



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 03:42 PM UTC

PDB ID : 4NGR / pdb_00004ngr
Title : Crystal Structure of Glutamate Carboxypeptidase II in a complex with urea-based inhibitor
Authors : Tykvart, J.; Pachl, P.
Deposited on : 2013-11-02
Resolution : 1.90 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

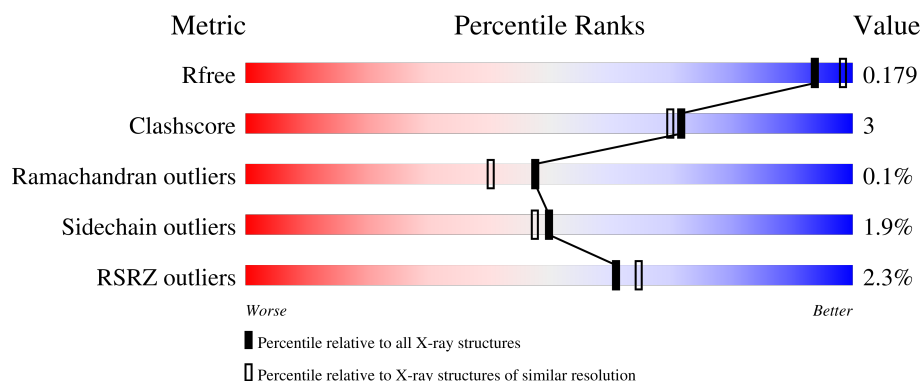
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

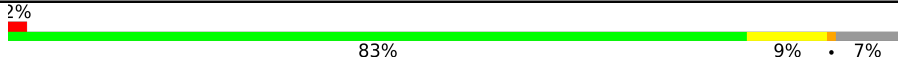
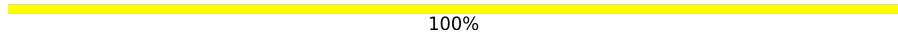
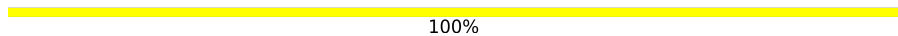
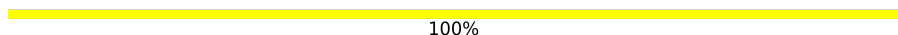
The reported resolution of this entry is 1.90 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	7789 (1.90-1.90)
Clashscore	190562	8410 (1.90-1.90)
Ramachandran outliers	187476	8333 (1.90-1.90)
Sidechain outliers	187428	8333 (1.90-1.90)
RSRZ outliers	180081	7790 (1.90-1.90)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	739	 2% 83% 9% 7%
2	B	2	 100%
2	C	2	 100%
2	D	2	 100%
3	E	4	 75% 25%

2 Entry composition

There are 9 unique types of molecules in this entry. The entry contains 6203 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 Glutamate carboxypeptidase 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	689	Total	C	N	O	S	0	7	0
			5498	3534	924	1021	19			

There are 32 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	12	ARG	-	expression tag	UNP Q04609
A	13	SER	-	expression tag	UNP Q04609
A	14	GLY	-	expression tag	UNP Q04609
A	15	LEU	-	expression tag	UNP Q04609
A	16	ASN	-	expression tag	UNP Q04609
A	17	ASP	-	expression tag	UNP Q04609
A	18	ILE	-	expression tag	UNP Q04609
A	19	PHE	-	expression tag	UNP Q04609
A	20	GLU	-	expression tag	UNP Q04609
A	21	ALA	-	expression tag	UNP Q04609
A	22	GLN	-	expression tag	UNP Q04609
A	23	LYS	-	expression tag	UNP Q04609
A	24	ILE	-	expression tag	UNP Q04609
A	25	GLU	-	expression tag	UNP Q04609
A	26	TRP	-	expression tag	UNP Q04609
A	27	HIS	-	expression tag	UNP Q04609
A	28	GLU	-	expression tag	UNP Q04609
A	29	GLY	-	expression tag	UNP Q04609
A	30	SER	-	expression tag	UNP Q04609
A	31	GLY	-	expression tag	UNP Q04609
A	32	SER	-	expression tag	UNP Q04609
A	33	GLY	-	expression tag	UNP Q04609
A	34	SER	-	expression tag	UNP Q04609
A	35	GLU	-	expression tag	UNP Q04609
A	36	ASN	-	expression tag	UNP Q04609
A	37	LEU	-	expression tag	UNP Q04609
A	38	TYR	-	expression tag	UNP Q04609

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Chain	Residue	Modelled	Actual	Comment	Reference
A	39	PHE	-	expression tag	UNP Q04609
A	40	GLN	-	expression tag	UNP Q04609
A	41	GLY	-	expression tag	UNP Q04609
A	42	ARG	-	expression tag	UNP Q04609
A	43	SER	-	expression tag	UNP Q04609

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



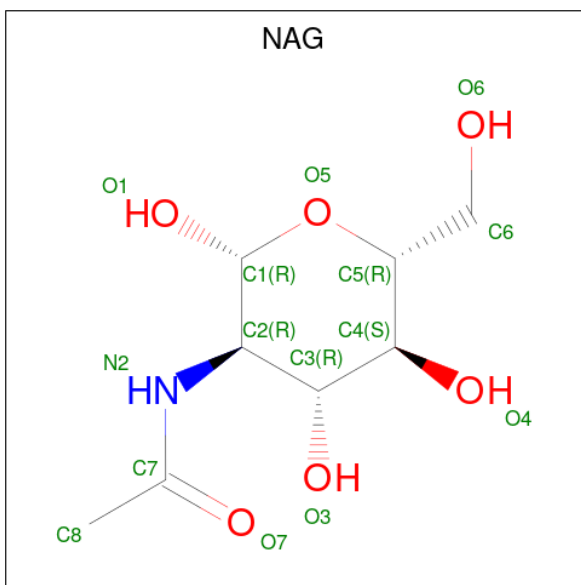
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	B	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	C	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	D	2	Total	C	N	O	0	0	0
			28	16	2	10			

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



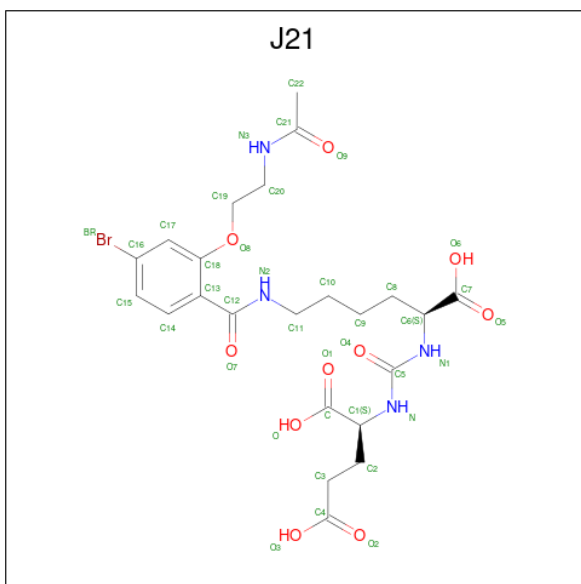
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	E	4	Total	C	N	O	0	0	0
			50	28	2	20			

- Molecule 4 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: C₈H₁₅NO₆).



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

- Molecule 5 is N-{[(1S)-5-({2-[2-(acetylamino)ethoxy]-4-bromobenzoyl}amino)-1-carboxypentyl]carbamoyl}-L-glutamic acid (CCD ID: J21) (formula: $C_{23}H_{31}BrN_4O_{10}$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	A	1	Total	Br	C	N	O	0	0
			38	1	23	4	10		

- Molecule 6 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	2	Total	Zn	0	0
			2	2		

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

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

- Molecule 8 is CALCIUM ION (CCD ID: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	A	1	Total	Ca	0	0
			1	1		

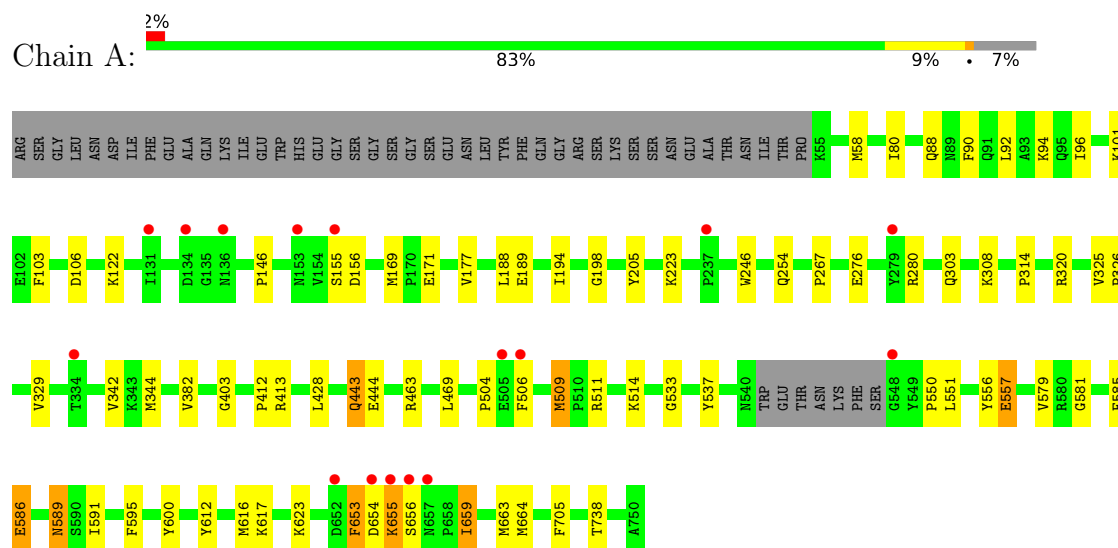
- Molecule 9 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	A	485	Total	O	0	4
			487	487		

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.

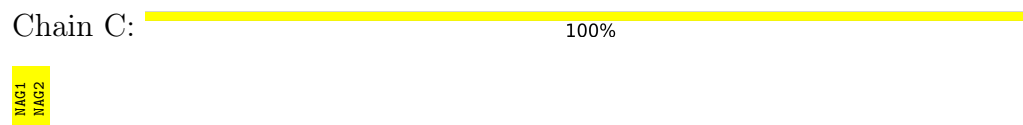
- Molecule 1: Glutamate carboxypeptidase 2



- 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



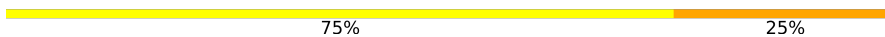
- Molecule 2: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



MAG1
MAG2

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

Chain E:



MAG1
MAG2
BMA3
MAN4

4 Data and refinement statistics

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, α , β , γ	101.10Å 130.05Å 158.45Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	46.81 – 1.90 46.81 – 1.90	Depositor EDS
% Data completeness (in resolution range)	99.3 (46.81-1.90) 99.3 (46.81-1.90)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.09 (at 1.90Å)	Xtriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.176 , 0.216 (Not available) , 0.179	Depositor DCC
R_{free} test set	4080 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	23.4	Xtriage
Anisotropy	0.128	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 46.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	6203	wwPDB-VP
Average B, all atoms (Å ²)	26.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.20% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: CL, NAG, CA, J21, MAN, ZN, 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	1.34	13/5671 (0.2%)	1.15	8/7686 (0.1%)

All (13) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	656	SER	CA-C	8.26	1.64	1.52
1	A	653	PHE	CA-C	-6.94	1.43	1.53
1	A	314	PRO	C-O	-6.53	1.19	1.25
1	A	579	VAL	CA-CB	-5.92	1.47	1.54
1	A	106	ASP	CA-C	-5.77	1.45	1.52
1	A	280	ARG	CA-C	-5.77	1.45	1.52
1	A	533	GLY	CA-C	5.71	1.57	1.51
1	A	705	PHE	N-CA	5.56	1.50	1.46
1	A	659	ILE	CA-C	-5.31	1.45	1.52
1	A	738	THR	N-CA	5.28	1.52	1.46
1	A	267	PRO	N-CA	-5.07	1.40	1.47
1	A	664	MET	CA-C	5.03	1.59	1.52
1	A	557	GLU	CA-CB	5.02	1.59	1.52

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	146	PRO	CA-C-N	-7.07	113.10	120.38
1	A	146	PRO	C-N-CA	-7.07	113.10	120.38
1	A	581	GLY	CA-C-N	5.49	126.19	119.99
1	A	581	GLY	C-N-CA	5.49	126.19	119.99
1	A	509	MET	CB-CA-C	-5.44	100.76	109.08
1	A	659	ILE	N-CA-C	-5.38	105.88	111.58
1	A	514	LYS	CB-CG-CD	-5.26	99.19	111.30
1	A	428	LEU	N-CA-C	-5.06	106.40	112.58

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	5498	0	5356	37	1
2	B	28	0	25	0	0
2	C	28	0	25	0	0
2	D	28	0	25	0	0
3	E	50	0	43	0	1
4	A	42	0	39	1	0
5	A	38	0	28	0	0
6	A	2	0	0	0	0
7	A	1	0	0	0	0
8	A	1	0	0	0	0
9	A	487	0	0	7	0
All	All	6203	0	5541	37	1

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.

All (37) 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:659:ILE:O	1:A:663[B]:MET:HG3	1.90	0.72
1:A:612:TYR:CZ	1:A:616:MET:HG3	2.33	0.63
1:A:655:LYS:HD2	1:A:655:LYS:N	2.13	0.61
1:A:617:LYS:NZ	9:A:1242:HOH:O	2.35	0.58
1:A:463[B]:ARG:HG2	1:A:463[B]:ARG:HH21	1.68	0.57
1:A:506:PHE:CB	1:A:509:MET:HG3	2.35	0.56
1:A:90:PHE:CE2	1:A:94:LYS:HE2	2.42	0.54
1:A:443[A]:GLN:HG2	9:A:1380[A]:HOH:O	2.09	0.52
1:A:155:SER:O	1:A:156:ASP:HB2	2.11	0.50
1:A:623:LYS:NZ	9:A:1361:HOH:O	2.45	0.50
1:A:659:ILE:HG22	1:A:663[B]:MET:SD	2.52	0.50
1:A:653:PHE:O	1:A:655:LYS:HD2	2.13	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:80:ILE:HD12	1:A:88:GLN:HG2	1.95	0.48
1:A:194:ILE:HD13	1:A:329:VAL:HG11	1.96	0.48
1:A:101:LYS:HG2	9:A:1239:HOH:O	2.14	0.47
1:A:177:VAL:HG12	1:A:188:LEU:HD21	1.96	0.47
1:A:169:MET:HA	1:A:344:MET:O	2.16	0.46
1:A:325:VAL:HB	1:A:326:PRO:HD2	1.98	0.45
1:A:58:MET:CE	1:A:586:GLU:HG2	2.46	0.45
1:A:412:PRO:HA	1:A:589[A]:ASN:OD1	2.17	0.45
1:A:413:ARG:N	1:A:589[A]:ASN:OD1	2.44	0.45
1:A:308:LYS:NZ	9:A:1350:HOH:O	2.50	0.44
1:A:504:PRO:HG3	1:A:511:ARG:NH1	2.32	0.44
1:A:320:ARG:HD2	9:A:1352:HOH:O	2.17	0.43
1:A:469:LEU:O	1:A:595:PHE:HA	2.18	0.43
1:A:551:LEU:HD22	1:A:556:TYR:HB2	2.00	0.43
1:A:58:MET:HG3	1:A:585:PHE:CD1	2.53	0.43
1:A:246:TRP:CD1	4:A:807:NAG:H83	2.53	0.43
1:A:591:ILE:HG12	9:A:1014:HOH:O	2.18	0.43
1:A:171:GLU:HA	1:A:342:VAL:O	2.19	0.42
1:A:463[B]:ARG:HG2	1:A:463[B]:ARG:NH2	2.33	0.42
1:A:103:PHE:O	1:A:403:GLY:HA3	2.20	0.41
1:A:198:GLY:O	1:A:223:LYS:HE2	2.20	0.41
1:A:205:TYR:CE2	1:A:254:GLN:HB3	2.56	0.41
1:A:444:GLU:HA	1:A:444:GLU:OE1	2.20	0.41
1:A:654:ASP:C	1:A:654:ASP:OD1	2.65	0.40
1:A:92:LEU:O	1:A:96:ILE:HG12	2.21	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:276:GLU:OE1	3:E:3:BMA:O2[2_555]	2.17	0.03

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	692/739 (94%)	672 (97%)	19 (3%)	1 (0%)	48	40

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	382	VAL

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	588/629 (94%)	575 (98%)	13 (2%)	45	42

All (13) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	122	LYS
1	A	189	GLU
1	A	303	GLN
1	A	443[A]	GLN
1	A	443[B]	GLN
1	A	537	TYR
1	A	550	PRO
1	A	557	GLU
1	A	586	GLU
1	A	589[A]	ASN
1	A	589[B]	ASN
1	A	600	TYR
1	A	655	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	260	ASN
1	A	620	GLN
1	A	667	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

10 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	B	1	2,1	14,14,15	0.88	0	17,19,21	1.71	4 (23%)
2	NAG	B	2	2	14,14,15	0.78	1 (7%)	17,19,21	2.24	8 (47%)
2	NAG	C	1	2,1	14,14,15	1.06	1 (7%)	17,19,21	1.19	2 (11%)
2	NAG	C	2	2	14,14,15	0.56	0	17,19,21	2.11	6 (35%)
2	NAG	D	1	2,1	14,14,15	1.09	1 (7%)	17,19,21	1.51	4 (23%)
2	NAG	D	2	2	14,14,15	0.87	0	17,19,21	1.70	6 (35%)
3	NAG	E	1	3,1	14,14,15	0.90	1 (7%)	17,19,21	1.89	5 (29%)
3	NAG	E	2	3	14,14,15	0.73	0	17,19,21	1.53	3 (17%)
3	BMA	E	3	3	11,11,12	0.57	0	15,15,17	1.23	2 (13%)
3	MAN	E	4	3	11,11,12	0.88	0	15,15,17	1.51	1 (6%)

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	B	1	2,1	-	2/6/23/26	0/1/1/1
2	NAG	B	2	2	-	2/6/23/26	0/1/1/1
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
2	NAG	D	1	2,1	-	0/6/23/26	0/1/1/1
2	NAG	D	2	2	-	0/6/23/26	0/1/1/1
3	NAG	E	1	3,1	-	0/6/23/26	0/1/1/1
3	NAG	E	2	3	-	0/6/23/26	0/1/1/1
3	BMA	E	3	3	-	0/2/19/22	0/1/1/1
3	MAN	E	4	3	-	2/2/19/22	0/1/1/1

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	1	NAG	C1-C2	2.28	1.55	1.52
2	B	2	NAG	O5-C1	-2.08	1.40	1.43
2	D	1	NAG	C1-C2	2.05	1.55	1.52
3	E	1	NAG	O3-C3	-2.05	1.37	1.43

All (41) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	2	NAG	C1-O5-C5	4.98	118.86	112.19
2	B	2	NAG	O5-C1-C2	-4.56	104.24	111.29
3	E	1	NAG	C1-O5-C5	4.26	117.89	112.19
2	B	2	NAG	C1-C2-N2	3.74	116.32	110.43
2	C	2	NAG	O3-C3-C4	-3.51	102.10	110.38
2	B	2	NAG	O6-C6-C5	-3.47	99.52	111.33
2	B	1	NAG	O5-C5-C6	3.27	114.02	107.66
2	D	2	NAG	C3-C4-C5	-3.18	104.46	110.23
2	B	2	NAG	C1-O5-C5	3.17	116.43	112.19
2	B	1	NAG	O5-C1-C2	-3.16	106.40	111.29
2	B	1	NAG	O4-C4-C5	-3.15	101.56	109.32
2	C	2	NAG	O6-C6-C5	-2.95	101.30	111.33
3	E	1	NAG	O5-C5-C6	2.91	113.33	107.66
2	D	1	NAG	C8-C7-N2	2.79	120.74	116.12
3	E	2	NAG	C1-C2-N2	2.76	114.79	110.43
2	D	1	NAG	O7-C7-N2	-2.76	117.10	121.98
2	C	2	NAG	C6-C5-C4	-2.74	106.29	113.02
3	E	1	NAG	C6-C5-C4	-2.72	106.35	113.02

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	2	NAG	O5-C5-C4	2.71	117.43	110.83
2	D	2	NAG	O4-C4-C5	2.63	115.79	109.32
3	E	1	NAG	O5-C1-C2	-2.56	107.34	111.29
3	E	2	NAG	O4-C4-C5	-2.52	103.12	109.32
2	D	1	NAG	O4-C4-C3	-2.49	104.50	110.38
2	D	2	NAG	O6-C6-C5	-2.45	102.98	111.33
3	E	1	NAG	O5-C5-C4	-2.44	104.88	110.83
2	B	2	NAG	O3-C3-C2	-2.42	104.37	109.40
2	B	2	NAG	O5-C5-C4	2.42	116.72	110.83
3	E	3	BMA	O5-C5-C6	-2.39	103.00	107.66
3	E	2	NAG	C6-C5-C4	-2.34	107.27	113.02
3	E	4	MAN	O3-C3-C4	-2.34	104.87	110.38
2	B	2	NAG	C6-C5-C4	-2.33	107.29	113.02
2	B	1	NAG	C1-O5-C5	2.19	115.11	112.19
2	D	2	NAG	C4-C3-C2	-2.16	107.86	111.02
3	E	3	BMA	O3-C3-C2	-2.14	105.69	110.05
2	C	2	NAG	O4-C4-C5	2.13	114.56	109.32
2	D	2	NAG	C2-N2-C7	-2.11	120.07	122.90
2	B	2	NAG	C4-C3-C2	2.11	114.11	111.02
2	C	1	NAG	O4-C4-C3	-2.09	105.45	110.38
2	D	1	NAG	C2-N2-C7	-2.08	120.11	122.90
2	D	2	NAG	O3-C3-C4	-2.06	105.51	110.38
2	C	1	NAG	C8-C7-N2	2.03	119.48	116.12

There are no chirality outliers.

All (8) torsion outliers are listed below:

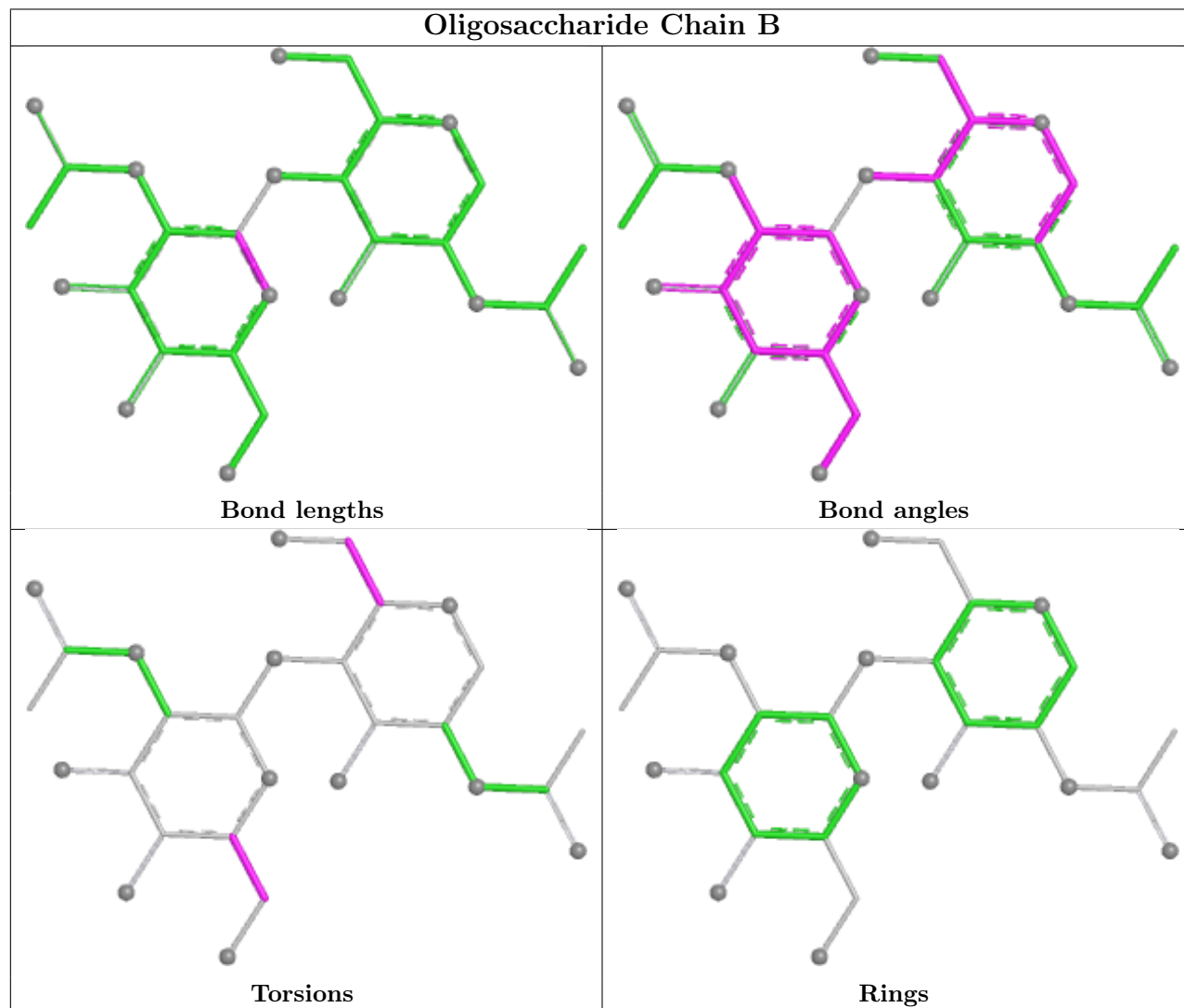
Mol	Chain	Res	Type	Atoms
2	B	2	NAG	C4-C5-C6-O6
2	B	1	NAG	C4-C5-C6-O6
2	B	1	NAG	O5-C5-C6-O6
2	C	2	NAG	C4-C5-C6-O6
2	B	2	NAG	O5-C5-C6-O6
3	E	4	MAN	C4-C5-C6-O6
3	E	4	MAN	O5-C5-C6-O6
2	C	2	NAG	O5-C5-C6-O6

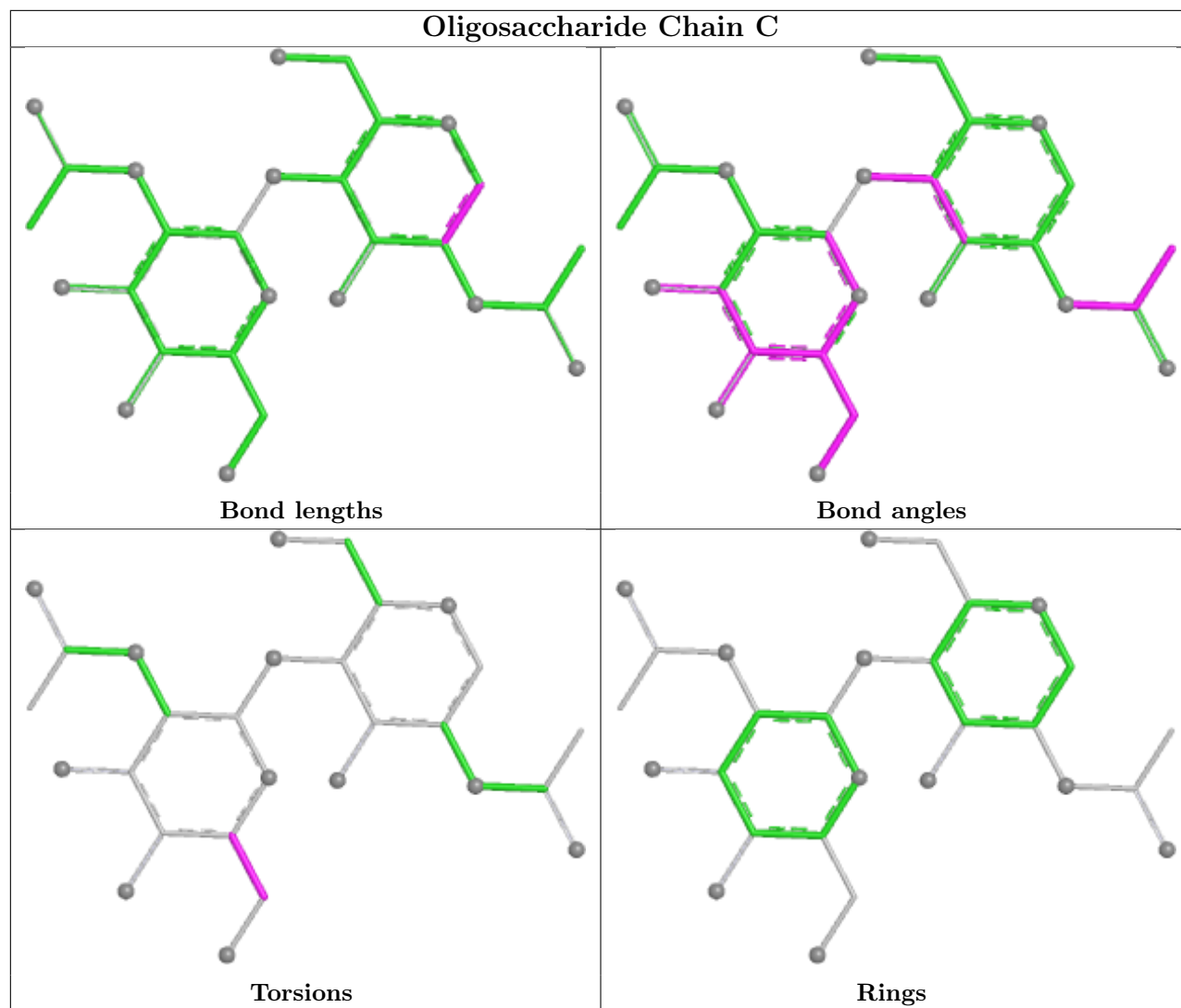
There are no ring outliers.

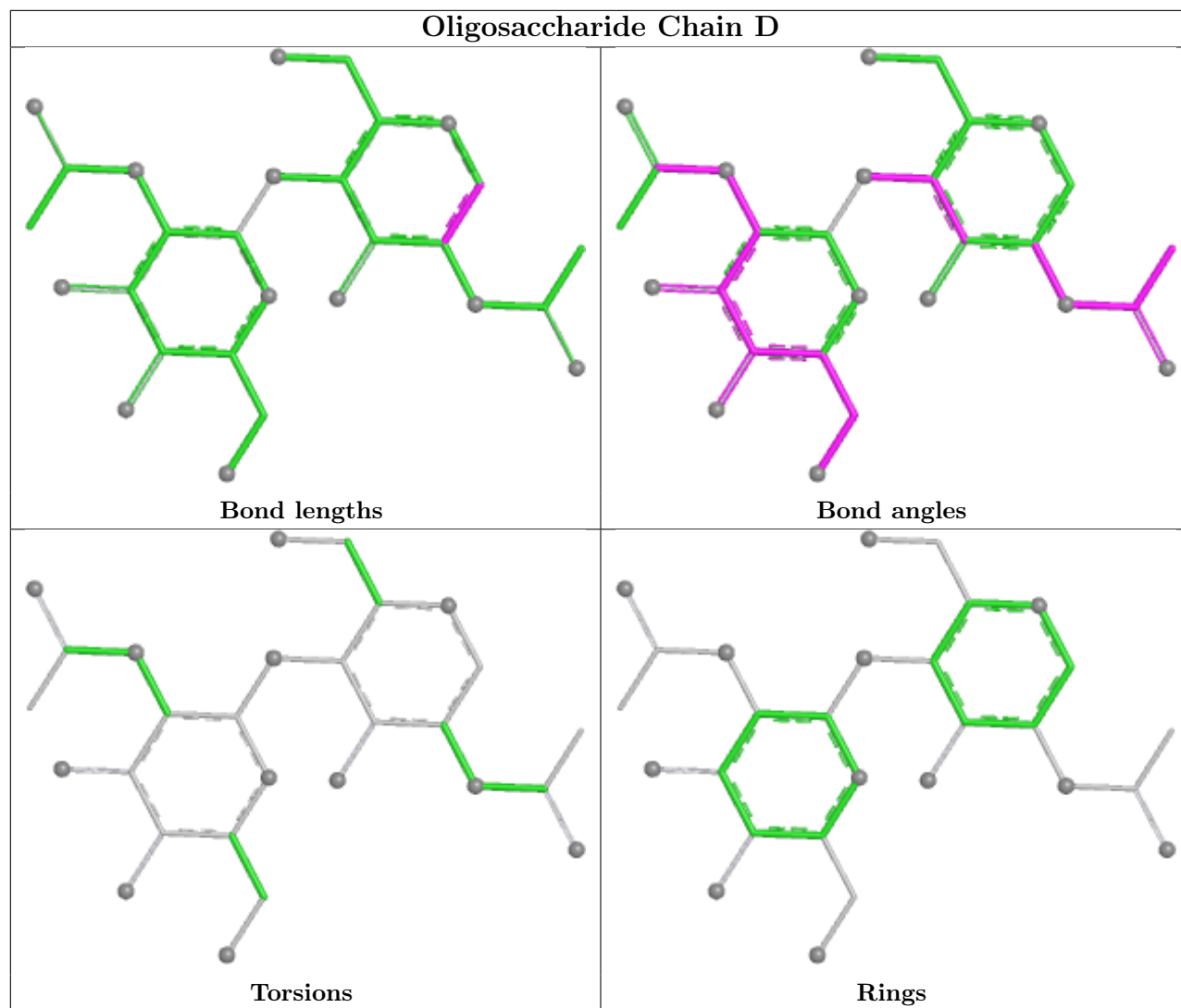
1 monomer is involved in 1 short contact:

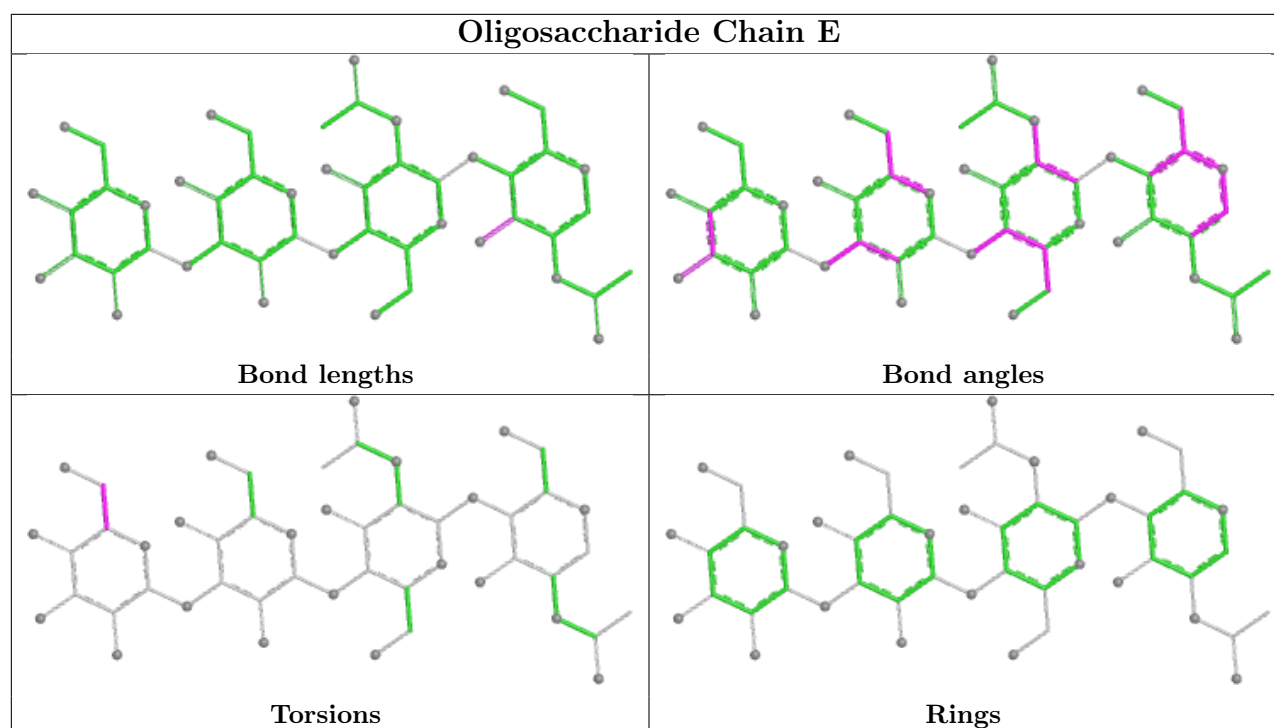
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	E	3	BMA	0	1

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 8 ligands modelled in this entry, 4 are monoatomic - leaving 4 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
4	NAG	A	806	1	14,14,15	0.58	0	17,19,21	2.59	3 (17%)
4	NAG	A	807	1	14,14,15	1.16	3 (21%)	17,19,21	3.02	10 (58%)
4	NAG	A	803	1	14,14,15	1.01	0	17,19,21	2.05	7 (41%)
5	J21	A	814	6	38,38,38	0.96	0	49,49,49	1.69	15 (30%)

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	NAG	A	806	1	-	2/6/23/26	0/1/1/1
4	NAG	A	807	1	-	2/6/23/26	0/1/1/1
4	NAG	A	803	1	-	2/6/23/26	0/1/1/1
5	J21	A	814	6	-	3/40/40/40	0/1/1/1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	807	NAG	C1-C2	2.37	1.55	1.52
4	A	807	NAG	O4-C4	2.24	1.48	1.43
4	A	807	NAG	C3-C2	2.09	1.56	1.52

All (35) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	806	NAG	C1-O5-C5	9.18	124.49	112.19
4	A	807	NAG	C1-O5-C5	5.53	119.59	112.19
4	A	807	NAG	O5-C1-C2	-5.07	103.44	111.29
4	A	807	NAG	O3-C3-C4	-4.71	99.27	110.38
4	A	807	NAG	O7-C7-C8	-4.54	113.98	122.05
4	A	803	NAG	O5-C5-C6	4.18	115.81	107.66
5	A	814	J21	O8-C19-C20	3.92	116.67	107.90
4	A	803	NAG	O6-C6-C5	3.82	124.33	111.33
4	A	807	NAG	C8-C7-N2	3.32	121.62	116.12
4	A	806	NAG	O3-C3-C2	-3.18	102.79	109.40
4	A	807	NAG	C3-C4-C5	-3.12	104.57	110.23
4	A	807	NAG	O3-C3-C2	3.03	115.70	109.40
5	A	814	J21	C18-C13-C12	-2.94	120.93	126.24
4	A	807	NAG	O4-C4-C3	2.77	116.90	110.38
5	A	814	J21	C19-C20-N3	2.73	118.31	111.82
5	A	814	J21	O9-C21-C22	-2.69	117.26	122.05
5	A	814	J21	C14-C13-C18	2.63	121.67	118.21
5	A	814	J21	O8-C18-C13	2.61	122.70	116.97
5	A	814	J21	C17-C18-C13	-2.59	116.53	121.39
4	A	803	NAG	C1-C2-N2	-2.54	106.43	110.43
5	A	814	J21	C8-C6-N1	-2.46	106.03	110.91
5	A	814	J21	C14-C15-C16	-2.35	116.37	119.18
4	A	807	NAG	O5-C5-C6	2.31	112.15	107.66
4	A	803	NAG	O5-C5-C4	-2.30	105.22	110.83
4	A	807	NAG	O4-C4-C5	2.29	114.97	109.32
4	A	803	NAG	O7-C7-C8	-2.29	117.98	122.05
5	A	814	J21	C6-N1-C5	2.26	125.83	120.64

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	814	J21	O6-C7-O5	-2.22	119.04	124.08
4	A	803	NAG	C4-C3-C2	2.22	114.27	111.02
5	A	814	J21	O3-C4-C3	2.16	120.82	114.00
5	A	814	J21	C2-C1-N	2.09	115.05	110.91
5	A	814	J21	C19-O8-C18	2.08	122.71	117.69
4	A	806	NAG	O4-C4-C3	2.05	115.22	110.38
4	A	803	NAG	O4-C4-C5	2.04	114.34	109.32
5	A	814	J21	C2-C1-C	-2.02	105.56	110.35

There are no chirality outliers.

All (9) torsion outliers are listed below:

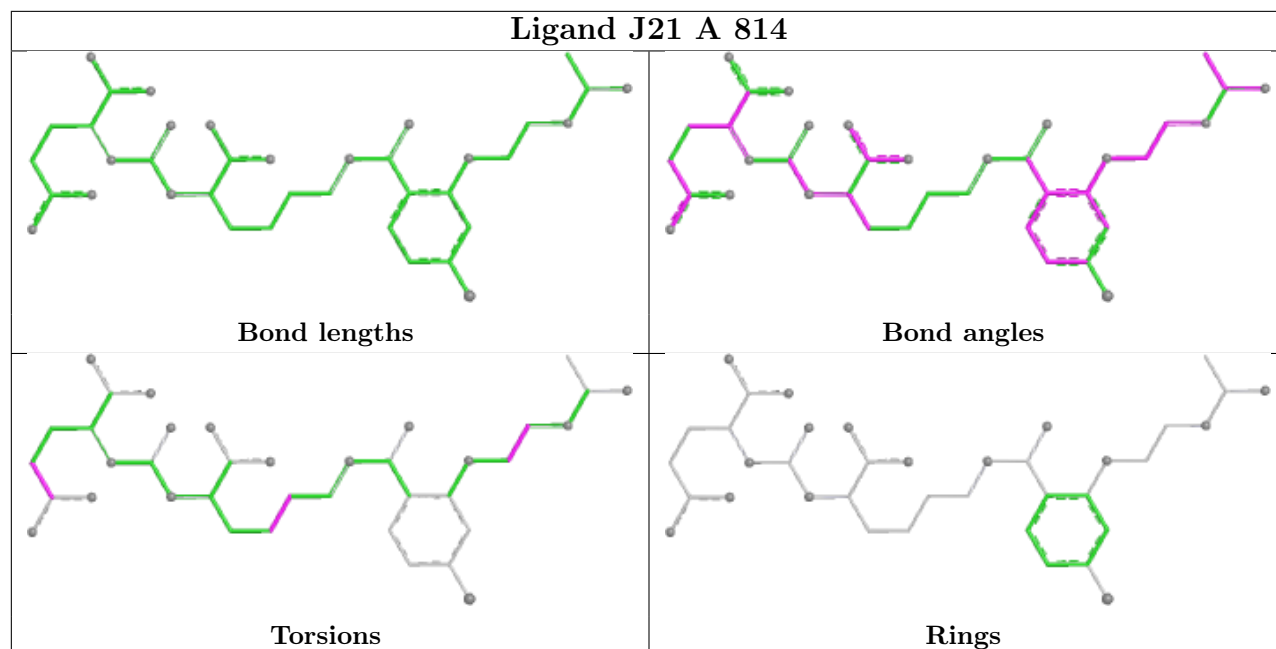
Mol	Chain	Res	Type	Atoms
4	A	806	NAG	O5-C5-C6-O6
4	A	806	NAG	C4-C5-C6-O6
4	A	803	NAG	C4-C5-C6-O6
5	A	814	J21	O8-C19-C20-N3
4	A	807	NAG	O5-C5-C6-O6
5	A	814	J21	C11-C10-C9-C8
4	A	807	NAG	C4-C5-C6-O6
4	A	803	NAG	O5-C5-C6-O6
5	A	814	J21	C2-C3-C4-O3

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	807	NAG	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



5.7 Other polymers [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	689/739 (93%)	-0.05	16 (2%) 61 65	12, 22, 42, 68	7 (1%)

All (16) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	548	GLY	5.6
1	A	656	SER	3.4
1	A	279	TYR	2.9
1	A	652	ASP	2.8
1	A	657	ASN	2.6
1	A	506	PHE	2.5
1	A	155	SER	2.5
1	A	505	GLU	2.5
1	A	654	ASP	2.4
1	A	237	PRO	2.3
1	A	655	LYS	2.3
1	A	153	ASN	2.3
1	A	334	THR	2.2
1	A	136	ASN	2.1
1	A	134	ASP	2.0
1	A	131	ILE	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.

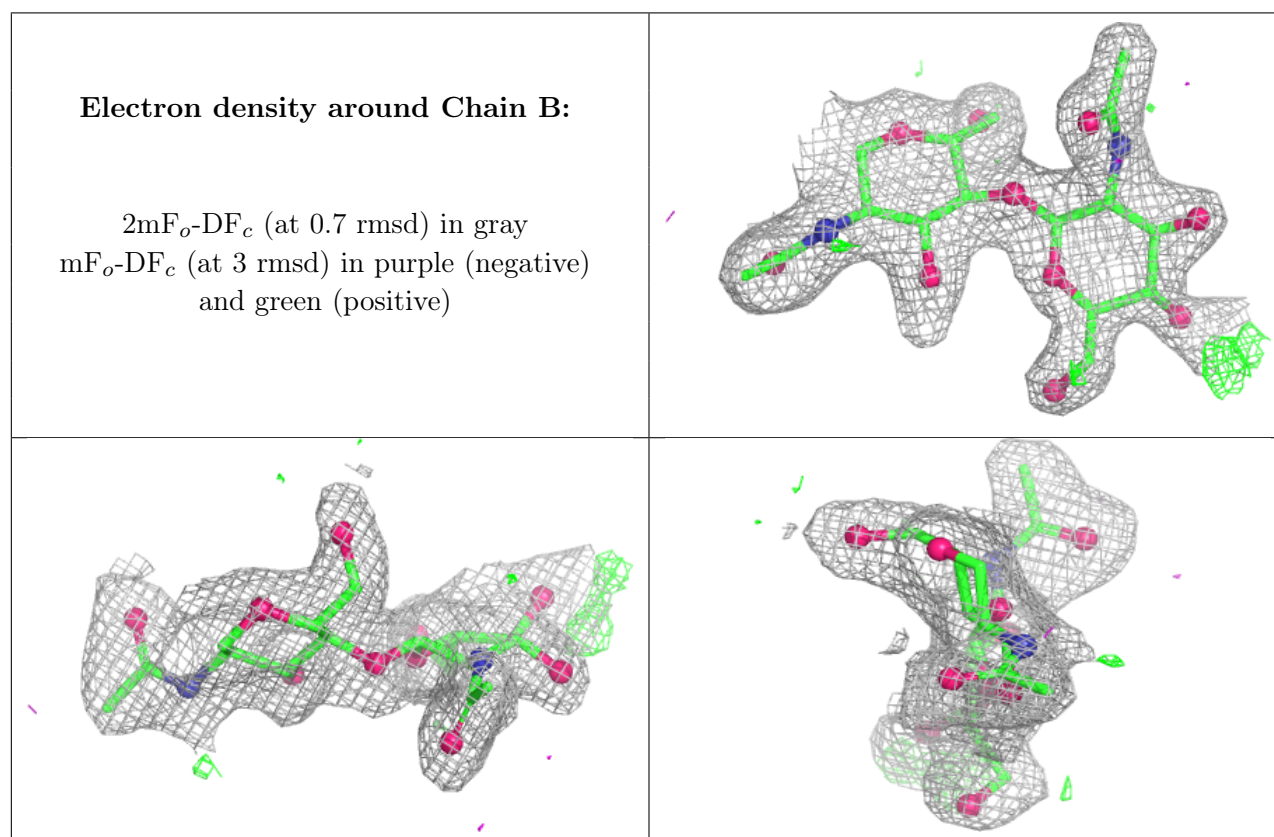
6.3 Carbohydrates [i](#)

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.

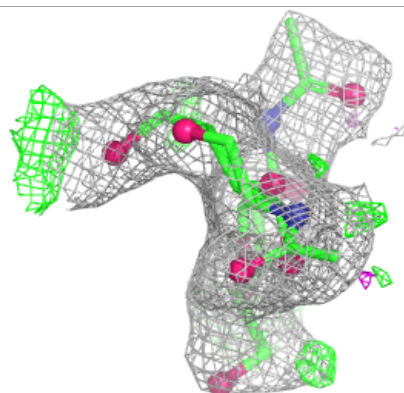
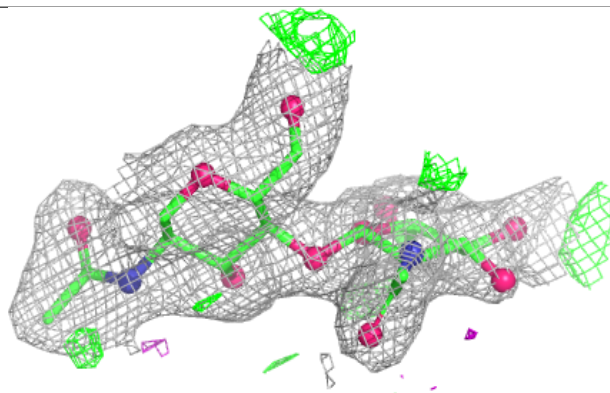
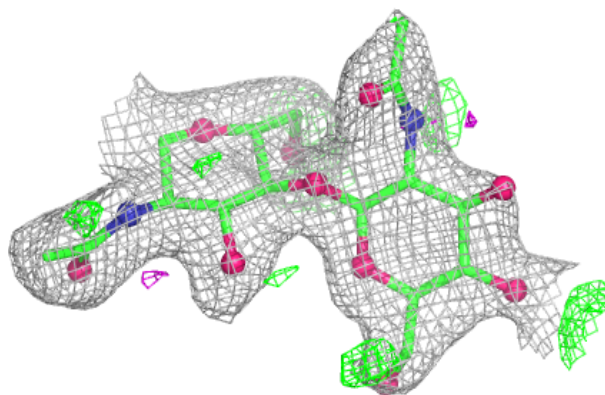
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	NAG	C	2	14/15	0.78	0.14	48,51,60,64	0
2	NAG	B	2	14/15	0.80	0.14	33,45,54,58	0
3	MAN	E	4	11/12	0.86	0.12	45,48,51,52	0
3	BMA	E	3	11/12	0.87	0.11	39,41,46,48	0
3	NAG	E	2	14/15	0.87	0.13	34,42,49,58	0
2	NAG	D	2	14/15	0.89	0.10	34,38,43,50	0
2	NAG	C	1	14/15	0.89	0.10	31,37,42,46	0
3	NAG	E	1	14/15	0.93	0.08	17,26,35,47	0
2	NAG	D	1	14/15	0.93	0.08	24,27,30,33	0
2	NAG	B	1	14/15	0.94	0.09	28,36,46,49	0

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

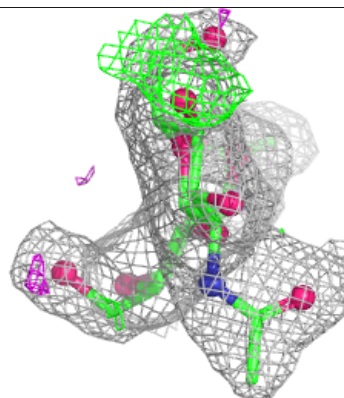
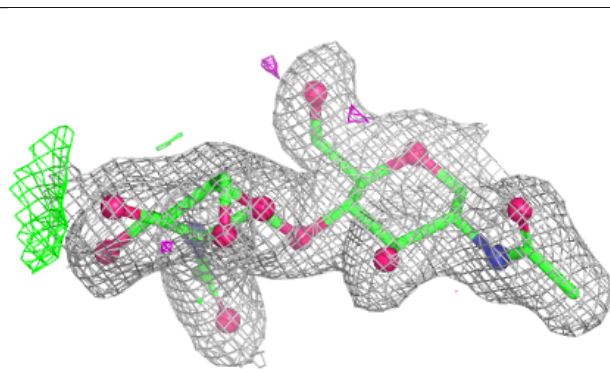
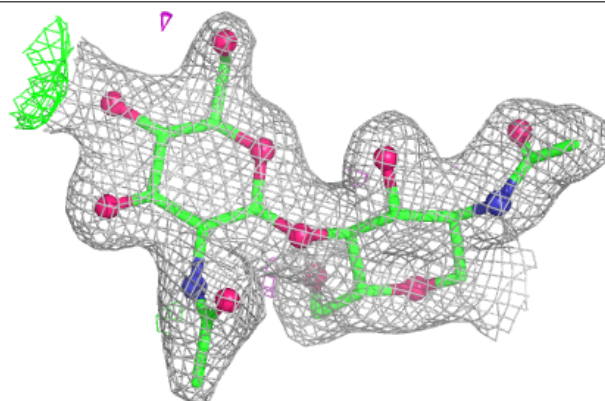


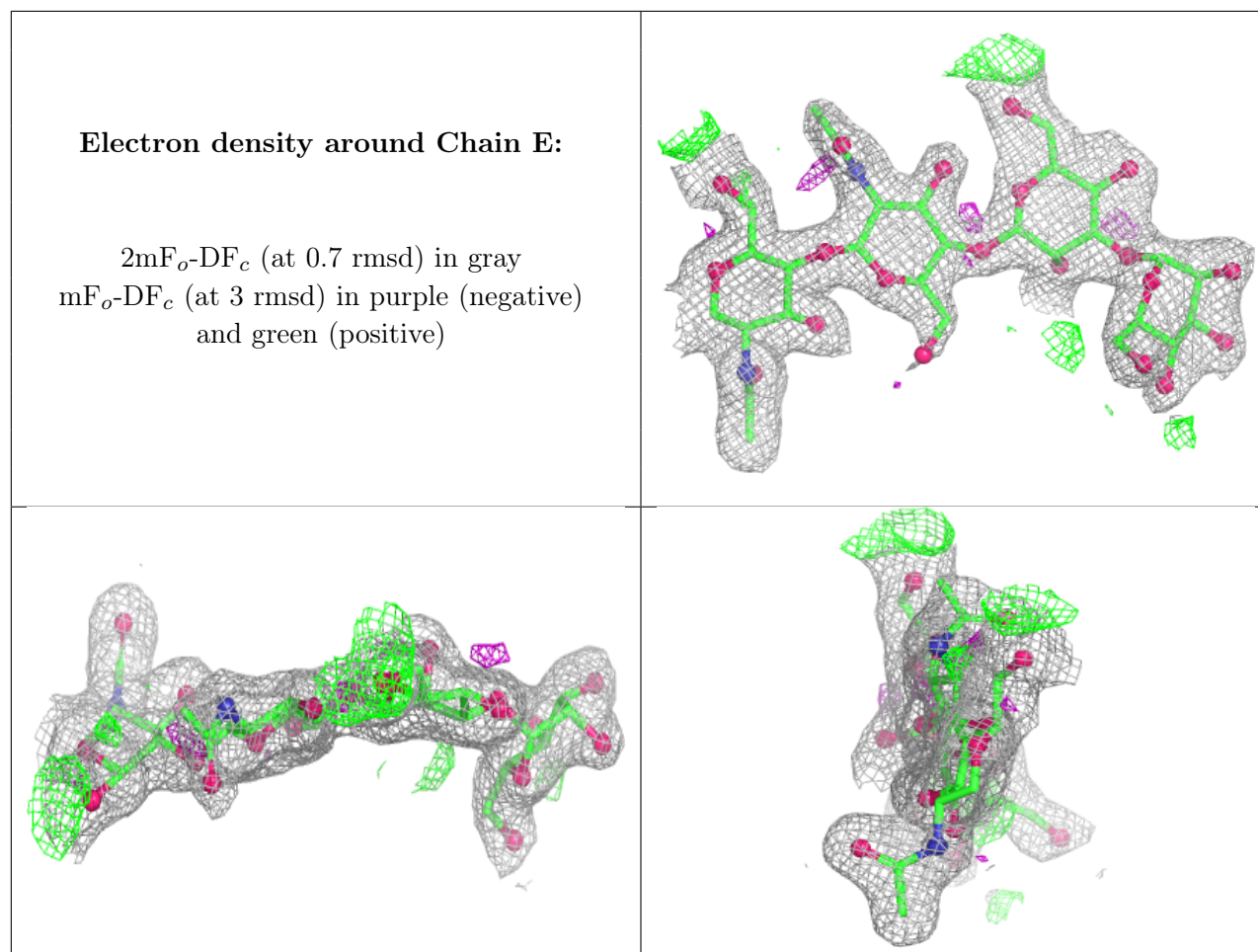
Electron density around Chain C:

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

**Electron density around Chain D:**

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





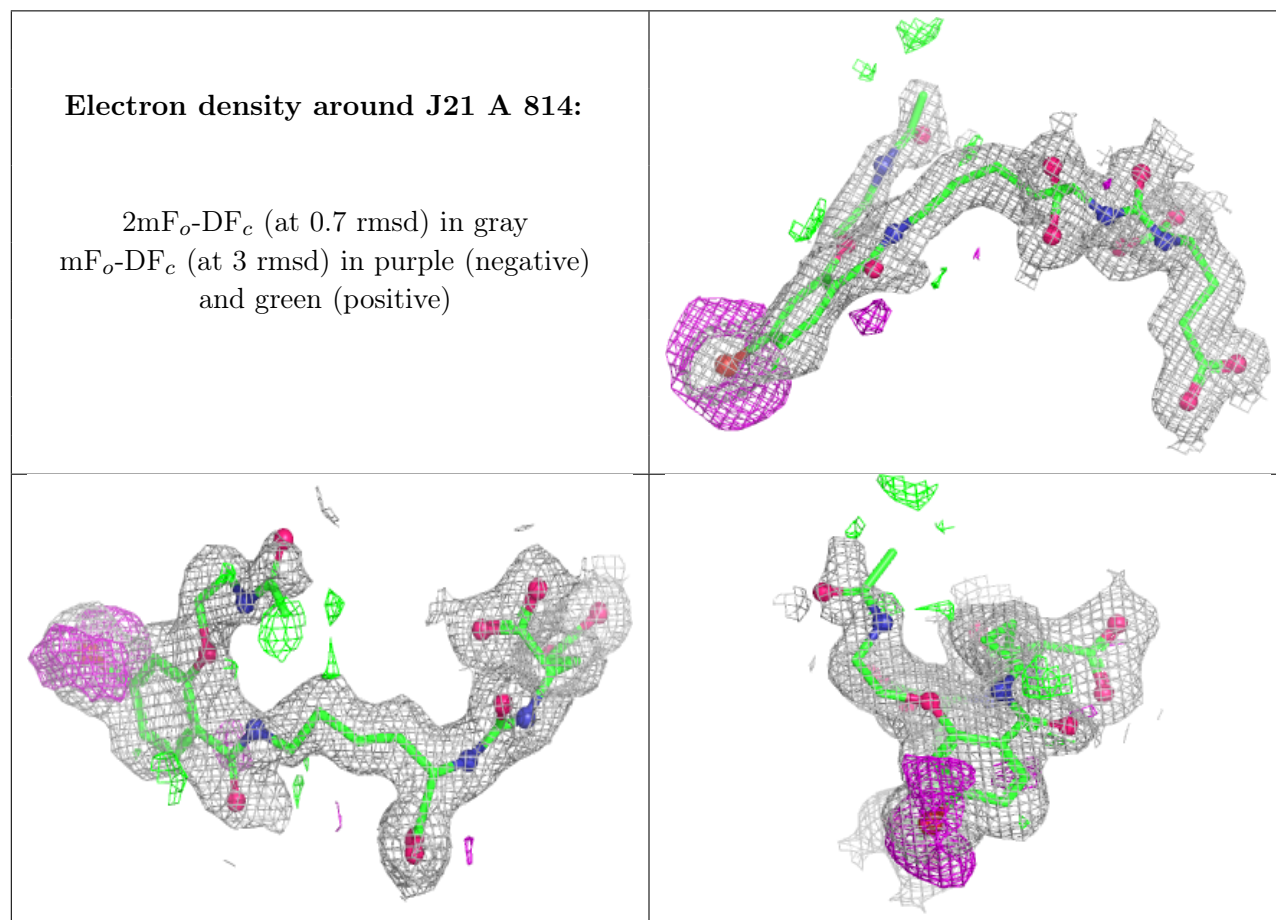
6.4 Ligands ⓘ

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	NAG	A	806	14/15	0.76	0.14	54,60,67,68	0
4	NAG	A	803	14/15	0.77	0.17	41,52,69,78	0
4	NAG	A	807	14/15	0.87	0.12	31,44,50,51	0
5	J21	A	814	38/38	0.95	0.11	13,26,72,81	0
6	ZN	A	815	1/1	1.00	0.02	17,17,17,17	0
6	ZN	A	816	1/1	1.00	0.02	17,17,17,17	0
7	CL	A	817	1/1	1.00	0.03	17,17,17,17	0
8	CA	A	818	1/1	1.00	0.01	14,14,14,14	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.



6.5 Other polymers ⓘ

There are no such residues in this entry.