



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 07:04 PM UTC

PDB ID : 4NGT / pdb_00004ngt
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 : 2.31 Å(reported)

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

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A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

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

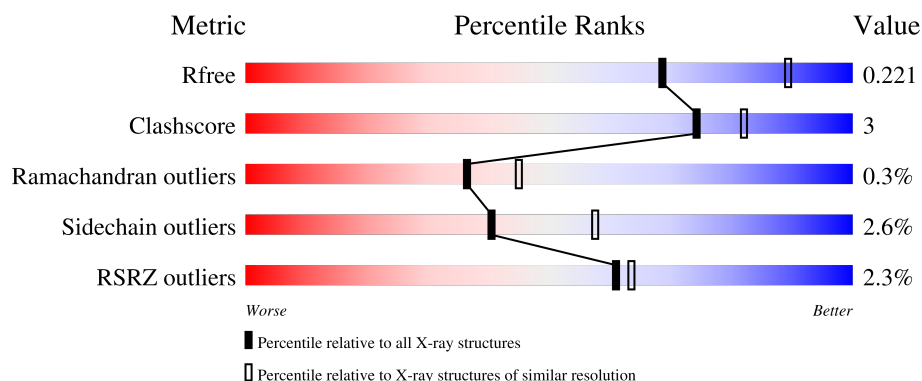
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

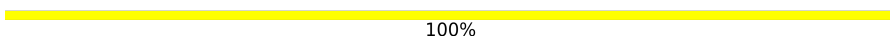
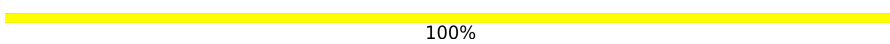
The reported resolution of this entry is 2.31 Å.

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	7754 (2.34-2.30)
Clashscore	190562	8383 (2.34-2.30)
Ramachandran outliers	187476	8303 (2.34-2.30)
Sidechain outliers	187428	8303 (2.34-2.30)
RSRZ outliers	180081	7760 (2.34-2.30)

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

Mol	Chain	Length	Quality of chain
1	A	739	 2% 81% 12% 6%
2	B	2	 100%
3	C	3	 100%

2 Entry composition

There are 10 unique types of molecules in this entry. The entry contains 5985 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	692	Total	C	N	O	S	0	1	0
			5494	3533	921	1022	18			

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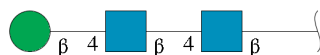
Chain	Residue	Modelled	Actual	Comment	Reference
A	39	PHE	-	expression tag	UNP Q04609
A	40	GLN	-	expression tag	UNP Q04609
A	41	GLY	-	expression tag	UNP Q04609
A	42	ARG	-	expression tag	UNP Q04609
A	43	SER	-	expression tag	UNP Q04609

- 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			

- 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	C	3	Total	C	N	O	0	0	0
			39	22	2	15			

- 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		
4	A	1	Total	C	N	O	0	0
			14	8	1	5		

- Molecule 5 is ZINC ION (CCD ID: ZN) (formula: Zn).

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

- Molecule 6 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

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

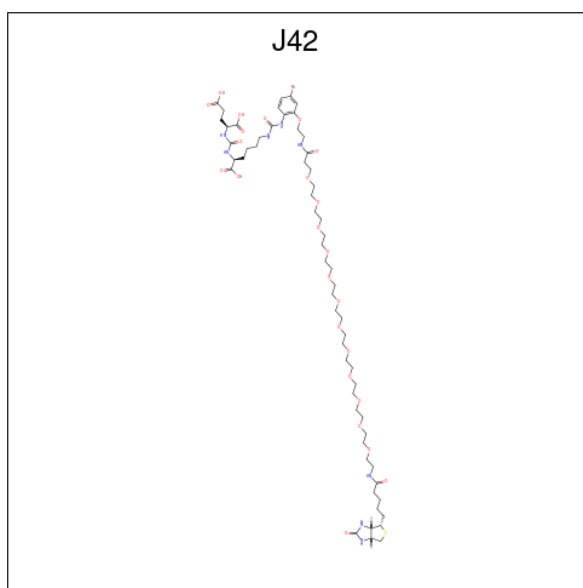
- Molecule 7 is CALCIUM ION (CCD ID: CA) (formula: Ca).

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

- Molecule 8 is SODIUM ION (CCD ID: NA) (formula: Na).

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

- Molecule 9 is N-{[(1S)-5-({[4-bromo-2-({4,44-dioxo-48-[(3aS,4S,6aR)-2-oxohexahydro-1H-thieno[3,4-d]imidazol-4-yl]-7,10,13,16,19,22,25,28,31,34,37,40-dodecaoxa-3,43-diazaoctatetracount-1-yl}oxy)phenyl]carbamoyl}amino)-1-carboxypentyl]carbamoyl}-L-glutamic acid (CCD ID: J42) (formula: C₅₈H₉₇BrN₈O₂₄S).

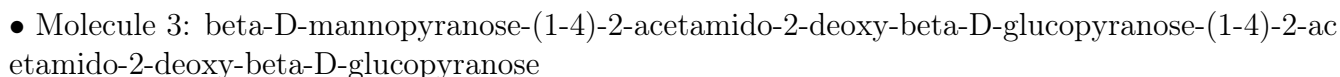
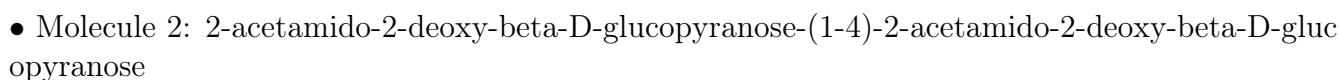


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
9	A	1	Total	Br	C	N	O	0	1
			78	2	46	10	20		

- Molecule 10 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
10	A	285	Total	O	0	0
			285	285		

- Molecule 1: Glutamate carboxypeptidase 2



4 Data and refinement statistics

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, α , β , γ	101.54Å 130.30Å 159.86Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	47.19 – 2.31 47.19 – 2.31	Depositor EDS
% Data completeness (in resolution range)	98.9 (47.19-2.31) 98.9 (47.19-2.31)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.21 (at 2.32Å)	Xtriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.176 , 0.223 0.176 , 0.221	Depositor DCC
R_{free} test set	2316 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	28.5	Xtriage
Anisotropy	0.205	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 48.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	5985	wwPDB-VP
Average B, all atoms (Å ²)	29.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.19% 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: ZN, J42, NAG, NA, CA, CL, 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	1.33	15/5651 (0.3%)	1.18	14/7663 (0.2%)

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	A	0	1

All (15) 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	-7.88	1.41	1.53
1	A	106	ASP	C-O	-6.62	1.15	1.24
1	A	641	GLU	CA-C	-6.49	1.44	1.52
1	A	239	VAL	C-O	-6.09	1.17	1.24
1	A	738	THR	N-CA	5.99	1.53	1.46
1	A	749	VAL	N-CA	-5.50	1.39	1.46
1	A	585	PHE	C-O	-5.45	1.17	1.24
1	A	235	PHE	C-O	-5.41	1.17	1.24
1	A	636	VAL	N-CA	5.28	1.52	1.46
1	A	584	VAL	N-CA	-5.26	1.40	1.46
1	A	350	ASN	C-O	-5.17	1.17	1.23
1	A	627	VAL	N-CA	-5.12	1.40	1.46
1	A	479	LYS	C-O	-5.08	1.17	1.24
1	A	579	VAL	CA-CB	-5.06	1.48	1.54

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	146	PRO	CA-C-N	-9.45	110.64	120.38
1	A	146	PRO	C-N-CA	-9.45	110.64	120.38
1	A	147	PRO	CA-C-N	-6.05	114.15	120.38
1	A	147	PRO	C-N-CA	-6.05	114.15	120.38
1	A	661	LEU	N-CA-C	-6.05	104.61	111.14
1	A	692	TYR	N-CA-C	5.98	118.16	108.41
1	A	549	TYR	CA-C-N	-5.94	112.89	119.19
1	A	549	TYR	C-N-CA	-5.94	112.89	119.19
1	A	706	PRO	N-CA-C	5.70	121.34	113.65
1	A	404	THR	N-CA-C	-5.53	105.16	111.07
1	A	299	TYR	N-CA-C	5.50	118.20	111.82
1	A	505	GLU	N-CA-C	5.34	118.97	112.23
1	A	457	GLU	N-CA-C	-5.12	104.81	112.54
1	A	66	LYS	N-CA-C	5.05	117.12	108.90

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	129	SER	Peptide

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	5494	0	5325	31	0
2	B	28	0	24	0	0
3	C	39	0	34	0	0
4	A	56	0	52	0	0
5	A	2	0	0	0	0
6	A	1	0	0	0	0
7	A	1	0	0	0	0
8	A	1	0	0	0	0
9	A	78	0	52	6	0
10	A	285	0	0	1	0
All	All	5985	0	5487	35	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.

All (35) 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)
9:A:815[A]:J42:O7	9:A:815[A]:J42:H6	1.62	0.97
1:A:443:GLN:HG2	10:A:1066:HOH:O	1.68	0.92
1:A:659:ILE:O	1:A:663[B]:MET:HG3	1.88	0.73
1:A:58:MET:CE	1:A:586:GLU:HG2	2.24	0.68
9:A:815[A]:J42:O7	9:A:815[A]:J42:C2	2.33	0.67
1:A:58:MET:HE1	1:A:586:GLU:HG2	1.78	0.64
1:A:541:TRP:HD1	9:A:815[B]:J42:BR	2.37	0.63
9:A:815[B]:J42:H6	9:A:815[B]:J42:O7	1.98	0.62
1:A:169:MET:HA	1:A:344:MET:O	2.08	0.54
1:A:129:SER:HA	1:A:139:PHE:O	2.10	0.51
1:A:506:PHE:CB	1:A:509:MET:HG3	2.40	0.51
1:A:148:PRO:HG2	1:A:151:TYR:CD1	2.46	0.51
1:A:155:SER:O	1:A:156:ASP:HB2	2.12	0.49
9:A:815[A]:J42:O6	9:A:815[A]:J42:C16	2.60	0.49
1:A:358:VAL:HB	1:A:420:SER:HB3	1.95	0.48
1:A:387:ASP:HA	1:A:388:PRO:HA	1.66	0.48
1:A:191:ASP:N	1:A:191:ASP:OD1	2.45	0.48
1:A:240:LYS:O	1:A:245:GLY:HA3	2.13	0.48
1:A:541:TRP:CD1	9:A:815[B]:J42:BR	3.23	0.45
1:A:612:TYR:CZ	1:A:616:MET:HG3	2.52	0.45
1:A:277:TYR:O	1:A:278:ALA:C	2.60	0.45
1:A:551:LEU:HD22	1:A:556:TYR:HB2	2.01	0.43
1:A:517:SER:HB2	1:A:694:PRO:HG3	2.01	0.43
1:A:345:HIS:O	1:A:346:ILE:HD13	2.19	0.42
1:A:325:VAL:HB	1:A:326:PRO:HD2	2.00	0.42
1:A:691:ILE:O	1:A:704:SER:HA	2.19	0.42
1:A:205:TYR:CE2	1:A:254:GLN:HB3	2.55	0.42
1:A:178:ASN:HB2	1:A:319:TRP:CE3	2.54	0.42
1:A:715:ILE:HD13	1:A:725:TRP:CE2	2.55	0.42
1:A:491:LYS:N	1:A:491:LYS:HD3	2.33	0.42
1:A:90:PHE:CZ	1:A:94:LYS:HD3	2.55	0.41
1:A:335:GLY:O	1:A:336:ASN:C	2.64	0.40
1:A:654:ASP:OD1	1:A:654:ASP:C	2.63	0.40
1:A:657:ASN:ND2	1:A:660:VAL:HG23	2.37	0.40
1:A:171:GLU:HA	1:A:342:VAL:O	2.22	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	689/739 (93%)	669 (97%)	18 (3%)	2 (0%)	36	45

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	335	GLY
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	583/629 (93%)	568 (97%)	15 (3%)	40	57

All (15) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	98	SER
1	A	122	LYS
1	A	138	ILE
1	A	189	GLU
1	A	303	GLN
1	A	338	SER
1	A	396	HIS
1	A	443	GLN
1	A	456	ILE

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Mol	Chain	Res	Type
1	A	465	ASP
1	A	507	SER
1	A	537	TYR
1	A	554	SER
1	A	557	GLU
1	A	600	TYR

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

Mol	Chain	Res	Type
1	A	95	GLN
1	A	578	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 ⓘ

5 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	1,2	14,14,15	1.68	3 (21%)	17,19,21	3.37	11 (64%)
2	NAG	B	2	2	14,14,15	0.96	0	17,19,21	2.35	8 (47%)
3	NAG	C	1	1,3	14,14,15	1.08	1 (7%)	17,19,21	1.58	2 (11%)
3	NAG	C	2	3	14,14,15	0.92	1 (7%)	17,19,21	1.54	3 (17%)
3	BMA	C	3	3	11,11,12	1.10	1 (9%)	15,15,17	1.95	7 (46%)

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	1,2	-	2/6/23/26	0/1/1/1
2	NAG	B	2	2	-	2/6/23/26	0/1/1/1
3	NAG	C	1	1,3	-	2/6/23/26	0/1/1/1
3	NAG	C	2	3	-	0/6/23/26	0/1/1/1
3	BMA	C	3	3	-	0/2/19/22	0/1/1/1

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	1	NAG	O5-C1	-3.77	1.37	1.43
2	B	1	NAG	O7-C7	-2.65	1.17	1.23
3	C	3	BMA	C4-C5	2.55	1.58	1.53
3	C	1	NAG	C2-N2	-2.46	1.42	1.46
3	C	2	NAG	O5-C1	-2.36	1.39	1.43
2	B	1	NAG	O3-C3	-2.19	1.37	1.43

All (31) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	1	NAG	C1-O5-C5	7.31	121.98	112.19
2	B	2	NAG	C1-O5-C5	5.09	119.01	112.19
2	B	1	NAG	O5-C5-C6	-4.84	98.24	107.66
2	B	1	NAG	O6-C6-C5	-4.36	96.47	111.33
3	C	1	NAG	C1-O5-C5	4.23	117.86	112.19
2	B	1	NAG	C8-C7-N2	4.14	122.99	116.12
2	B	1	NAG	O3-C3-C4	-3.99	100.96	110.38
2	B	1	NAG	O7-C7-N2	-3.53	115.75	121.98
2	B	1	NAG	C1-C2-N2	-3.46	104.98	110.43
2	B	2	NAG	O4-C4-C5	3.38	117.66	109.32
2	B	1	NAG	O5-C5-C4	3.33	118.94	110.83
2	B	2	NAG	O6-C6-C5	-3.27	100.18	111.33
3	C	3	BMA	O3-C3-C4	3.17	117.85	110.38
3	C	2	NAG	C1-O5-C5	3.16	116.42	112.19
2	B	1	NAG	C6-C5-C4	-3.05	105.52	113.02
3	C	1	NAG	O5-C1-C2	-3.03	106.60	111.29
2	B	1	NAG	O5-C1-C2	-2.93	106.76	111.29
2	B	2	NAG	O3-C3-C4	-2.87	103.62	110.38
2	B	2	NAG	C8-C7-N2	2.79	120.74	116.12

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	3	BMA	O4-C4-C3	-2.70	104.01	110.38
3	C	3	BMA	C3-C4-C5	2.66	115.06	110.23
3	C	2	NAG	O3-C3-C4	2.62	116.55	110.38
3	C	3	BMA	C6-C5-C4	2.58	119.36	113.02
2	B	2	NAG	O5-C5-C4	2.57	117.09	110.83
2	B	2	NAG	O7-C7-C8	-2.54	117.54	122.05
2	B	2	NAG	C6-C5-C4	-2.44	107.03	113.02
3	C	3	BMA	O6-C6-C5	2.37	119.39	111.33
3	C	3	BMA	C1-C2-C3	2.29	112.98	109.64
3	C	2	NAG	C1-C2-N2	-2.25	106.89	110.43
3	C	3	BMA	O5-C5-C4	-2.15	105.61	110.83
2	B	1	NAG	C2-N2-C7	-2.05	120.16	122.90

There are no chirality outliers.

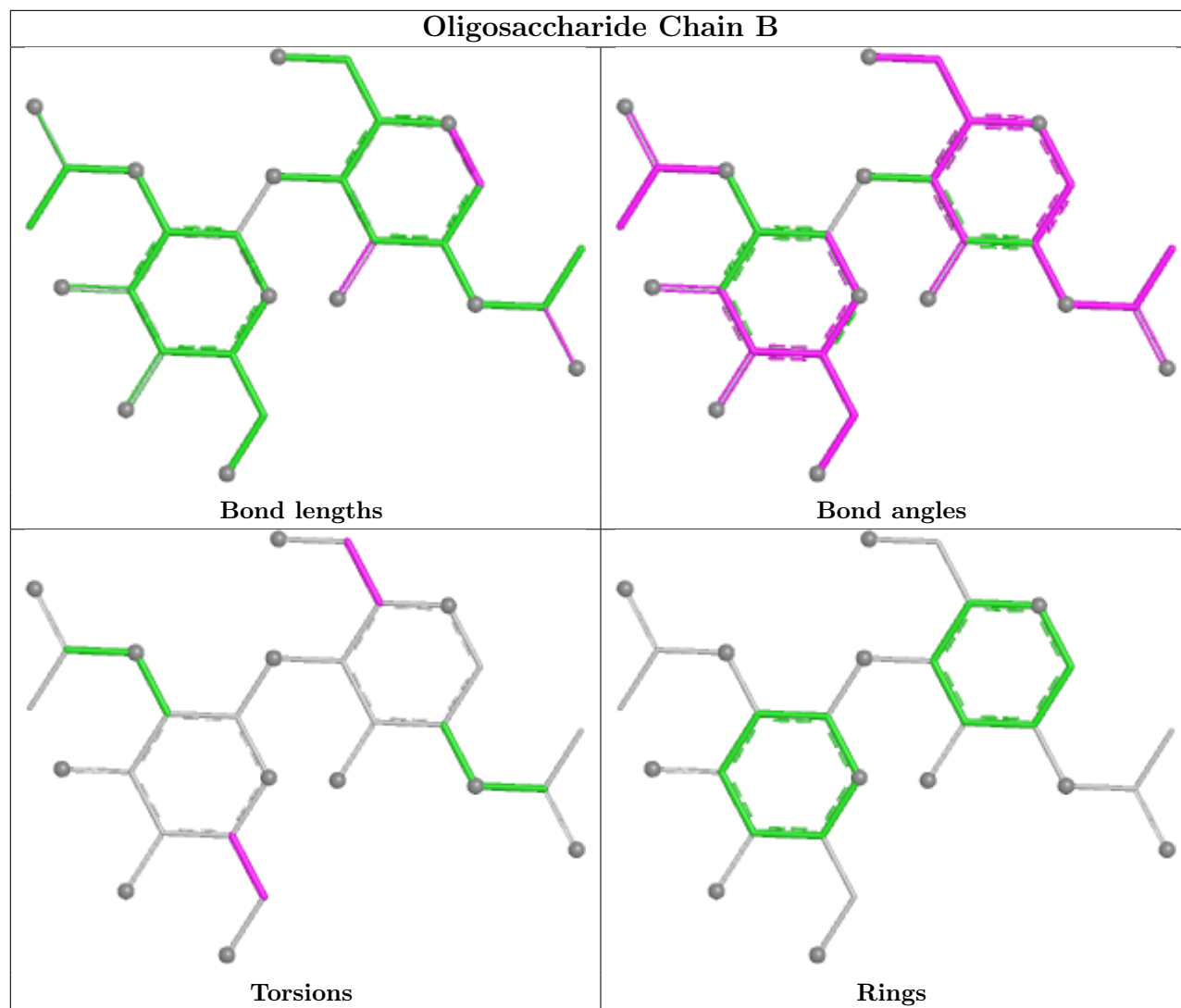
All (6) torsion outliers are listed below:

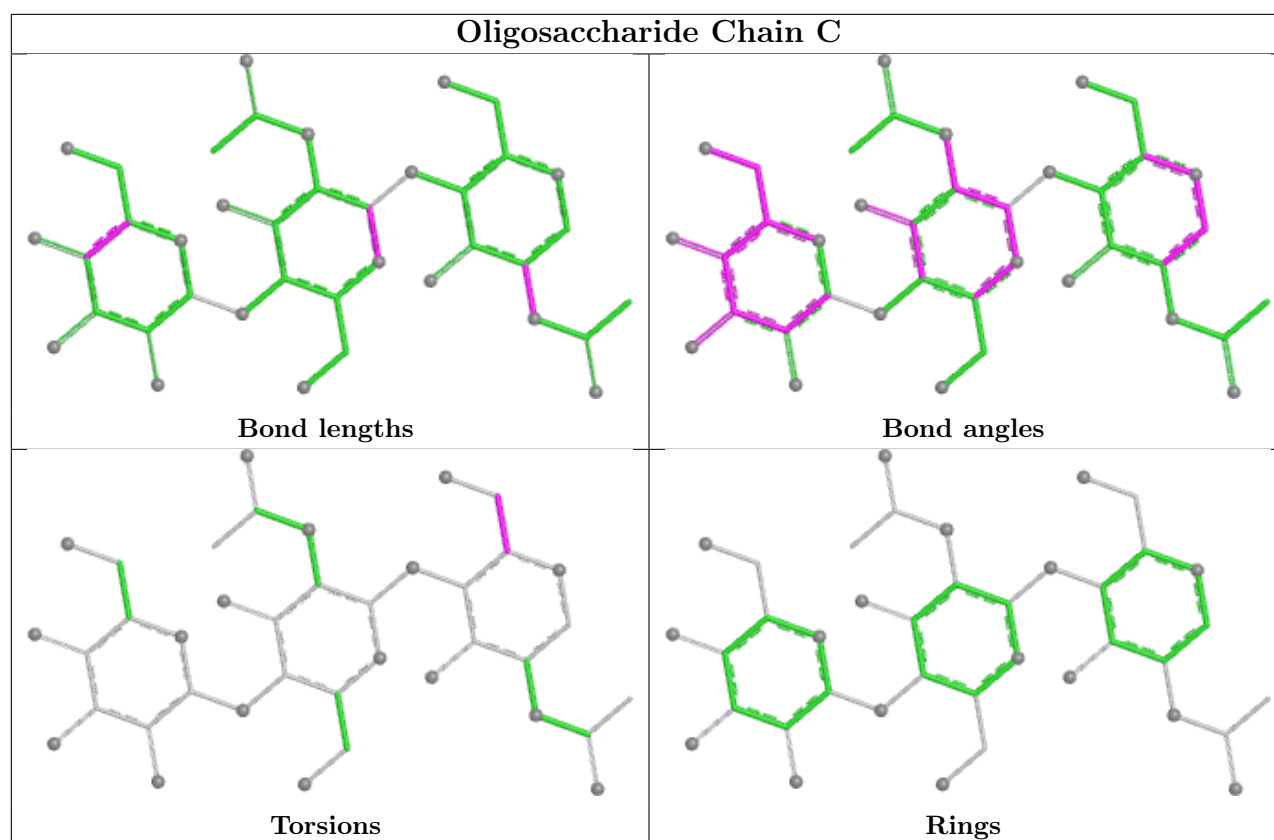
Mol	Chain	Res	Type	Atoms
2	B	1	NAG	O5-C5-C6-O6
2	B	1	NAG	C4-C5-C6-O6
2	B	2	NAG	C4-C5-C6-O6
3	C	1	NAG	C4-C5-C6-O6
3	C	1	NAG	O5-C5-C6-O6
2	B	2	NAG	O5-C5-C6-O6

There are no ring outliers.

No monomer is involved in short contacts.

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 11 ligands modelled in this entry, 5 are monoatomic - leaving 6 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	802	1	14,14,15	0.98	1 (7%)	17,19,21	2.72	8 (47%)
9	J42	A	815[B]	5	39,39,94	1.11	3 (7%)	50,50,112	1.38	6 (12%)
4	NAG	A	804	1	14,14,15	1.02	1 (7%)	17,19,21	3.55	7 (41%)
4	NAG	A	803	1	14,14,15	1.01	1 (7%)	17,19,21	2.32	7 (41%)
9	J42	A	815[A]	5	39,39,94	1.14	3 (7%)	50,50,112	1.55	9 (18%)
4	NAG	A	801	1	14,14,15	0.79	0	17,19,21	1.59	5 (29%)

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	802	1	-	1/6/23/26	0/1/1/1
9	J42	A	815[B]	5	-	3/40/40/110	0/1/1/3
4	NAG	A	804	1	-	1/6/23/26	0/1/1/1
4	NAG	A	803	1	-	1/6/23/26	0/1/1/1
9	J42	A	815[A]	5	-	7/40/40/110	0/1/1/3
4	NAG	A	801	1	-	2/6/23/26	0/1/1/1

All (9) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
9	A	815[A]	J42	O1-C10	3.41	1.32	1.22
9	A	815[B]	J42	O1-C10	3.38	1.32	1.22
9	A	815[B]	J42	C3-N	-2.74	1.36	1.41
9	A	815[B]	J42	O-C10	-2.61	1.22	1.30
9	A	815[A]	J42	O-C10	-2.53	1.22	1.30
9	A	815[A]	J42	C3-N	-2.52	1.36	1.41
4	A	803	NAG	C4-C5	2.43	1.58	1.53
4	A	802	NAG	C6-C5	2.35	1.59	1.51
4	A	804	NAG	O5-C5	2.00	1.47	1.43

All (42) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	804	NAG	C1-O5-C5	10.26	125.93	112.19
4	A	804	NAG	C6-C5-C4	-5.53	99.45	113.02
4	A	803	NAG	C1-O5-C5	5.52	119.58	112.19
4	A	804	NAG	O3-C3-C4	-5.34	97.79	110.38
4	A	802	NAG	C1-O5-C5	5.12	119.05	112.19
9	A	815[B]	J42	C18-O8-C17	4.95	129.63	117.69
4	A	802	NAG	O5-C5-C6	4.81	117.02	107.66
4	A	804	NAG	O5-C5-C6	4.35	116.14	107.66
4	A	802	NAG	C4-C3-C2	4.19	117.16	111.02
4	A	802	NAG	O6-C6-C5	4.01	125.00	111.33
9	A	815[A]	J42	N-C4-N1	3.80	120.17	113.83
4	A	803	NAG	C2-N2-C7	3.69	127.85	122.90
4	A	803	NAG	O3-C3-C2	-3.46	102.22	109.40
9	A	815[A]	J42	O8-C17-C3	3.22	120.21	114.95
9	A	815[B]	J42	O-C10-C9	3.13	124.09	113.51
9	A	815[A]	J42	O-C10-C9	3.04	123.80	113.51

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	802	NAG	C3-C4-C5	3.04	115.74	110.23
4	A	802	NAG	O5-C1-C2	-2.87	106.85	111.29
4	A	804	NAG	O5-C5-C4	2.86	117.79	110.83
4	A	801	NAG	C1-O5-C5	2.81	115.95	112.19
4	A	803	NAG	O4-C4-C3	2.76	116.89	110.38
4	A	802	NAG	O7-C7-C8	-2.71	117.22	122.05
4	A	803	NAG	O7-C7-C8	-2.71	117.23	122.05
9	A	815[B]	J42	C9-N2-C11	2.70	126.84	120.64
9	A	815[A]	J42	C9-N2-C11	2.62	126.66	120.64
9	A	815[A]	J42	C18-O8-C17	2.62	124.01	117.69
4	A	803	NAG	O7-C7-N2	2.62	126.61	121.98
4	A	801	NAG	O5-C1-C2	-2.58	107.30	111.29
4	A	802	NAG	O3-C3-C2	-2.55	104.10	109.40
4	A	801	NAG	O4-C4-C5	2.48	115.44	109.32
9	A	815[B]	J42	C16-C12-N3	-2.48	104.82	110.57
4	A	804	NAG	O7-C7-C8	-2.48	117.64	122.05
4	A	803	NAG	O5-C5-C4	2.47	116.84	110.83
9	A	815[A]	J42	C3-N-C4	-2.40	119.76	125.34
4	A	801	NAG	C2-N2-C7	-2.35	119.75	122.90
4	A	804	NAG	O4-C4-C3	2.35	115.92	110.38
9	A	815[A]	J42	O-C10-O1	-2.29	118.88	124.08
9	A	815[A]	J42	O2-C15-O3	-2.16	117.77	123.33
4	A	801	NAG	O5-C5-C4	2.15	116.06	110.83
9	A	815[B]	J42	O2-C15-O3	-2.14	117.83	123.33
9	A	815[B]	J42	O-C10-O1	-2.13	119.25	124.08
9	A	815[A]	J42	C17-C3-N	2.01	120.47	116.73

There are no chirality outliers.

All (15) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	801	NAG	O5-C5-C6-O6
9	A	815[B]	J42	N1-C5-C6-C7
4	A	801	NAG	C4-C5-C6-O6
9	A	815[A]	J42	O8-C18-C19-N4
9	A	815[A]	J42	C3-C17-O8-C18
9	A	815[A]	J42	C57-C17-O8-C18
4	A	803	NAG	C4-C5-C6-O6
4	A	802	NAG	O5-C5-C6-O6
9	A	815[A]	J42	O-C10-C9-N2
9	A	815[A]	J42	C19-C18-O8-C17
9	A	815[B]	J42	C5-C6-C7-C8

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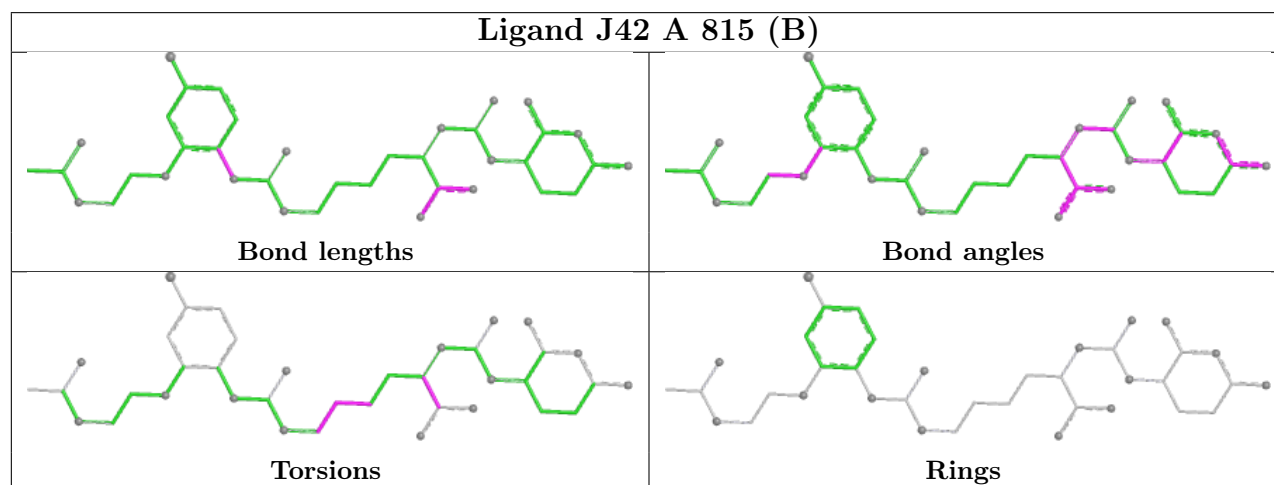
Mol	Chain	Res	Type	Atoms
9	A	815[A]	J42	N1-C5-C6-C7
9	A	815[B]	J42	O-C10-C9-N2
4	A	804	NAG	C4-C5-C6-O6
9	A	815[A]	J42	O1-C10-C9-N2

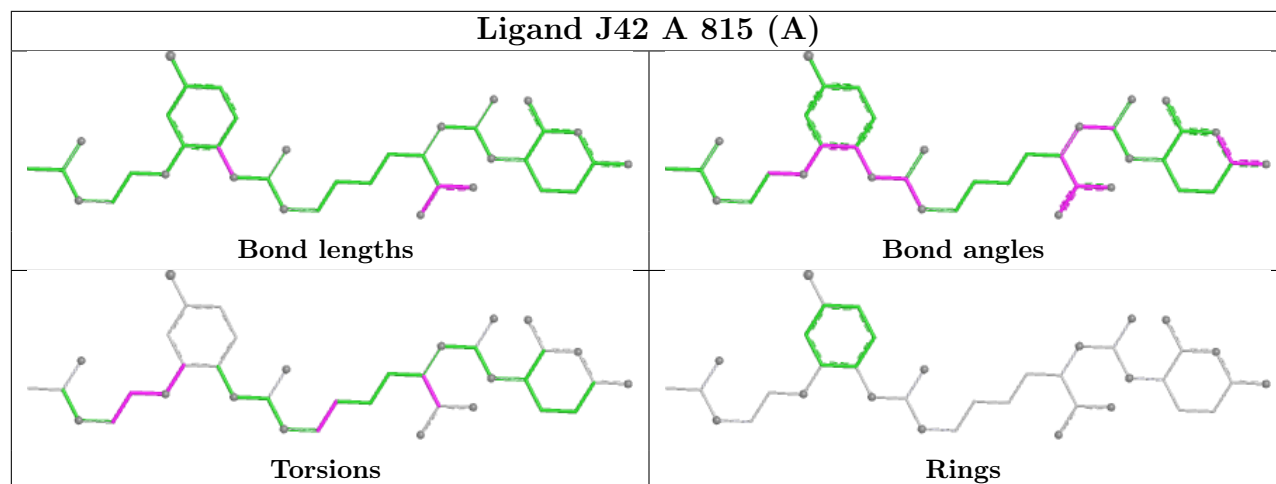
There are no ring outliers.

2 monomers are involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
9	A	815[B]	J42	3	0
9	A	815[A]	J42	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 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	692/739 (93%)	-0.16	16 (2%) 61 63	13, 25, 53, 90	1 (0%)

All (16) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	541	TRP	5.8
1	A	543	THR	4.9
1	A	548	GLY	3.2
1	A	336	ASN	2.8
1	A	542	GLU	2.5
1	A	124	HIS	2.5
1	A	276	GLU	2.4
1	A	122	LYS	2.4
1	A	152	GLU	2.3
1	A	506	PHE	2.3
1	A	133	GLU	2.2
1	A	505	GLU	2.2
1	A	136	ASN	2.1
1	A	275	ASN	2.1
1	A	341	LYS	2.0
1	A	155	SER	2.0

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

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

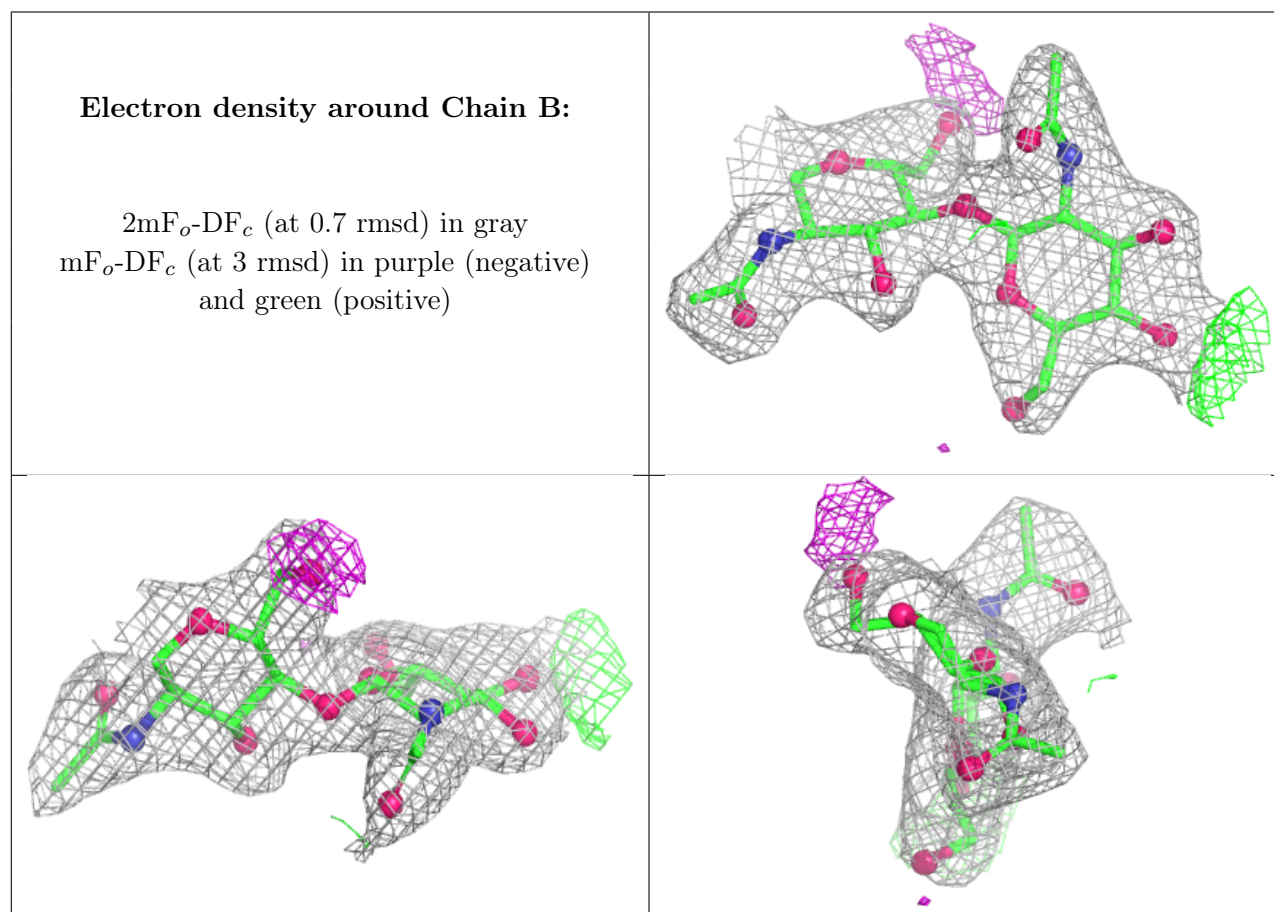
6.3 Carbohydrates [i](#)

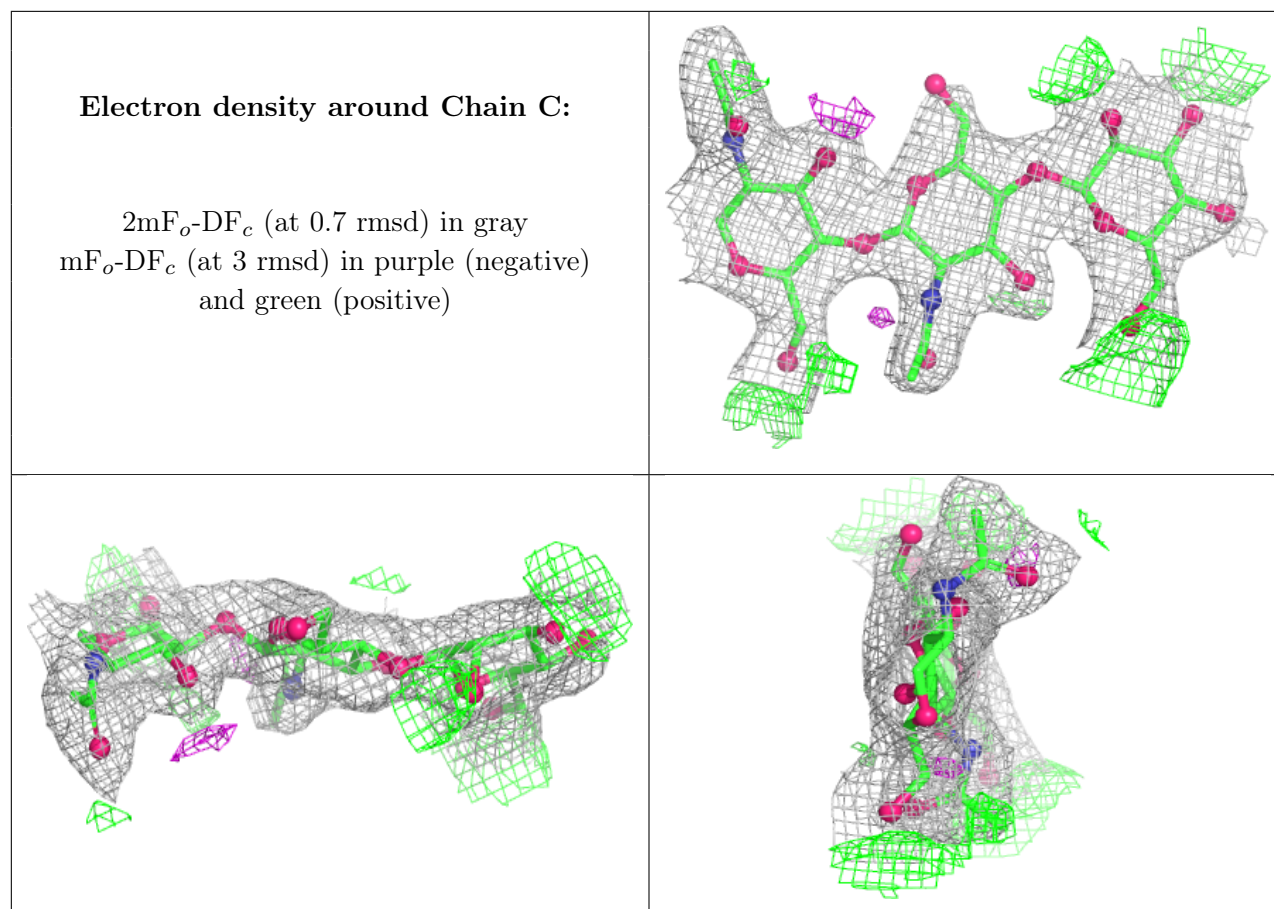
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum,

median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q<0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	BMA	C	3	11/12	0.80	0.14	43,45,50,50	0
2	NAG	B	2	14/15	0.88	0.09	33,41,49,54	0
3	NAG	C	2	14/15	0.89	0.11	42,48,54,63	0
2	NAG	B	1	14/15	0.92	0.08	26,33,36,36	0
3	NAG	C	1	14/15	0.92	0.07	21,31,42,42	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.





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.

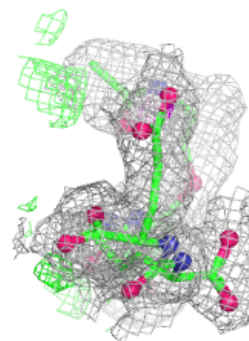
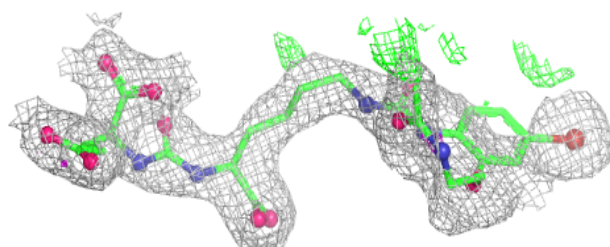
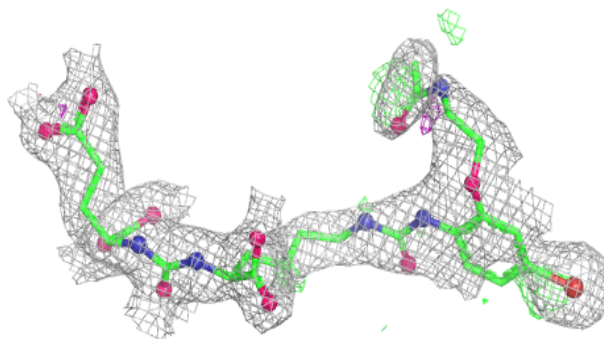
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	NAG	A	803	14/15	0.77	0.13	39,46,51,51	0
4	NAG	A	802	14/15	0.78	0.17	49,57,73,77	0
4	NAG	A	804	14/15	0.88	0.12	28,50,59,65	0
4	NAG	A	801	14/15	0.90	0.09	34,42,46,49	0
9	J42	A	815[A]	39/92	0.92	0.15	17,35,80,85	39
9	J42	A	815[B]	39/92	0.92	0.15	17,30,41,48	39
8	NA	A	814[B]	1/1	0.93	0.07	29,29,29,29	1
6	CL	A	812	1/1	0.99	0.04	19,19,19,19	0
5	ZN	A	811	1/1	1.00	0.01	20,20,20,20	0
5	ZN	A	810	1/1	1.00	0.02	21,21,21,21	0
7	CA	A	813	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.

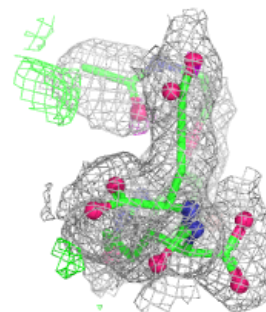
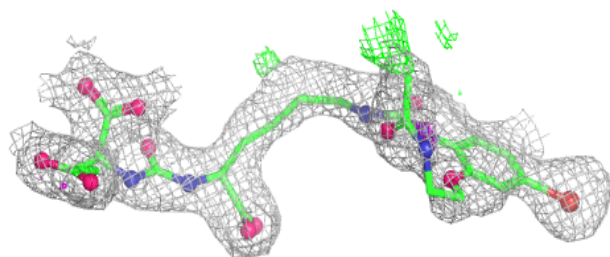
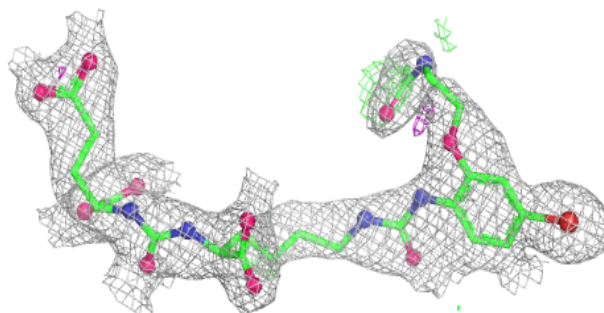
Electron density around J42 A 815 (A):

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



Electron density around J42 A 815 (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.