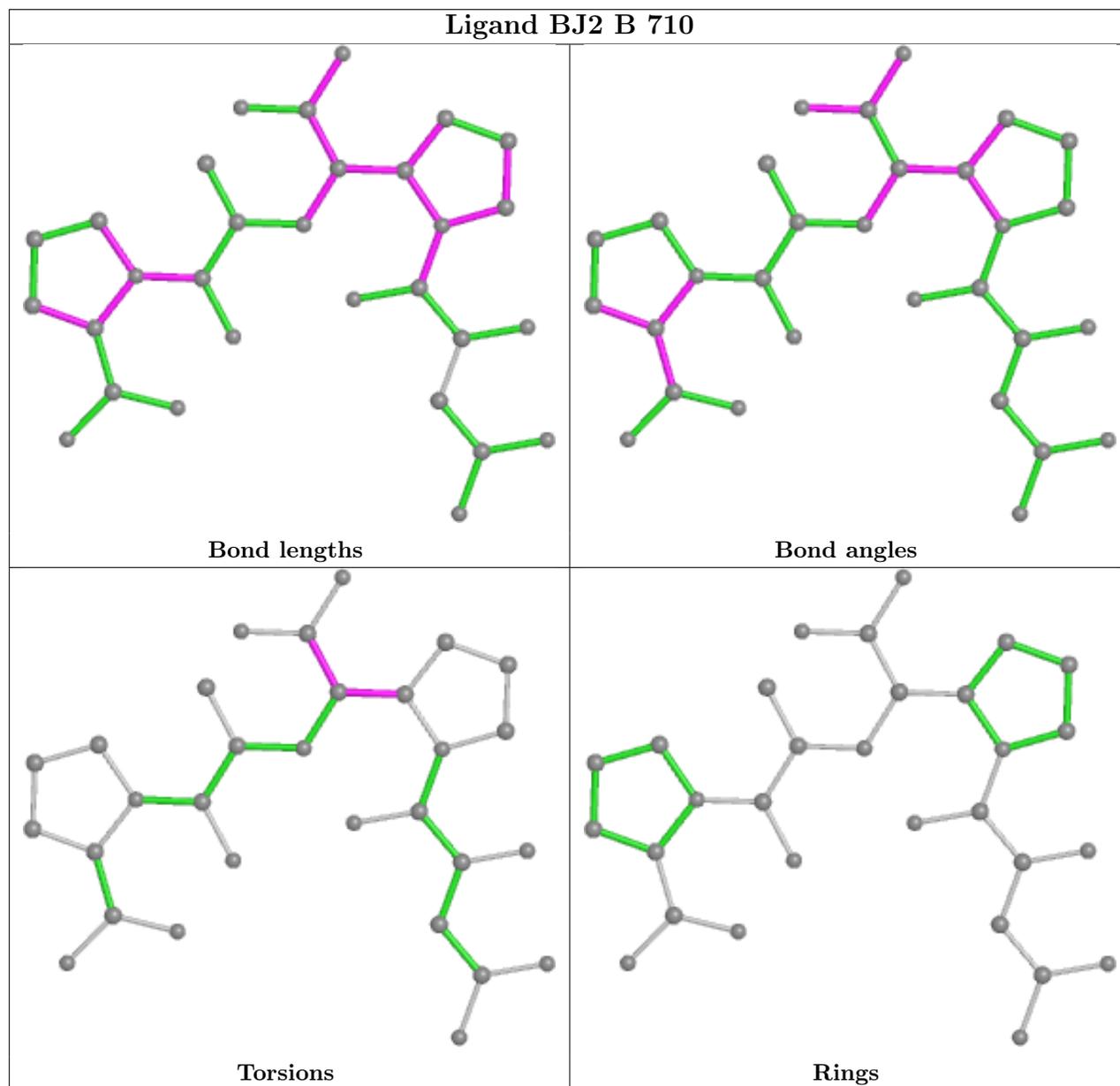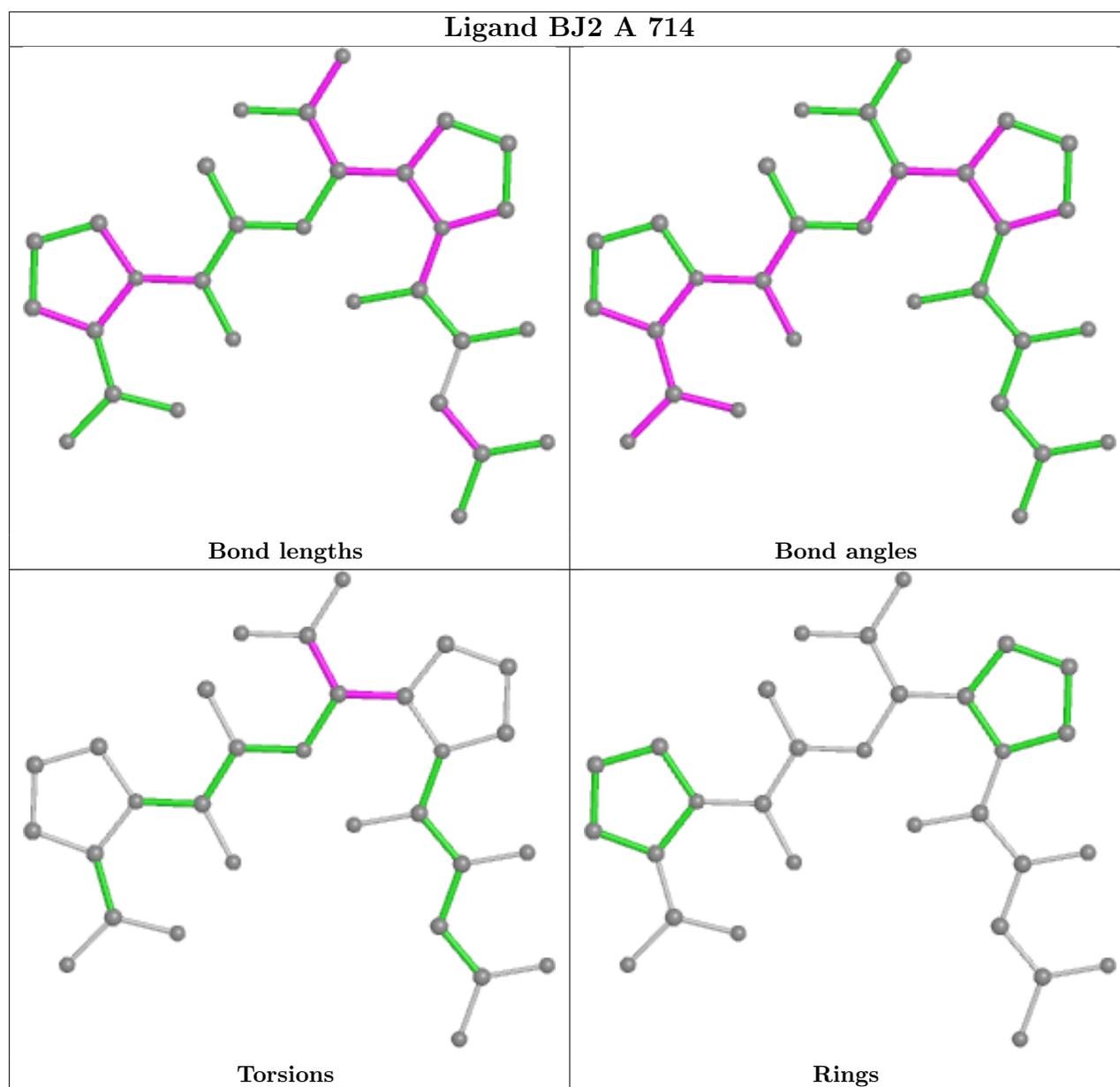
5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2			OWAB(Å^2)	Q<0.9
1	A	603/629 (95%)	-0.05	4 (0%)	87	90	16, 26, 47, 96	0
1	B	603/629 (95%)	0.48	51 (8%)	10	12	18, 36, 72, 98	0
All	All	1206/1258 (95%)	0.22	55 (4%)	32	36	16, 30, 66, 98	0

The worst 5 of 55 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	1	LEU	8.8
1	A	325	GLY	6.2
1	B	92	ILE	6.0
1	B	86	PRO	5.7
1	B	414	VAL	5.3

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

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

6.3 Carbohydrates ⓘ

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
4	FUC	E	2	10/11	0.69	0.27	56,78,104,109	0
3	BMA	D	3	11/12	0.73	0.15	55,78,94,97	0
2	NAG	C	2	14/15	0.76	0.26	51,71,108,109	0
2	NAG	F	2	14/15	0.81	0.28	67,82,112,112	0
2	NAG	F	1	14/15	0.82	0.20	51,65,75,78	26

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\mathrm{\AA}^2$)	Q<0.9
3	FUC	D	4	10/11	0.84	0.15	42,55,63,76	0
2	NAG	C	1	14/15	0.85	0.14	44,54,65,75	0
4	NAG	E	1	14/15	0.88	0.10	35,46,65,70	0
4	FUC	G	2	10/11	0.89	0.22	55,78,111,119	0
4	NAG	G	1	14/15	0.92	0.10	39,53,71,85	0
3	NAG	D	2	14/15	0.92	0.14	43,57,82,82	0
3	NAG	D	1	14/15	0.94	0.09	31,44,60,60	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:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
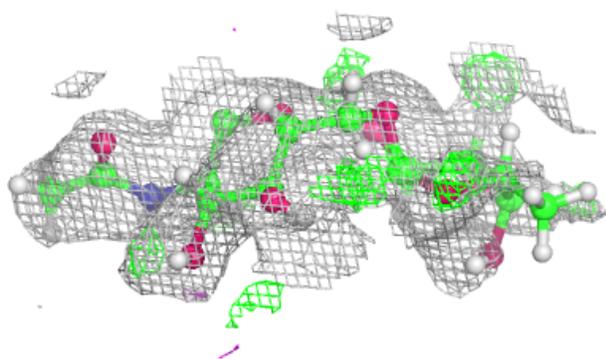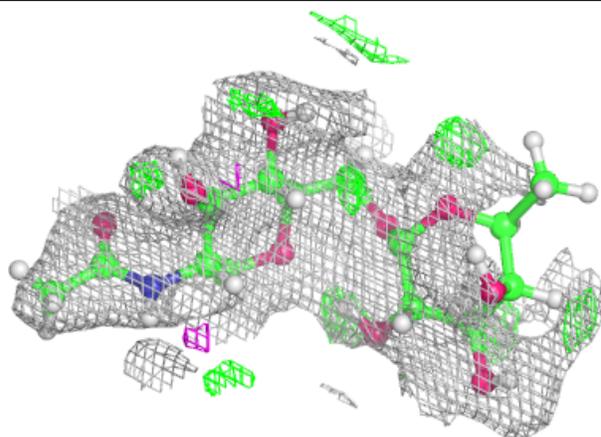$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative) and green (positive)
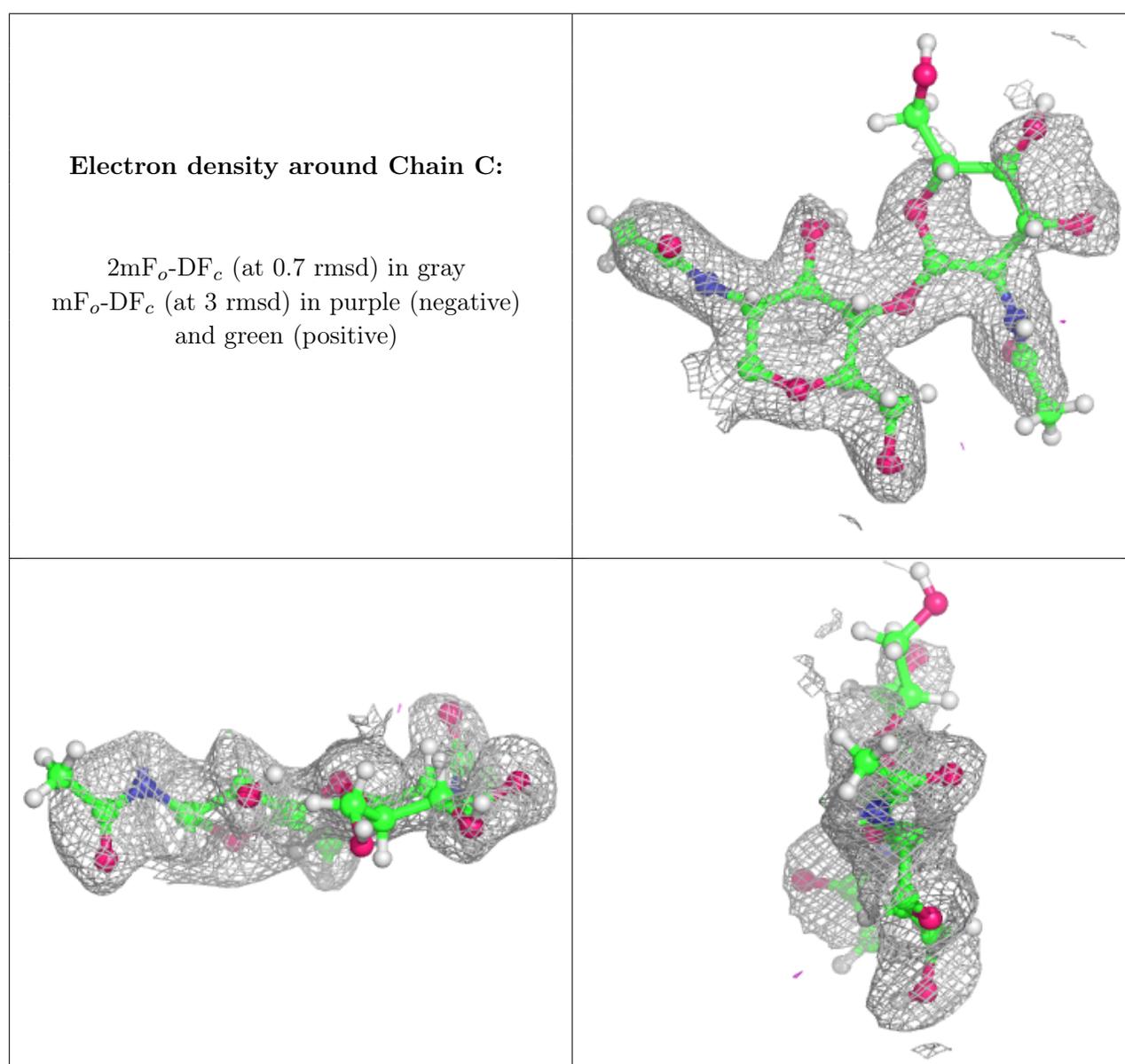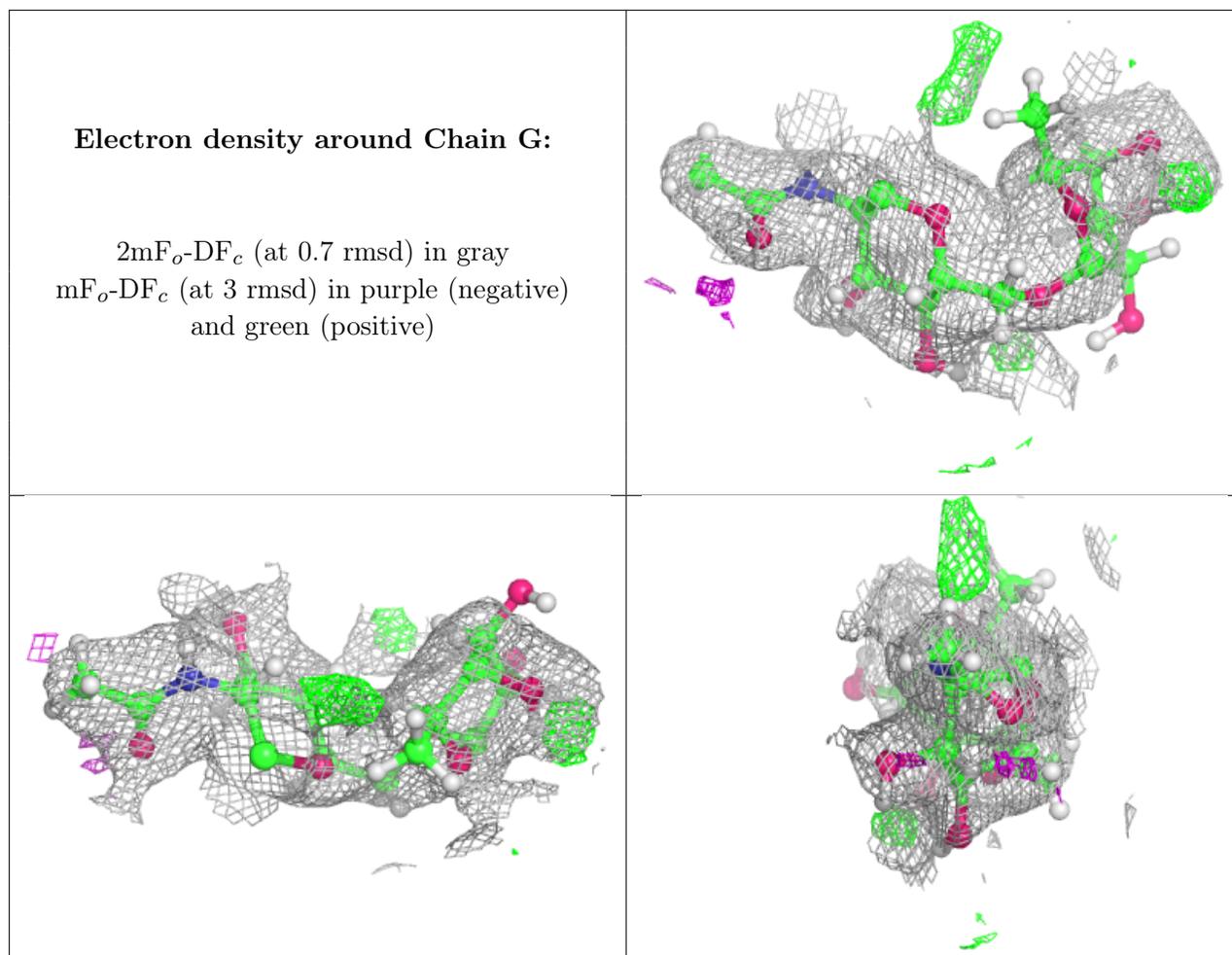
Electron density around Chain F:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
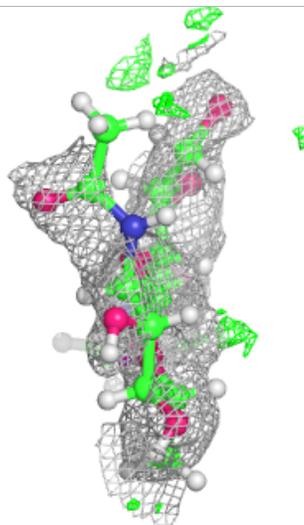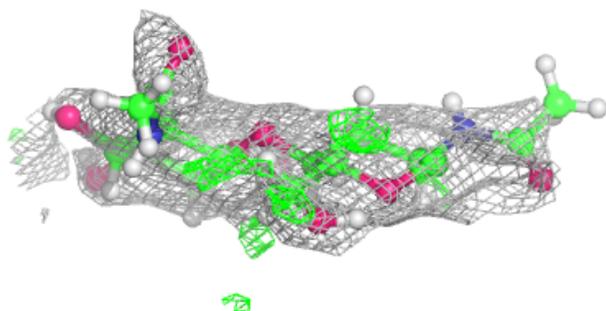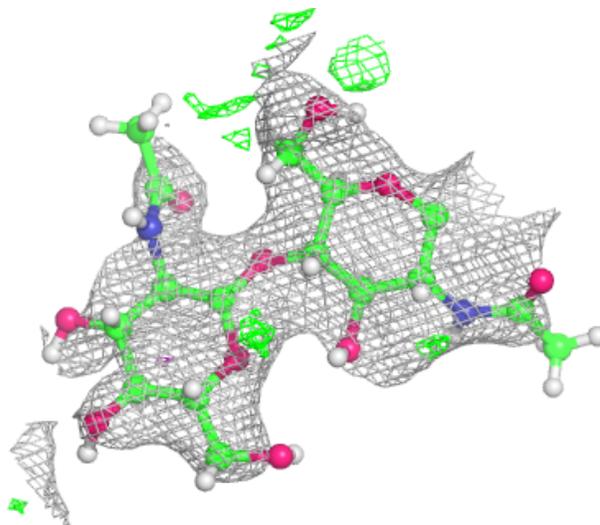
Electron density around Chain D:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
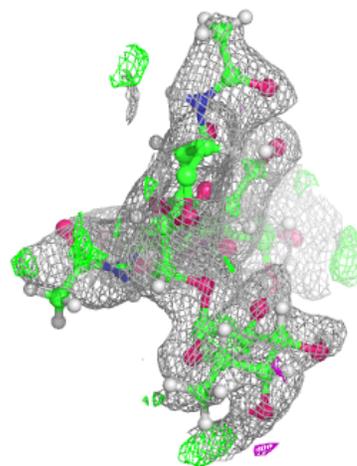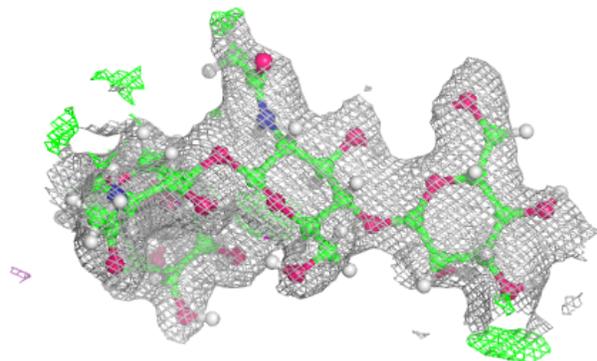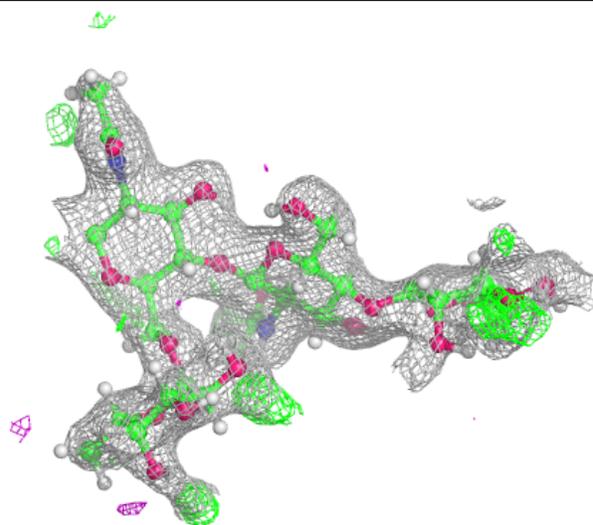
Electron density around Chain E:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
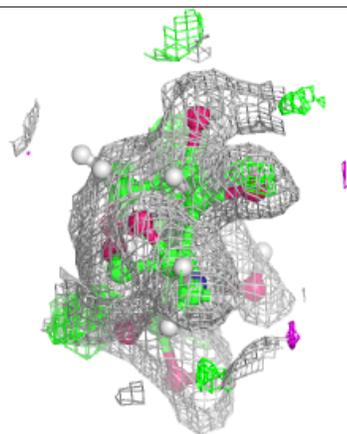
Electron density around Chain G:

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

6.4 Ligands ⓘ

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($Å^2$)	Q<0.9
15	NAG	B	701	14/15	0.58	0.28	67,82,101,110	0
11	PG4	A	717	13/13	0.74	0.15	41,55,67,67	0
12	EDO	B	715	4/4	0.78	0.30	56,67,78,78	0
5	BO3	B	706	4/4	0.81	0.14	40,46,55,56	0
10	PEG	B	712	7/7	0.82	0.15	41,59,70,70	0
12	EDO	B	713	4/4	0.83	0.31	36,55,66,69	0
13	BCN	B	716	11/11	0.84	0.16	40,59,70,80	0
9	PGE	B	711[A]	10/10	0.86	0.15	25,37,43,44	24
9	PGE	B	711[B]	10/10	0.86	0.15	30,38,45,50	24
13	BCN	A	722	11/11	0.86	0.13	27,45,65,79	0

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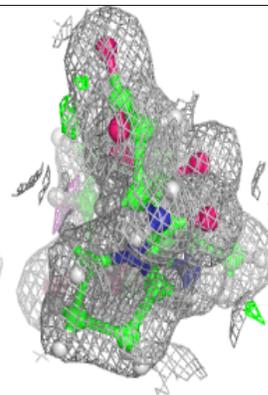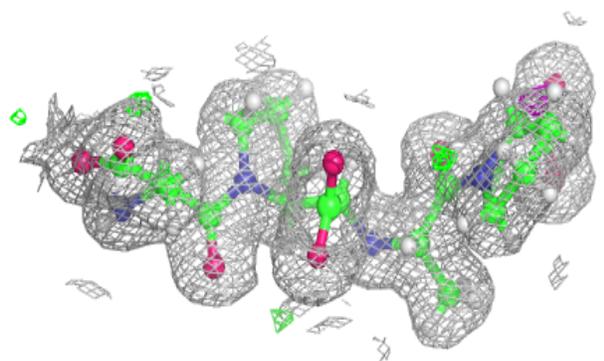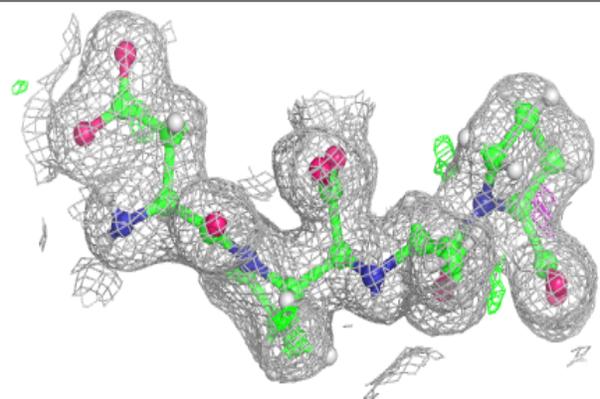| Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
12	EDO	A	720[A]	4/4	0.86	0.19	30,42,55,55	10
12	EDO	A	720[B]	4/4	0.86	0.19	23,42,51,57	10
12	EDO	B	714	4/4	0.87	0.13	42,52,62,69	0
10	PEG	A	716	7/7	0.88	0.10	35,44,58,65	0
9	PGE	A	715	10/10	0.89	0.10	34,50,63,75	0
5	BO3	A	711	4/4	0.91	0.12	29,35,43,49	0
12	EDO	A	718	4/4	0.92	0.09	43,52,60,63	0
13	BCN	A	723	11/11	0.93	0.15	27,39,54,56	0
5	BO3	B	707	4/4	0.93	0.10	30,35,38,45	0
14	CA	B	717	1/1	0.93	0.06	43,43,43,43	0
12	EDO	A	719	4/4	0.93	0.08	50,60,64,67	0
12	EDO	A	721	4/4	0.95	0.19	36,50,61,61	0
5	BO3	A	709	4/4	0.96	0.12	37,39,46,47	0
8	BJ2	B	710	30/30	0.96	0.10	17,26,39,43	0
5	BO3	A	710	4/4	0.96	0.08	36,43,59,62	0
7	CL	B	709	1/1	0.97	0.15	26,26,26,26	0
8	BJ2	A	714	30/30	0.97	0.10	16,22,28,31	0
14	CA	A	724	1/1	0.99	0.10	24,24,24,24	1
7	CL	A	713	1/1	1.00	0.12	17,17,17,17	0
6	ZN	A	712	1/1	1.00	0.14	18,18,18,18	0
6	ZN	B	708	1/1	1.00	0.13	23,23,23,23	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 BJ2 B 710:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
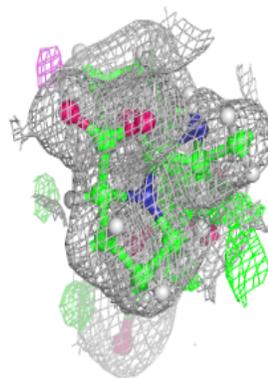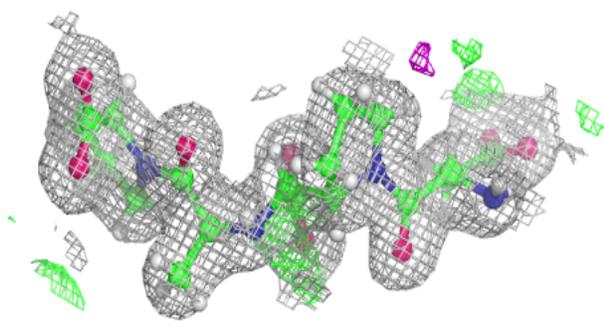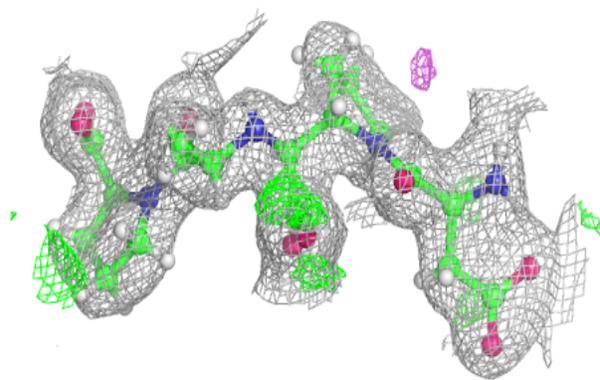
Electron density around BJ2 A 714:

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

6.5 Other polymers (i)

There are no such residues in this entry.